Venture Capitalist Reputation and the Long-run Performance of China's Initial Public Offerings

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Abstract

China has experienced significant growth in the Initial Public Offering (IPO) market during the last decade. During this period, venture capital (VC) has been playing an increasingly important role in the IPO market. The main aim of this thesis is to empirically examine the impact of both VC-backing and VC reputation on the long-run performance of Chinese IPOs, and to explore whether the impact is subject to where the IPO get listed, e.g. ChiNext Board (a Nasdaq-type Board in China).

The thesis measures IPO performance with both share price performance and operating performance. In particular, the former is measured as the buy-and-hold abnormal returns, where the each IPO has its own matched portfolio as the benchmark. The latter is measured by the return on equity. These measures are calculated for up to three years post IPO. Significantly, this thesis acknowledges the wide range of possible metrics that can be used for measuring reputation and examines the importance of metric choice on the performance measurement outcomes. A special feature of the reputation used in this thesis is the use of a real-world and market-based ranking measure for VC reputation created by the Zero2IPO Research Group for the China market, which is more multifaceted than many of the traditional proxies for reputation used in earlier studies. This thesis constructs a cross-sectional sample consists of more than 1000 IPOs listed during the nine-year period from January 2004 through December 2012.

The thesis finds that although IPOs generally experience long-run underperformance in the Chinese stock market, VC-backed IPOs show better long-run performance than their non-VC-backed counterparts. In addition, there is some evidence that the higher the VC's reputation, the better their invested IPOs perform in the stock market relative to non-VC-backed IPOs. This pattern is driven primarily by IPOs listed on the ChiNext Board (a Nasdaq-type Board), and the results are independent of reputation proxy. However, within the sample of VC-backed IPOs, the difference in performance between IPOs backed by high-reputation VCs and those backed by lower-ranked VCs is found not to be statistically significant and so this study is unable to provide conclusive evidence that VC reputation influences the performance of VC-backed IPOs. In the case of operating performance, neither VC-backing nor VC reputation affect post-IPO performance significantly. This is likely due to the limited forward-looking characteristics of historic accounting data, especially for early-stage and hi-tech firms. These results are robust to a range of additional tests.

The thesis brings forward some important policy implications based on the results. For example, the government should broaden the sources of funding to make private VC to participate more into the IPO market, provide more favourable tax policies to VC and encourage more involvements from VCs.

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List of Abbreviation

BHAR	Buy-and-Hold Abnormal Returns
CAR	Cumulative Abnormal Returns
CSMAR	The China Stock Market & Accounting Research
CSRC	China Securities Regulatory Commissions
ICB	Industry Classification Benchmark
IPO	Initial Public Offering
M&A	Merge and Acquisition
PE	Private Equity
Repo	Repurchase Agreements
ROA	Return on Assets
ROE	Return on Equity
SHSE	Shanghai Stock Exchange
SME	Small and Medium Sized Enterprises
SZSE	Shenzhen Stock Exchange
VC	Venture Capital

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Chapter 1

Introduction

This thesis explores the impact of Venture Capital (VC) and VC reputation on initial public offering (IPO) firms' long-run post-issue performance, based on an emerging economy like China. This market has experienced significant growth over recent decades. As the government of China strives to stimulate economic growth by promoting the development of high-tech industries, VC has been playing an increasingly vital role in assisting the success of start-up firms. China therefore provides an ideal environment for exploring the study of associations between VCs and IPO performance. This chapter first reviews the specific institutional background of the Chinese IPO market and the VC industry. After that, the research objectives are proposed followed by the conclusive summation of outcomes of this study.

1.1 IPO Market in China

IPO is the first time that a private company issues shares to investors to raise capital and thereby transfers to a public listed company. Through IPO, a firm could attract more investors, improve brand recognition, and earn generous returns. It could also benefit firms to improve their enterprise system and managerial structure. Therefore, going public is the optimal choice for private firms if they are eligible to do so. The China stock market has exhibited great expansion during the last 30 years. The number of IPO companies steadily rises every year.

Figure 1.1 illustrates the number of A share IPOs listed on the Shanghai stock exchange (SHSE) and Shenzhen stock exchange (SZSE) from 1990 to 2012[1]. Generally, the IPO market in China was vibrant. Across the 32 years, there are 2,548 A share IPOs. However, the number of IPOs fluctuates in this period. For instance, in 1996 and 1997, China approved more than 200 IPOs in each year, but in 2005 there were only 15 new-issued firms[2]. With the establishment of ChiNext board[3] on Oct 30 2009, the number of IPOs soared to 349 in 2010, 282 in 2011, and 155 in 2012[4].
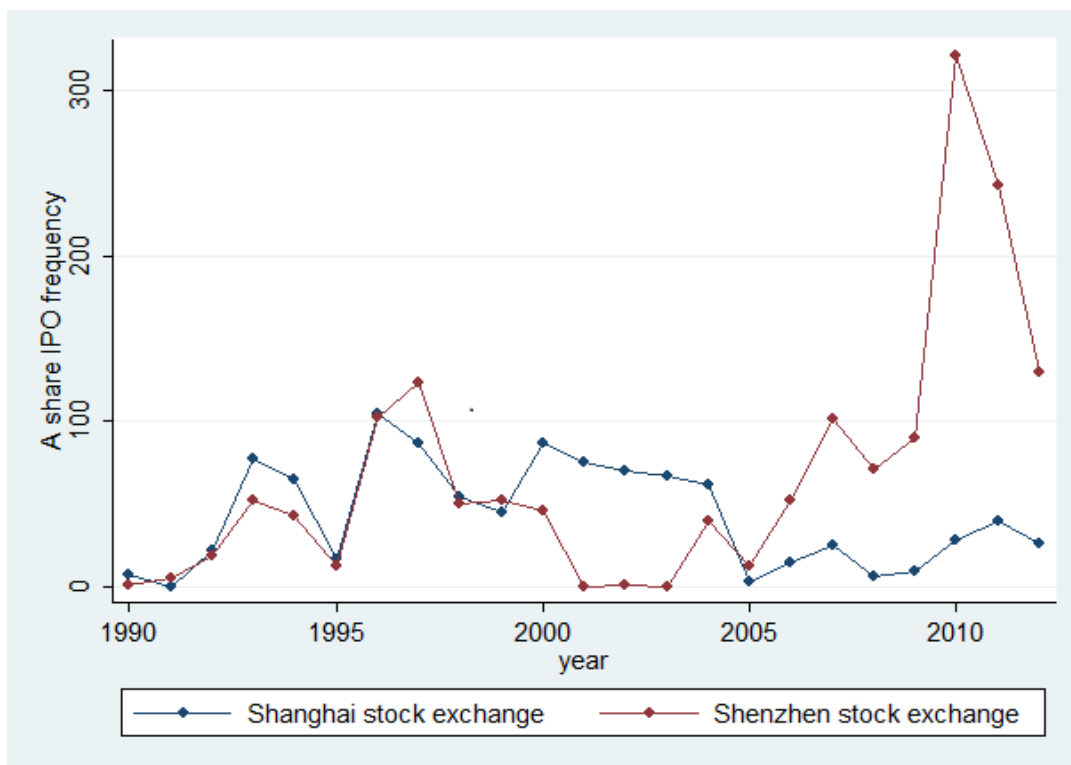
Figure 1.1 Distributions of A share IPOs from 1990-2012 by SHSE and SZSE.

Comparing the IPO frequencies by exchanges provides additional insight into the development of the China stock market. From 1990 to 2004, the SHSE took the leading role and had more IPOs than SZSE for most years. From 2001 to 2003 only one IPO was

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[1] A more detailed discussion of China stock can be found in section 3.
[2] This was because from the May 2005, one year after the establishment of SME board (May 2004), the CRSC suspended the process of IPO after the SME board accomplished the 50th IPO case. Meanwhile, the whole market was dedicated into share-split reform during this period. Eventually the IPO market resumed in May 2006.
[3] This is a Nasdaq-type board, especially for start-up firms to get listed.
[4] The IPO market was suspended from Oct 2012 for the second period of adjustment. It reopened 14 months later in Jan 2014.

issued on the SZSE, while there were 212 on SHSE. However, the situation reversed since 2005, the total number of IPOs listed on SZSE was about 7 times more than on the SHSE.

This reversal was mainly due to the launch of the SME in 2004 and the ChiNext board in 2009 on the SZSE, respectively. These two boards provide opportunities for small- and medium-sized and great growth potential firms to raise funds for further development. Thus, there is a huge and growing number of IPOs on the SZSE on account of the expansion of privately-own enterprises in many emerging and non-traditional industries. The apparent drop in the number of IPOs on the SHSE is also because of the new listings were halted for 11 months between 2005 and 2006 and 10 months between 2008 and 2009. This makes the Main board IPOs more tough and strict.

1.2 The ChiNext Board

It is obvious that the ChiNext board has played a very important role in China's IPO market and the continued development of the China stock market. Nearly all the mature capital markets possess a second board, e.g. the Nasdaq of America, AIM of UK, Jasdaq of Japan, and the GEM of HK, etc. A Second board is an indispensable segment of an integrated stock market, and the establishing of the ChiNext board has symbolized the beginning of multi-level capital market in China.

The existence of ChiNext board provides a number of advantages. First of all, it incentives and encourages venture firms' operation and development. Once listed on the ChiNext board, IPO firms will face a more efficient financial system and structure and more strict regulations, under which the raising and spending of money become more transparent, thereby avoiding abuses such as black-box operations. Besides, it can stimulate the entire venture industry, because to VCs IPO is the best way to liquidate their investments and accelerate capital turnover speed. The ChiNext board is well designed for the development of VC. A great number of studies have shown that VC is of great importance to the development of small and medium sized and innovative firms. Thirdly, the ChiNext board is mainly designed for the domestic growth start-ups, emphasising support for firms with creative independent intellectual property rights, good prospects, and positive employment opportunities[5]. It generates more opportunities for venture firms to go public. While being

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[5] In particularly, it prefers to support burgeoning industries such as New Material, New resources, IT, Medical Biotechnology, Energy-conserving and Environment-protective, and Morden Service, etc.

different with the western second board, the ChiNext is not limited to the IPO of high-tech venture firms but is available for other industries.

Table 1.1 displays the notable contribution the ChiNext board has made to the China stock market, by comparing the number of IPOs and the total IPO market capitalizations from 2009 to 2012. In 2009, 36% of IPOs were listed on the ChiNext board, while in 2012 the proportion rose to 47%. Such trend is also applicable to the total IPO market capitalizations. For instance, in 2009, the 36 ChiNext board IPOs only contributed to 6.67% of the total IPO market capitalization, but in 2012, the ChiNext board IPOs contributed to 39.63% of the total IPO market capitalization.

Overall, the data proves that ChiNext has become an increasing vital component of the China stock market. It is particularly meaningful to the small and medium size growth enterprises as this board promotes the integration of technology, knowledge and capital, the transformation from ideas to physical products. More strikingly, it is an ideal place for VC investments to exit.

Table 1.1 IPO Frequency and Market Capitalization of ChiNext

	IPO Numbers			Market Capitalization		
	ChiNext	**Full Market**	**%**	**ChiNext**	**Full Market**	**%**
2009	36	99	36.36	1,610.08	24,150.37	6.67
2010	117	349	33.52	7,365.22	25,693.44	28.67
2011	128	282	45.39	7,433.79	20,730.30	35.86
2012	74	155	47.74	8,731.24	22,029.41	39.63

In **Table 1.1,** the market capitalization is measured by the unit of Billon Yuan.

1.3 VC Industry in China

The founding of American Research and Development Corporation in 1946 is treated as the birth of the modern VC industry[6]. Since then, VC has attracted the world's attention due to its ability to produce enormous rewards. VC is a major impetus for the global development of high-tech industry, and it has been supported by governments in most countries. Generally, VC is acknowledged as a specialist-managed capital investment form. However, there is still a lot ambiguity in the standard definition of VC. According to the US National Venture Capital Association, VC is defined to be one kind of private equity that targets the investment towards the enterprises that have high potential, high growth rate and dramatic competing strength. The European Venture Capital Association emphasises the particular behaviour of VC investment, i.e. VC investors do not only offer capital, but also get involved in the management and operation of the funded firms.

The definition of VC varies with the development of the VC industry. In the early years, VC was associated with the early stage investment in high-tech firms, i.e., seed and start-up. Nonetheless, VCs have gradually extended their investment range beyond this narrow sense. An increasing number of VCs started to step into projects at the expiation and mature stages, and also attempted to widen their business to more traditional industries. Consequently, a broader concept of VC now appears to be more appropriate - all the capital investments towards pioneering, innovative and creative projects could be defined as VC investment. In fact, this description is more acceptable in Europe and Asia, for example, the British Venture Capital Association recognizes VC investment as an equity investment to unlisted UK company.

In recent years, the broad sense of VC has been gradually replaced by an even broader concept - private equity (PE). A PE investment is a private investment form which purchases equity stakes of unlisted companies or the non-tradable equities of listed companies. Generally speaking, VC is a subsample of PE which targets early stage investment. Even though VCs and PEs have diverse investment preferences, they both are pre-IPO equity investments aiming at long-term capital appreciation. Besides, in addition to money, they both provide services to venture firms that are contributable to the business expansion, new-product development, operations and management efficiency. In fact, boundaries to separate VC and PE are more and more unclear currently. A few specialized

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[6] In 1957, ARD invested $70,000 to the Digital Equipment Corporation; while later in 1971, the market value of DEC had grown by more than 5000 times and reached up to $3.55 billion, which ballooned investors' values dramatically.

PE institutions participated in VC projects, while many VCs have also intervened in the business activities of PEs.

VC was introduced to China in 1980s[7], and it has experienced enormous growth with the support of Chinese government. In China, VC is primarily defined as equity investment into the high-tech, high growth rate and high potential start-up firms, but not limited to the early stage investments. It is crucial to mention that there is no strict distinction between VC and PE in China. These two terms are often reported or presented together as VC/PE. Generally, any equity investment into the unlisted companies by the VC/PE firms all are classified into the equity investment category. Indeed, VC and PE institutions are frequently stepping into each other's business scope. For example, the traditional PE like Carlyle Group also conducted many VC investments (Ctrip, Target Media). In this research, all the IPOs invested by VC and/or PE institutions are classified as the VC-backed IPOs.
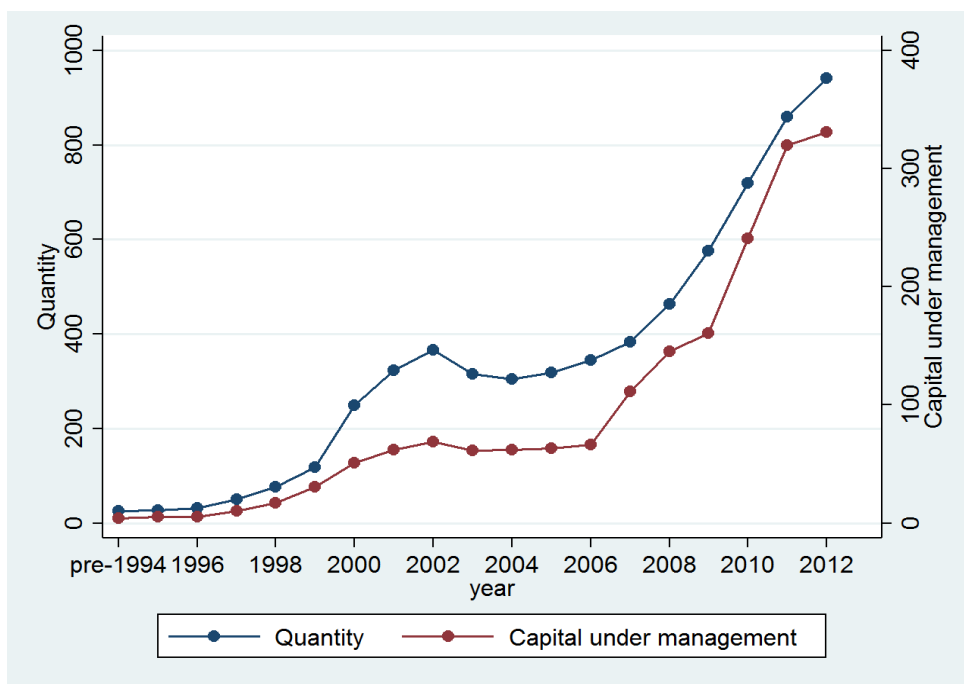
Figure 1.2 Distribution of VC Quantity and Gross capital Raised.

Figure 1.2 illustrates the 20-year development of Chinese VC industry from 1994 to 2012. From the table, it is clear that before 1999 VC in China developed at a very low pace. The quantity of VC institutions and the scale of capital raised were hovering around low

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[7] The first VC institution, "Chinese New Technology Venture Capital Corporation", in China was established in 1985, which is sponsored by State Scientific and Technological Commission and People's Bank of China.

levels, and the usage of fund was less efficient at this stage. With the expansion of global economy across the world in the late 1990s, VC played a prominent role in pushing the technological innovation and economic growth in China.

In spite of being influenced by several global economy cycles, the VC industry in China experienced steady growth. During this period, there was a great demand for funding as a large number of enterprises were established under the prosperity of high-tech knowledge-based industry. Given the issue of several encouragement policies, the launch of SME and ChiNext boards, and the participation of overseas VC funds, VC has developed considerably in China. In 2012, there were 942 VC institutions raising totally 331.29 billion yuan, an increase of 547% compared with 2000. The total investment amount reached 235.51 billion yuan and the average investment amount in each project reached 13.23 million yuan. China's VC industry is not only vital for capital market growth, but also accounts for a large share of China's IPO market.

1.4 VC Reputation

Reputation is recognized as a unique, cumulative, irreplaceable and comprehensive asset which is formed imperceptibly throughout the life span of a firm (Barney, 1991). According to Fombrun (1996, p.72), "reputation is a perceptual representation of a company's past actions and future prospects that describe the firm's overall appeal to all its key constituents when compared to other leading rivals". Commonly, reputation has been affirmed as one of the indicators to distinguish a firm's quality. The benefits that reputation generates could be enormous. A good reputation carries a signal of reliable and experience to the investors and consumers. One may also regard firms which cooperate with reputable firms to be of higher quality too.

The above definition of reputation is completely applicable to VC firms. Reputation is of great importance to VC firms, since it could reflect the competitive advantages and qualities of VCs (Dimov *et al*., 2007). Given their unique characteristics as financial intermediaries, VCs are the bridge to connect capital and investment opportunities. Nonetheless, in such a competitive industry, it is difficult for VCs to raise funding and select the 'right projects'. Raising capital, as well as the ability to identify better projects would be much easier for a reputable VCs. Moreover, reputation is not only crucial to VCs, but also essential to the firms funded by VCs.

The measurement of VC reputation has attracted great academic attention because there is no explicit measure for it, given its nature (i.e. an intangible asset). Hence, there have been many studies (e.g. Shu et al., 2011, Cho and Lee, 2013 and Barry and Mihov, 2015) on the exploration of how to measure VC reputation, and how well can different measurements capture the true effects of VC reputation.

1.5 Research Questions and Hypotheses

A majority of studies find that VC-backed firms exhibited superior post-IPO performance in the long-term than the non-VC-backed IPO firms due to VC's function of Certification, Screening and Monitoring (e.g. Lahr and Mina, 2012), as well as Value-added functions (Croce et al., 2013). On the contrary, another group of studies also found that VCs display a negative impact on IPO firms' long-run performance. The inferior performance of VC-backed IPOs is suggested to be the consequences of the Adverse Selection between VCs and the portfolio firms (e.g. Rosenbusch *et al*., 2013) and VCs' Grandstanding behaviour (e.g. Hsu, 2013). Therefore, our first research question is to whether VC-backed IPOs experience significantly different long-term performance pattern than the non-VC-backed IPOs in China. This research question is addressed by formally testing the following hypothesis: **H₁.** The VC-backed IPOs exhibit significantly superior long-run performance than the non-VC-backed IPOs in China.

In the course of investigating the performance of VC-backed IPO firms, a few studies have been carried out focusing on the properties which are unique to each VC, e.g. the reputation. However, the results are not conclusive. On the one hand, a few studies have verified that reputable VCs are more experienced in selecting projects and nurturing promising companies. Hence, it is more likely for reputable VC-backed firms to develop rapidly and became successful, and VC reputation is concluded to be positively associated with IPO firms' long-run performance (e.g. Lahr and Mina, 2012). On the other hand, some studies suggest a negative impact from less reputable VCs (e.g. Rosenbusch et al. 2013). Therefore, the second question of this thesis is to understand whether VC reputation exerts a significant impact on the post-IPO long-run performance in China. This question is addressed by formally testing the following two hypotheses: **H₂.** VC reputation exhibits significantly positive impact on the long-run performance of IPOs in China; and **H₃.** High

(Low) VC reputation exhibits a positive (negative) impact on the long-run performance relative to the non-VC-backed IPO in China.

In general, this body of research usually focuses on the developed markets like the US and UK. China has shown significant economic growth since the 1980s. Due to the significance and intangibility of the reputation to every financial institution, it is a considerable task to test how VC's reputation accounts for their effects in such a specific market. However, to the best knowledge of this research, studies that explore the impact of VC reputation on China IPO market still needed to be enriched. The last two decades have witnessed the success of VC investment in China. The quantity of VC-backed IPOs has grown up sharply in China and a large population of them are listed on the ChiNext Board. Therefore, the third question is whether VC/VC reputation exerts an exceptional impact on the ChiNext board IPOs. This question is answered by formally testing the following two hypotheses: **H₄.** VC exerts significant impacts on post-IPO long-run performance for firms listed on the ChiNext board market and/or Main board market in China; and **H₅.** VC reputation exerts a significant impact on post-IPO long-run performance for firms listed on the ChiNext board market and/or Main board market in China.

1.6 Research Contributions

This thesis contributes to the literature in several aspects.

1. This thesis examines both the post-IPO long-term stock market performance and operating performance in the context of China and finds that VC-backing/VC reputation plays different roles on China IPOs' long-run stock market and operating performance.
2. This thesis makes improvement on the measurement of long-run performance as buy-and-hold abnormal returns. The thesis construct IPO-specific portfolio as the bench mark to each IPO firms, in order to precisely estimate the abnormal returns. More specifically, for each IPO firm, the portfolio consists of firms with M/B ratio and market capitalization both being no smaller than and no larger than the corresponding values of the IPO by 25%.
3. This thesis acknowledges the wide range of possible metrics that can be used for measuring reputation and examines the importance of metric choice on the performance measurement outcomes. In particular, a special feature of the reputation used in this

thesis is the use of a real-world and market-based ranking measure for VC reputation created by the Zero2IPO Research Group for the China market, which is more multifaceted than many of the traditional proxies for reputation used in earlier studies.

4. According to the specific institutional background of China stock market, this thesis also examines the impact of VC reputation (by high and low) on the long-run IPO performance across different boards, i.e. the Main, SME and ChiNext boards.

1.7 Research Findings

From the analysis of stock market performance, this thesis finds that the 36-month Buy-and-Hold Abnormal Returns (BHARs) of VC-backed IPOs are significantly superior to the non-VC-backed IPOs. VC-backed IPOs are significantly older, exhibit lower initial returns, and own less state-owned equity stakes than the non-VC-backed IPOs. What is more, the analysis with VC reputation generates several findings. Firstly, VC reputation does not act as a significant role in identifying variations of VC-backed IPOs' post-IPO long-term returns. Compared to the non-VC-backed IPOs, both IPOs funded by more reputable VCs and those funded by less reputable VCs display significantly better performance. Although the positive effects of more reputable VCs are stronger, the preponderance is not very notable. Examining across different boards, the above reputation effects of VCs are only significant on the non-main-board IPOs. This indicates that the impact of VCs on China stock market performance is driven principally by the impact on smaller firms with high growth potential.

However, the analysis of long-run post-IPO operating performance illustrates that VC and VC reputation unlikely exerte on the stock market performance. The ROE reduction is serious across all the IPOs in China over the three years after flotation, whereas VC-backed IPOs do not demonstrate any significant benefits. Neither the reputable nor the less reputable VCs are found to have a significant impact on the three-year's post-IPO ROEs. Moreover, the examination by boards also fails to catch any significant impact of VC reputation on the operating performance.

Overall, this thesis finds that VC-backing and VC reputation have a significant positive impact on three-year's post-IPO stock market performance but no impact on the three-year's operating performance at all. Why such results? One explanation is that the stock

returns are 'forward-looking' indicators which integrate the expectations of investors, while the accounting data used for calculating operating performance are primarily 'backward-looking'.

The stock prices can easily fluctuate as investor sentiment towards the firms' expected returns alter. In accordance with the Certification hypothesis, the involvement of VC is a symbol of good quality and high growth potential. Therefore, the superior stock prices of VC-backed IPOs might be because of investors' positive attitudes to the future prospects. By the same token, even if VCs completely exit, investors still incline to be more optimistic about IPOs, given that they had been labelled as VC-backed. The operating performance measure are backward-looking accounting-based indicators which reveal current and past performance. Hence, when VCs leave the IPO firms and the guidance and service terminates, their impact on firms' operations terminates. In this sample, a large number of VCs completely exit the IPO firms after 12 months of floatation, meaning that using the three-year's post-IPO period may not be sufficient to capture the exact impact of VC/VC reputation. The lack of significance of VC reputation on operating performance might, in part, be the result of this limitation.

The robustness of the above findings is examined by using the Heckman Two-step model which controls the selection bias of VC investors. The empirical results demonstrate consistent effects of VC/VC reputation. The associations between the various measurements of VC reputation are then explored. These reveal that measures used in the prior studies are far from being perfectly correlated and this may explain why some prior studies generate conflicting findings.

1.8 Thesis Structure

The structure of this study is as follows. Chapter 2 presents the literature review of IPO long-run performance and the impact of VCs on long-run performance. Summaries of the studies of VC reputation have also been included in this Chapter, including the functions and the measurements of VC reputation. Chapter 3 introduces the institutional background of China's stock market and the development of the VC industry in China across the 20 years. Following the discussion from the previous chapters, Chapter 4 develops hypotheses, designs the empirical models and explains the methodologies for this thesis. The descriptions of the IPO dataset are presented in this Chapter as well. Chapter 5 first reports

the results of the empirical models that are put forward in Chapter 4 and then discusses the findings. Chapter 6 presents additional analyses including robustness checks of the above results and the associations between various measurements of VC reputation. Finally, Chapter 7 presents the concluding remarks. In chapter 7, the results of this thesis are summarised and implications to the VC investors, venture entrepreneurs, and the policy makers in China are discussed. Finally, the limitations of this thesis are explained, together with proposals for future studies.

1.9 Conclusions

This chapter introduces the IPO market and VC industry in China. VC has been playing an increasingly vital role in China. Therefore, China therefore provides an ideal environment for exploring the study of associations between VCs and IPO performance. The chapter then describe ChiNext, which has played a very important role in China's IPO market and the continued development of the China stock market. This suggests that to study the influence of ChiNext on the impact of VC-backing and VC reputation is important in China. Moreover, the chapter describes the research questions, and demonstrates how they are addressed and linked to the main research hypotheses. Furthermore, the research contributions are clearly illustrated. Finally, research findings and the structure are described.

Chapter 2

Review of Prior Studies

This chapter summarises prior studies regarding the research questions described in the previous chapter. Firstly, the chapter reviews the studies on the IPO long-run performance. For the purpose of raising large amounts of capital to expand their business, going public has become the optimal goal for most companies. However, going public does not guarantee perpetual success. Maintaining promising performance is essential, otherwise firms might be suspended or delisted from the exchange. An overwhelming majority of studies have found IPO firms' post-issue performance during the three to five years are significantly weaker than the listed firms that have been traded for years. Then, the paper reviews the studies on the role of VC and VC reputation in the IPO long-run performance. Since the measurement of VC reputation is one of the main contributing claims in this thesis, this chapter also summarizes the studies on the measurement of VC reputation.

2.1 IPO Long-run Underperformance

IPO long-run underperformance after the issue of IPO has been documented in the literature. This section will review these studies and the explanations of this phenomenon.[8] The long-term post-issue underperformance of IPO firms have been found in a great deal of studies. For example, Ritter (1991) examines the buy and hold abnormal returns (BHARs) during

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[8] However, there are some exceptions of long-run outperformance. For example, Kim *et al*. (1995) using 169 firms listed on the Korea Stock Exchange during the period 1985–1989 find that the Korean IPOs outperform seasoned firms with similar characteristics. Ahmad-Zaluki *et al*. (2007) using 454 Malaysian IPOs during the period 1990 to 2000 and find significant outperformance for equally-weighted event time CARs and buy-and-hold returns. Michel *et al*. (2014) also find positive abnormal returns after IPO using a sample of 1801 IPOs that occurred between January 1996 and December 2006. Bird and Yeung (2010) find that Australian IPOs over performed by 12%.

the three years' post-issue period of 1,526 IPOs listed on the US market from 1975 to 1984. Compared to the controlled listed stocks one-to-one matched by market value and industry, the three-year's BHARs of the sample IPOs significantly underperformed by 27.39%. Such findings indicate that investors would lose money by buying and holding shares of companies that recently accomplished the IPO. The post-IPO underperformance pattern has also been found by Loughran and Ritter (1995) based on an even larger sample which contains nearly 4,753 US IPOs listed between 1970 and 1990. Their results claim that investing in IPO firms is hazard for investors' wealth. The post-issue five years' average annualized return of IPO firms only 5%, which is significantly lower than the same period returns of the matched non-listed firms (11.8%). Alternatively, IPO firms' five-year's BHARs are -50.7% and -41.6% relative to the matched non-listed firms by size and the value-weighted market index, respectively. Their results give further support to the prior evidence of long-run underperformance. Brau et al. (2012) using 3,547 IPOs from 1985 through 2003 find that the mean 3-year style-adjusted abnormal return is negative at 15.6%.

Inspired by Ritter's work, a large number of studies was conducted to explore the long-run post-IPO performance, and most of them are based on the US market (see for example, Ritter and Welch, 2002; Krishnan et al., 2011; and Hoechle et al., 2018). In general, those studies extensively acknowledge that the new issued companies underperform the companies that have been listed on the stock market for many years, i.e., their post-IPO performance, for a period of 3 or 5 years, are significantly lower compared with matched companies or the market index. For example, Loughran (1993) expands Ritter's study (1991) and further explores the six calendar years' post-IPO performance on a larger sample (3,656 IPOs) during 1967-1987 from the Nasdaq Market. His result demonstrates that the average six-year's post-IPO returns considerably underperform the equally-weighted market index, i.e. the returns are 17.29% vs. 76.23%. Meanwhile, the wealth relative mark is found to be 0.666, which is even smaller than that in Ritter's study (0.831). Jain and Kini (1994) examine the operating performance of 682 US IPOs from 1976 to 1988, measuring by ROA and operating cash flows over the total assets. Compared to the one year pre-IPO level, the post-IPO operating performance dropped dramatically after five years of floatation. Their finding is in line with the view of Pagano et al. (1998) that the post-IPO reduction in profitability results from the window of opportunity hypothesis. Krishnan et al. (2011) also finds that the abnormal returns are negative, especially for the IPOs that are not backed by VC. Hoechle et al., (2018) using a sample of 7,487 U.S. IPOs between 1975 and 2014 continues to find significant underperformance.

The post-IPO underperformance has found to be a worldwide manifestation. It is not only identified in US markets but also in the other developed markets such as UK (e.g. Espenlaub *et al*., 1999; Espenlaub *et al*., 2000; Coakley *et al*., 2007). Levis (1993) computes the 3-year's post-IPO returns on 712 IPOs listed on the London Stock Exchange from 1980 to 1988, choosing three different market indexes as the benchmark. The IPOs exhibit significantly inferior returns by 23% relative to the market index. Then Espenlaub *et al*. (2000) enhance the measurement of long-run post-issue returns in Levis's study by adopting several additional benchmarks and models. Consistent with the previous literature, their three-year's post issue operating performance (measured by ROA) display a significantly decline compared to that one-year pre-IPO level. Coakley *et al*. (2007) using around 590 UK IPOs from 1985 to 2003 and find significant underperformance during the 1998–2000 bubble years. Gregory et al. (2010) provides a more recent study of the IPO performance in UK market. They use a sample of 2499 firms issued from 1975 to 2004 and find a significant underperformance of IPOs, e.g. a negative 16.4% 3-year BHARs relative to the weighted size-matched portfolios. Studies based on the non-US/UK markets also support the underperformance pattern. For instance, evidence is found in Germany (Ljungqvist, 1997; Derrien, 2005), Italian market (Pagano *et al*., 1998), Australian (Rosa, 2003 and Suchard, 2009) and French (Boissin and Sentis, 2014). For example, using various methodologies, Boissin and Sentis (2014) find that IPOs in their sample performed poorly relative to the comparison portfolios over the 1991–2005 horizon. Furthermore, such underperformance not only exists in developed markets, but also takes place in developing markets. For example, Agathee et al. (2014) focus on the African market. They examine the long-run performance of initial public offerings on the Stock Exchange of Mauritius and show that the 3-year equally weighted cumulative adjusted returns average is negative at 16.5%.

2.2 Long-run Underperformance of Chinese IPOs

In recent years, China's capital market has been a superstar in attracting VC financing. However, due to the relatively late start point of the stock market (in 1990s), there are still various studies that explore the China IPOs' long-run performance.

Although the Chinese stock market was established much later than those in the developed countries, it generally follows the similar pattern of the post-IPO long-run

underperformance as well.9 For example, using of IPO firms from 1992 to 1995, Chen et al. (2000) find that the BHARs (relative to market returns) of China IPOs exhibit a continually declining trend in the long-term and their BHARs become substantially negative at 212% at 3 years after IPO. Cai et al. (2008) using IPOs listed on China's Shanghai Stock Exchange from 1997 to 2001 find that three-year post-IPO BHARs are negative at 29.6%, indicating a significant underperformance. Primarily, studies of VCs in China derive from prior studies on the US market. With the sample covering period after 2000, the results are also consistent. Su and Bangassa (2011) report that their sample of 590 China A share IPOs during 2001-2008 exhibit significantly negative 36-month market-adjusted BHARs is (-21.74%). Liu et al. (2012) also find that the 3-year buy and hold returns (BHRs) of 627 IPOs during 2000 to 2007 are found to be significantly lower than the matched IPO firms by size and B/M ratio, and are negative (-0.447), confirming the underperformance of China IPOs.10

The findings of underperformance are sensitive to the method of calculation and measurement. For example, Su et al. (2011) provide a piece of evidence with 936 A-share IPOs during 1996-2005 based on a set of more rigorous methods. More specifically, the abnormal returns of sample IPOs are based on matching size and industry IPOs: the equal-weighed three-year BHARs significantly outperform the benchmark primarily owing to the better performance of small-sized IPOs, whereas the value-weighted BHARs are much lower and do not show any significantly difference. At the same time, the three-year CARs show no significant difference either calculated in terms of equal-weighted or value-weighted metrics. When using the market index as the benchmark, the sample IPOs are found to exhibit significant negative underperformance both for the BHARs and CARs. Finally, the sample IPOs do not show any significant performance differences if using calendar-time approaches, i.e. the CAPM and Fama-French three-factor model.

Given the robust pattern of underperformance in China, some studies aim to find some China-specific factors to explain the pattern. For example, Cai *et al*. (2008) find that government retained shareholdings, the allocation success rate, the post-IPO earnings

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9 There are also expectations. For example, Chen *et al*. (2004) find that in the long run, the 36-month BHARs of A share IPOs are not significantly different with the matched firms by using size and B/M ratio. Like Chan *et al*. (2004), Chang *et al*. (2010) claim that the 36-month post-IPO BHARs only slightly underperform (-7.8%) the benchmark IPOs, using a group of China A share IPOs listed from 1993-2004. The calendar-time regressions (performance adjusted by the Fama-French three-factor models) present mixed results while there is no significant underperformance for regressions on the full sample IPOs.
10 Wang (2005) finds that the post-IPO operating performance also exhibits sharp declines in the long-term post-IPO compared to the pre-IPO level, e.g. the industry adjusted ROA and sales to asset declined significantly from 4.41% to 0.45%, and 26.92% to 1.35% three years before and after IPO, respectively. Generally, this finding is consistent with the prior research that China IPOs experience substantial underperformance in the long-run.

growth rate and whether the IPO firms also issue B-shares all exert significantly positive impact on both the long-run BHARs. Besides, in accordance with expectations, factors such as the underpricing level, pre-IPO earnings and whether the underwriter and referee are the same institution are all negatively and significantly related to the IPO long-run performance. However, the offering size seems to be negatively associated with the long-run performance, which runs contrary to the traditional assumptions since large offering size firms are supposed to receive more funds for development. Another explanation is provided by Chen *et al*. (2004), suggesting that firms have the intention to window dress their financial status before IPO, which leads to the overestimation of firms' true value at the time of IPO. However, their true values are revealed in the post-IPO period and shows underperformance. Chang *et al*. (2010) find that the aftermarket P/E ratio and board size are negatively associated with long-run performance. They also find that underwriter reputation exerts positive impact on the performance, which is consistent with the statement that prestigious underwriters lessen the uncertainty and information asymmetry surrounding IPO pricing. This finding is also consistent with Su and Bangassa (2011).

Due to the unique characteristic of the China stock market during its early period, i.e. nearly all IPO firms are transformed from SOEs, various studies focus on the ownership and political connection to explain the long-run performance of China's IPOs. On the one hand, it has been found that state ownership seems not important to affect the long-run performance. For example, Chang *et al*. (2010) and Su and Bangassa (2011) find that state ownership shows no significant influence on the long-run IPO performance, which is consistent with Sun (2003) and Wang (2005). As argued in Wang (2005), the lack of significance of ownership types might be because the negative influence of government intervention is offset by the benefits associated with government connections.

On the other hand, political connections have exhibited significantly positive impact on the long-run performance. For example, Liu *et al*. (2012) shows that the three-year BHARs of IPOs with political connections are significantly larger than their counterpart IPOs. In particular, for the size-matching and B/M-matching, the IPOs with political-connected CEOs outperform the IPOs without political-connected CEOs by 18% and 20.5%, respectively. This mechanism behind the results is that firms which have connections with government have better access to benefits such as bank loans, resources, advantages in particular industries, and more financial credits (e.g. Tian, 2001; Wang, 2005 and Francis *et al*., 2009). Wu *et al*. (2012) and Wu *et al*. (2013) also find similar results. The former paper shows that the political connections have a positive effect in assisting private firms

attain tax benefits, while they do not exert this effect in SOEs. On the contrary, the fully government-controlled firms, i.e. the SOEs, suffer from serious over-investment problem, which are found to be detrimental to the long-term performance. The latter shows the central government connected IPOs display significantly better performance (raise more net proceeds), than the non-political-connected IPOs, whereas the regional government connected IPOs do not show a significant difference. However, the effects of political-connection differ in regions of different market conditions. The positive impact of central-government connections will be weakened in those regions with high market restrictions but strengthened in the regions that are industries regulation-oriented.

2.3 Explanations of Long-run Underperformance

The fact that IPO firms perform poorly in the long run after floatation is a consistent finding across markets with different institutional backgrounds (e.g. the stock market regulations, corporation laws, and taxation system, etc.). Therefore, a rational explanation for this universal anomaly is necessary. This section briefly explains some explanations in the literature. Generally speaking, the explanations could be interpreted from three sides.

2.3.1 Information Asymmetry

It is widely acknowledged that in all stock markets, information is unevenly distributed, and that information asymmetry existing between the issuing firms and external investors. As the side that have information superiority, issuers usually hold more information about the IPO firm. By contrast, the only way external investors get to know an IPO firm is from the information publicly disclosed in the IPO prospects. Consequently, this could possibly lead investors to make wrong investment decisions. Deriving from the theory of asymmetric information, several hypotheses have been proposed to illuminate the long-run weak performance of IPOs, including signalling, principal-agent/agency cost theory, and window dressing.

The signalling theory (Welch, 1989) was initially used to explain the underpricing puzzle, which demonstrates that underpricing is a signal of firms' quality. The rationale of this theory is that the issuer is perfectly informed about the value of the firm but investors are uniformed. For the purpose of mitigating information asymmetry and differentiating from less qualified firms, high quality firms are willing to set low issuing prices at IPO.

Unlike the lower quality firms, high quality firms are able to afford the cost of underpricing in the seasoned equity offerings (SEOs). Therefore, more underpriced IPOs, or higher quality IPO firms, should be associated with higher operating performance and higher stock market returns in the post-IPO long-term period (Levis, 1993; Ljungqvist *et al*., 2006).

The Agency Cost Theory stems from the proposition that there are conflicts of interest between firm managers and shareholders (Jensen and Meckling, 1976). In order to achieve the largest profits, the former tends to invest the money, either gained from the stock issuing or spare cash flows, to some inferior projects at the expense of shareholders' profits. During the process of IPO, as firms sell shares to the extensive external investors the ownership concentration of the management team lessens and the agency costs increase, thus leading to the reduction of managers' incentives. Accordingly, the post-issue performance of firms will decrease, attended by the downward adjustment of the new shares' intrinsic value. Therefore, the weak performance is observed in the long-run. Nevertheless, this theory only has mild support from the empirical evidence. Mclaughlin *et al*. (1996) propose similar ideas as the divergence of interests, finding that quoted companies which hold more cash flows exhibit a decline in their long-run performance. Mikkelson *et al*. (1997) state that the more the managers disperse their stakes at IPO, the worse the aftermarket operating performance. While Cai and Wei's (1997) study based on the Japanese market could not provide support for the ownership effect on the long-run stock profitability.

Given the difficulties to meet the listing financial requirements and the heavy reliance on the disclosed information, applicant firms may be tempted to manage their earnings, i.e. window-dressing. For investors, historical information on the issuing firms is essential. Generally, investors are able to evaluate the risk and returns through the extensive analysis of the historical information, and accordingly they make investment decisions. Since outside investors have access to limited information, they have no choice but to rely on the IPO prospectuses which report firms operating information in the last three years, especially for recently established firms (DeGeorge and Zeckhauser, 1993). Window-dressing means that the accounting numbers (e.g. accruals) are manipulated in order to make firms' pre-IPO financial performance meet the requirements and be attractive enough to investors (Dechow and Skinner 2000). This manipulation is also called "window-dressing" and such behaviour leads to an overstatement of pre-IPO operating levels and understatement of post-IPO operating levels. In the long-run, firms' performance will converge to its intrinsic value, IPOs will exhibit obvious underperformance. Rangan (1998) concludes that there is a significant negative relationship between earnings management

and the post IPO long-run performance. Teoh *et al.* (1998) demonstrate that the more serious the manipulated earnings, the worse the post-IPO long-run performance.

2.3.2 Behavioural Factors

Through the extensive detection of IPOs' underperformance, Ritter (1991) proposes the explanation from the perspective of behavioural finance. In a similar vein, a number of studies have also found that the long-run performance puzzle is attributed to irrational investor sentiments, i.e. investors may either be systematically overoptimistic about the prospects of IPO firms or was overreact to the disclosed information on the IPO market. Nevertheless, as time passes and more information is disclosed, the true value of stocks will be exposed. The investment passion of overoptimistic investors will fade away, leading the stock prices approaching their true level. Therefore, the behavioural finance theory suggests that it is the irrational investor sentiments and behaviour which cause long-run underperformance (Loughran *et al.*, 1994; Loughran and Ritter, 1995; Pagano *et al.*, 1998). The explanations could be systematically divided into three types: heterogeneous expectations, impresario hypothesis and windows of opportunity and fads.

The hypothesis of heterogeneous expectations denies the homogeneous expectation hypothesis proposed by EMH, suggesting that there are two types of investors in the secondary market, the optimistic ones and pessimistic ones. Investors exhibit heterogeneous expectations: different investors have disparate anticipations to listed firms' further cash flow and potential growth rate. Miller (1977) first tries to adopt this opinion to explain the long-run weak performance. He stresses that investors anticipate the new issuer's value based on their own information and they always give excessive trust to this information (Daniel *et al.*, 1998). Confident investors are more likely to be the purchaser of stocks issued by IPO firms. Due to the uncertainty of the stock value, the pessimistic investors' evaluation will be lower than the optimistic ones. That is to say, the offering price of IPO is determined by the most optimistic investors who will pay much more than the true value, leading to highly irrational underpricing. Since there will be more accessible information for the stocks in the long-run, the divergence of expectations will be lessened. The prices will unavoidably adjust downwards, resulting in weaker post-IPO long-run performance. In short, the greater is the difference in expectation, the higher the underpricing, and consequently, the poorer the long-term performance. However, a problem with this hypothesis is that, with the increasing evidence of long-run weak

performance, even the optimistic investors would suspicious about whether the new issues were worth such high prices. So, whether this theory is the best way to find the key of long-run underperformance puzzle remains to be seen. The problem with this theory is that it is not easy to find a sound way to proxy for investor sentiment and expectations.

The impresario hypothesis is put forward by Shiller (1990), suggesting that whether the issuing is successful or not, and how many shares are sold, both exert impact on the reputation and commission incomes of investment banks. In order to have a smooth IPO process, the investment banks act as the role of 'Impresario' when making up and promoting the new issue firms. These investment banks, also called underwriters, will always publicize the new shares (often via a low offer price) in order to create the illusion of excess demand. The large amount of uninitiated investors will then rush to buy shares at IPO, so that the initial stock prices are hyped. But the intrinsic value of the stocks will appear as time goes by and so stock prices will go back to their fundamental values. This hypothesis stresses that there is a negative relationship between the initial underpricing ratio and the long-run performance.

The definition of windows of opportunity is that there is a short time period during which an otherwise unachievable opportunity exists. The good opportunity will disappear when the window ends (Loughran and Ritter, 1995). Applying to the long-run performance puzzle, it is also called 'The Timing Hypothesis' (Baker and Wurgler, 2002) whose premise is that issuers tend to issue new shares at the peak time of enterprise development or at the time when investors are overoptimistic about the prospects of the firms (Aggarwal and Rivoli, 1990). Inherent in such views is a conflict of interest in which insiders take advantage of outsiders. In other words, for a particular time period, investors tend to fix their minds on the new issues when underwriters concentrate to issue stocks on the bull market, which will lead to the overvaluation of the new issued shares. This fad activity causes incredibly high demands in the short period after IPO, but simultaneously pushes the pessimistic investors to sell their stocks, thereby causing the long-run underperformance (Daniel et al., 1998). Many studies have shown that the IPOs during 'hot markets' are more likely to perform worse in the long-run (Helwege and Liang, 2004; Derrien, 2005; Ljungqvist et al, 2006), supporting the previous statements that investors only feel optimistic about the invested firms for a short period. As a result, investor sentiment becomes the main factor that drives the stock prices to a high level. However, this hypothesis is questioned by Habib and Ljungqvist (2001) who establishes an excess

expectation model which argues that the IPO long-run underperformance is an equilibrium phenomenon, denying the rationality of windows of opportunity.

2.3.3 Measurement Problems

Except from the possible reasons that may cause the long-run underperformance as mentioned above, this confusing puzzle might simply be a 'bad model problem' (Fama, 1998). Weather an IPO underperform in the long-run is highly depended on the measurements of performance. Moreover, the same measurement calculated by the same method may still produce diverse results when applying to different markets conditions. For instance, Moshirian *et al*. (2010) show that the existence of long-run underperformance for Asian IPOs is subject to the used methodology. This is in line with Gompers and Lerner (2003). Moreover, Ritter and Welch (2002) argue that the selection of IPO sample, e.g. the time period and the selection criteria, also matters when estimating the long-run performance of IPOs. More specifically, the measurement problems can be summarized into three categories.

The first type of problem is caused by the selection of benchmarks. Choosing appropriate benchmark is essential, because whether one can conclude the IPO is outperformed or underperformed is relative to how the benchmark performs. Given the great sensitivity of long-run performance to the benchmarks, it is plausible to consider that the underperformance might be merely due to the benchmarks used. A number of studies choose the market index as the benchmark (e.g. Loughran and Ritter, 1995; Brav and Gompers, 1997). However there arise problems if the time-varying systematic risk is not suitably controlled. It is impossible that all the firms are facing the same systematic risk (not all the betas equal to 1), neither are the risks constant over time (Clarkson and Thompson, 1990). Ritter (1991) and Ljungqvist (1995) suggest the underperformance is robust after controlling such risk, while Brav *et al*. (2000) find the underperformance disappear when the benchmark is value-weighted. There are also many studies that construct a matched portfolio of firms as the benchmark. Megginson and Weiss (1991) create portfolios for IPO firms that are matched by industry and size. Loughran and Ritter (1995) find that the 5-years' BHARs of IPOs are significantly lower than the non-IPO firms match by size, by 50 percent. Brav and Gompers (1997) construct a portfolio of listed firms for each IPO that matched by size and book-to-market ratio. They find the 5-years' BHARs

of IPO firms are higher the compared to the controlled portfolios. However, the IPOs are found to have underperformance when the market indexes are adopted as benchmarks.

The second problem emphasizes that the long-run performance is significantly affected by the measurements of returns, and the magnitude of the bias is different if different measurements are used. Debates have mainly concentrated on the comparison between the cumulative abnormal returns (CARs) and the buy and hold abnormal returns (BHARs). Barber and Lyon (1997) argue that the BHAR is better because it takes the investors' experience into consideration and the returns calculated in this approach are compounding returns which are believed to be necessary.

The third problem is the statistical inferences from the comparisons between long-run performances. Kothari and Warner (1997) suggest that when matching firms with the counter group, the standard parametric test statistics might violate normal distribution. Moreover, Lyon *et al*. (1999) claim that the traditional t-test might yield an over rejection of the null hypothesis (there is no positive abnormal returns). Besides, Mitchell and Stafford (2000) argue that the performance among individual firms might be correlated in calendar time, thus leading to an unreliable result. In order to deal with this problem, they suggest that the bootstrapping distribution can be adopted.

2.4 VC and IPO long-run Performance

IPO is recognized by VCs as the most preferred exit option since it provides the highest rate of returns. The market value of firms increase notably as their shares are sold to the public investors (Barry, 1994). For VCs, the returns corresponding to various exit patterns differ largely, i.e. on average the return is between 30% and 60% for exiting through IPOs, and around 15% for repurchase and merge and acquisitions (M&A). Hence, to receive the maximised profitability, bringing portfolio firms to IPO has always been the optimal choice for VCs. On the other hand, the engagement of VCs also impacts the IPO firms. VC-backed firms experience the same issuing procedures as the non-VC-backed firms. They both have to choose underwriters, determine the issuing time, and set the offering prices and share amounts. The biggest difference between them is that non-VC-backed firms can only receive money from the traditional fund-raising channels (e.g. banks), while VC-backed firms can access money from a wider range of sources. The additional benefits VCs could bring are various: they are able to provide expertise consulting service, supervise company

activities and serve in the board of directors to help with strategic and operational decisions, and even strengthen and extend the social networks for the invested portfolio companies (Sahlman, 1990; Lerner, 1995; Casamatta, 2003; Chemmanur et al., 2011). Therefore, it is reasonable that the VC-backed IPOs present distinctive aftermarket performance patterns. In fact, during the last 3 decades, considerable efforts have been made to uncover the relationships between VC investments and their portfolio firms' IPO performance.

2.4.1 The Impact of VC on Long-run Performance

The leading studies were initiated from the US stock market as it is the largest and the most developed and mature financial market in the world. VCs have been found to have significant impact on the post-IPO long-run performance. studies through various aspects. For example, Therefore, VC syndication has been one of the aspects (e.g. Tian, 2012; and Chahine *et al*., 2012). As argued by Tian (2012), VC syndication can help firms to enhance the innovation productivity and improve the product market value, which generate more patents with more profound influences. It also works well in improving firms' market value since syndicated VC-backed firms have higher successful exit rates (exit through IPO and M&A). Tian (2012) shows that the syndicated VC-backed IPOs are significantly less underpriced and have higher IPO market valuation, because VC syndication can efficiently alleviate information asymmetry within the IPO process. VC syndication has also been a factor to affect the pre-IPO earnings. For example, Chahine *et al*. (2012) find a numerous VC syndication involvement is likely to increase pre-IPO earnings management, which is then following by high initial returns and low long-run performance. The possible reason is that the discrepancy within VCs not only exacerbates the agency-principal conflicts but also aggravates the principal-principal conflicts. These results are in line with Gangi and Rosaria (2008).

VC's experience is another aspect that is studied as the mechanism of the VC's impact. Gompers *et al*. (2008) find that VCs increase their investments when the market heats up and that behaviour is exhibited mostly by VCs who have the highest industry-specific experience. At the same time, such reaction does not exert a significant influence on the success rate of VC investments. What is more, during the hot market more experienced VCs perform better than the less experienced VCs, although it is only slightly better. This result runs counter to the viewpoint of "overreaction" indicating that less experienced VCs

are more likely to increase their investments during the hot markets and the consequent investment outcomes will reduce greatly. Overall, this study proposes that the high volatility of VC is primarily due to the volatility from industry fundamentals, rather than the overreaction to market signals. They also find out that industry networks VC possessed are the most essential factor if they want to identify valuable investment opportunities and then provide follow-on value-added services. Chemmanur *et al*. (2011) find that VCs are able to select higher quality firms compared to non-VC-backed firms, with VC-backed firms exhibiting higher efficiency before the VC investments.

VC's functions, such as the governance, screening and monitoring, has also been considered in literature. For example, Jain (2001) examines the relationship between functions of VCs and VC-backed IPOs' post-issue operating performance in the long-run. In this study, the potential influencing factors on firm performance are controlled in order to exclude the indirect influence of VC investments, i.e. managerial strategy and industry structure. The empirical analysis shows that the quality of VC (due diligence), syndication size of VC, number of VCs on broad, time length of VC service, IPO size, the technology innovation inspiration and VCs' equity stake retention of the outperformed group are all significantly superior relative to the underperformed group. Their multivariate logit models reveal that VC have stronger effects on the post-IPO performance than the managerial strategy and industry structure, though the joint effects of VC and the management strategy are more significant. As a result, they conclude that there is usually a long-term commitment in the guarantee of good performance. What is more, VC's function will be more effective when venture firms are keen on receiving VCs' expertise.

The literature has also documented the VC's impact on the long-run performance in other markets, including both other developed markets and emerging markets. For example, Coakley *et al*. (2007) examine the five-year's operating performance of UK IPOs listed from 1985 to 2003 and find the significant impact of VC on the long-run performance. Suchard (2009) finds that VC improves the corporate governance of Australia IPOs, which is suggested to be beneficial for the long-term performance. With Italian IPOs, Gangi and Lombardo (2008) find that VC-backed IPOs exhibit continually declining operating performance. Croce *et al*. (2013) find that the ability of VC to improve firms' productivity growth is actually due to the value-added effects rather than the screening effects/selection effects. Besides, they suggest that the value-added effects last even after VC exits the invested firms.

Although many papers find that VC can significantly improve IPO firm's performance through a variety of aspects, this finding is not universal. For instance, Chemmanur and Loutskina (2006) dismiss the certification role of VC. Instead they put forward a hypothesis called "market power" of VCs, which also improves the VC-backed IPOs' performance. It specifies that VCs can attract higher quality market participants, such as investors, underwriters and lawyers. The integrated benefits of all the participants mutually contribute to better performance. Alperovych *et al*. (2015) design their research based on the Belgian context and claims that VC is responsible for the notable reduction in productivity. However, breaking down the VC-backed IPOs by ownership, the impact of VCs is surprisingly adverse. More specifically, firms invested by government-backed VCs sustain productivity reductions, while private-held VCs are related to the promotion of firms' production efficiency. In other words, the impact of government-backed VCs is the drivers of the negative impact of the entire VC group.

It is well known that stock markets of emerging economies are less developed and often lack sound systems, in terms of trading, law, regulation, and information disclosure. Because of the significantly positive effects of VC on the developed markets, do VCs play a similar role/function on firms listed on emerging markets? The existing studies show mixed findings. Wang *et al*. (2003) examine the operating performance and market performance of new-issued firms on the Singapore stock market from 1987 to 2001 and find VCs exert mixed impact. Contradicting the Monitoring role proposed by Jain and Kini (1995), they find that the operating performance of VC-backed IPOs decline faster than the non-VC-backed IPOs. In fact, the declining performance is primarily owing to IPOs with short VC investment durations, while the longer VC investment durations are associated with lower underpricing. The market performance of VC-backed IPOs (BHARs), are significantly higher than the non-VC-backed IPOs in the first six months after IPO. But there are no significant differences over the longer periods. Such results indicate that VCs exert negative impact on IPO's long-run performance, but positive impact in the short-run. Thus, evidence from Singapore market not only supports VC's Certification role, but also confirms VC's adverse selection and Grandstanding roles.

2.4.2 VC and IPO Performance in China

The substantial differences of VC industry pattern between China and the western markets are caused by the institutional discrepancies, especially the way VCs exert their functions (Bruton and Ahlstrom, 2003). One the one hand, before the investment, VCs in China pay more attention to the due diligence, particularly on the firms' financial background, and they barely select a firm without any documented financial statements. On the other hand, VCs in China tend to provide less value-added service, and VCs are willing to exercise the monitoring function to the portfolio firms only within closer geographic distances. Ahlstrom *et al*. (2007) analyse the development of the VC industry in China in comparison with the US and specifically how VCs gradually integrated into China's special institutional context. The fast-growing economy has caused strong demand in capital stock and technological innovation, thus providing an ideal environment for firms' development. It is a great opportunity for VCs to emerge and expand their business in such an institutional context. However, the lack of efficiency, stability and legitimacy of a developing economy like China had led to more systematic risks and challenges for VC investors. To minimize investment failures, VCs in China must place extra emphasis on ex ante investigation (i.e. due diligence) and monitoring firms more carefully and actively. In addition to money, more value-added activities are sought by China venture firms, especially in the high-tech sector. VC's suggestions, networks and global perspective are all vital to the VC-backed firms' development and success. The social relationship/control between VC investor and the firms' management team is more effective when VCs are delivering inputs (e.g. suggestions and guidance) to invested firms. In addition, given the difficulty for private firms to reach IPO in China, VCs usually prudently choose the best exit way for firms.

VC's monitoring role has also been supported in China. For example, Otchere and Vong (2016) using China A share IPOs from 1990 to 2008 find that demonstrate that in China, VC-backed IPOs and non-VC-backed IPOs both experienced declined long-run performance, but VC-backed IPOs perform significantly better than the non-VC-back IPOs. Guo and Jiang (2013) examine a sample of China entrepreneurial firms during 1998-2007. VCs are found to exert significant positive impact on firms' performance and the R&D activities. VCs not only choose better performing entrepreneurial firms to invest initially, but also can significantly improve firm performance after investment. At the same time, the post-IPO value-added impact are dominated by the FVCs, whereas domestic VC-backed firms demonstrate no significant performance improvements after receiving VC

investments. Furthermore, the syndication VC-backed firms experience significant performance improvements relative to the matched non-VC-backed firms, while this impact does not apply to the individually VC-backed firms.

VC investment performance varies remarkably depending on the ownership of VC firms in China (Ke and Wang, 2017). Firstly, in terms of successful exit rates, the privately-owned VCs (PVCs) outperform the foreign VCs, which outperform government-backed VCs. Given the fact that many foreign VCs have been participating in the China capital market and they have occupied more than half of the market share, the role of foreign VC has been particularly studied by some papers (e.g. Wang and Wang, 2011; Humphery-Jenner and Suchard, 2013; Huang et al., 2015). Wang and Wang (2011) focuse on the impact of the human capital in foreign VCs, e.g. network, reputation, and experience. However, these factors in FVCs exert very limit influence on their investment performance. In contrast, the founder (CEO) and manager's experience of Chine venture firms' play a notable role in the success of VC investments, e.g. exit via IPO or M&A. Humphery-Jenner and Suchard (2013) analyse the impact of foreign VCs on promoting the successful exit rate of venture firms in China. They point out that entirely foreign-financed VCs are not able to improve the success exit rate of venture firms, but firms which are jointly foreign and domestic financed are associating with higher successful exit rates. Generally, foreign VCs perform better in late-stage investments if they spread their investments across various industries. Moreover, compared to domestic VCs, foreign VCs are more likely to choose M&A or buyout as their exit method, rather than the IPOs. They argue that the restrictions on foreign investment institutions and the regulations of the China stock market (e.g. the long lock-up period) might limit the functions foreign VCs exert on the China stock market. From a different angel, Huang et al. (2015) explore the patterns of syndication investment decisions FVCs made with the Chinese domestic VCs. Firstly, FVCs are more likely to syndicate with China VCs in late-stage investments where uncertainty is the lowest, whereas in early-stage where the uncertainty is magnitude, FVCs prefer to avoid co-investing with China VCs. Moreover, FVCs are more willing to conduct syndicate investment with China VCs when they have already accumulated some experience in China. Finally, FVCs who have branches located in China also prefer to fully fund the portfolio firms by themselves or syndicate with other FVCs without the corporation with China domestic VCs. Therefore, they conclude that the social status and organization background identity is another factor that influences FVC's decisions of syndication investments objects.

2.4.3 The Explanations of Positive Impact

Traditionally, empirical studies examine the functions of VCs through comparing the portfolio firms' performance to similar firms that had never been invested by VCs. The significant functions VCs exert on portfolio companies are widely recognized, and several hypotheses have been put forward. Briefly speaking, the impact of VCs can be summarized into two contrary viewpoints. On the one hand, VCs contribute to the improvement of portfolio firms' performance due to their Certification role and Value-added services; on the other hand, conflicts between VCs and firm owners are detrimental to the performance if they fail to achieve a consensus objective, which is the result of adverse selection.

(1) Certification and Monitoring

VCs get actively involved in the management and the operation process soon after they invest venture firms. VCs prefer early stage projects (seed and start-up stages) which are associated with extremely high risks. Meanwhile, there is no guarantee for the money VCs invested, neither do the venture firms set up an institutionalized management system for operation. Hence, VCs must get involved with the venture firms and monitor the operation activities prudently. In this way, VCs can respond immediately to any potential risk and take appropriate rescue actions before the losses aggravate. It is not exaggeration to say that defusing crises is one of the most valuable contributions VCs make to the portfolio firms.

The positive role of VC emphasizes that VC-backed firms enjoy superior long-run performance, whether compare to their own pre-IPO levels, or to the non-VC-backed IPOs. Barry *et al*. (1990), Sahlman (1990) claim that VCs have a 'Monitoring' function due to their elaborate initial due diligence. The monitoring function is validated because VCs usually retain part of the equity after IPO and hold nearly one third of board seats on the board of directors. The experience and expertise VCs provide to the IPO firms reduce the underpricing, thus, conveying a message to investors that VC-backed IPOs are high quality firms. Lerner (1995) also provides the evidence of the Monitoring function. Jain and Kini (1995) report that the P/E ratio of VC-backed IPOs is significantly higher than the non-VC-backed IPOs, inferring that the 'Monitoring' role of VC lasts even after IPOs. Apart from the 3 to 5 years' post-issue performance, VCs' positive impact on industrial development have also been studied. Brown (2005) uses a group of VC-backed and non-VC-backed IPOs (matched by industry, size and B/M ratio), and demonstrates that the annual growth rate of

VC-backed enterprises in the ten years after IPO is much higher than those who did not receive VC investments. What is more, the R&D intensity of VC-backed enterprises is much stronger, which has exerted a profound influence on the high-tech sector. It infers that VC-backed firms expand and growth more rapidly. These results also illustrate that VC's monitoring functions have expanded beyond the IPO process. Lahr and Mina (2012) support this view and claim that VC is an effective market-based solution for investment in high-risk and opaque projects because it combines financial resources with substantive knowledge of markets and technologies.

The certification role by VCs is essential in reducing the conflicts of interest between agents (Jain and Kini, 1995). They find that VC-backed IPOs significantly perform better than the matched non-VC-backed IPOs, although they both underperform compared to the pre-IPO levels. Gompers (1995) confirms the agency theory predictions that VCs are able to reduce the information asymmetry within the VC-backed firms because they can generate valuable information. VCs are more likely to make early stage investments especially in the high-tech industries. This further confirms the monitoring role. VCs infuse multiple rounds and huge amounts of money into those firms which have a high probability to go public and those finally go public.

The certification role by VCs can also help to reduce information asymmetry ((Megginson and Weiss, 1991; Lin, 1996; Doukas and Gonenc, 2005). The 'Certification' role of VC, indicating that VC-backed IPOs not only exhibit lower initial returns and better long-run performance, but also cooperate with more prestigious underwriters, auditors and lawyers (Megginson and Weiss, 1991). This is because VCs can certify the true value of IPO firms and the quality of information issued at IPO. Hence, the presence of VCs reduces the information asymmetry between the issued firm and public investors. Moreover, the involvement of VCs reduces the cost of IPOs and maximizes the returns of issued firms. In addition, by holding the equities of IPO firms, VCs become an implicit guarantee and certification of the future performance. Numerous in-depth studies done and support this theory. Doukas and Gonenc (2005) agree that the involvement of VC can help to overcome the Moral Hazard problem and reduce information asymmetry. Amit *et al*. (1998) propose that VCs are capable of reducing the cost of information asymmetries. The basic rationale behind the Certification role is to eliminate information asymmetries in a way that effectively match the supply and demand of capital, as well as making deals smoothly in the short period owing to their gradually formed reputation.

(2) Value-adding Role

VCs not only have the potential to enhance the financial value but also increase the managerial value of invested firms (Hellmann and Puri, 2002). Except from Monitoring, VCs are known for their value-adding ability, as documented in Lerner (1999); Kortum and Lerner (2000); Gompers *et al*. (2008); Sorensen, 2007; Meuleman *et al*. (2009). VCs usually have a rich experience and provide a unique advantage in supporting and guiding venture firms to success. They also have many resources which are very difficult to acquire for the non-VC-backed firms. These are especially valuable to the start-up/early stage and high-tech firms (Colombo and Grilli, 2005).

VCs' supervision is a key factor to venture firms' success and this action starts immediately after the investment. Through the intensive observation, VC become familiar with the venture firm's situation. Hence, they put forward critical suggestions on, such things as development strategies and major business operating decisions. Kaplan and Stromberg (2003) indicate that VCs strive for control rights at the time of investment and tend to provide valuable wide-ranging guidance and advice subsequently. During the holding period, VCs get involved in the management of invested firms via exhaustive activities (Jeng and Wells, 2000; Winton and Yerramilli, 2008), e.g. recruit high level staff (managers and CEOs), improve the compensation systems, access to their networks (attract reputable underwriters, investors, high quality suppliers, and more potential customers), communicate regularly with the invested firms, and participate in operational planning (Gompers and Lerner, 1998; Hellman and Puri, 2002; Bottazzi *et al*., 2008).

Besides, VCs also add value to invested firms through extensive corporate governance (Kaplan and Stromberg, 2003). Suchard (2009) confirms this proposition and proposes that VCs tend to display better corporate governance through a more independent board. A more independent board structure can better protect shareholders' interests via monitoring of management. At the same time, taking advantage of VCs' networks, firms are able to recruit more experienced investors within their industry. Hochberg (2011) specifically conducts an empirical study on the corporate governance effects of VCs at the time of going public. This study starts with the assumption that all the firms establish government structures at the time of IPO to overcome the troubles inherent in the new financial environment, i.e. the agency cost and shifts of ownership. Based on this, this study proposes that the corporate governance structures VCs built, and the value-added service VCs provided have significant ex post impact, but are not limited to the pre-IPO stage. VC-backed IPOs are

found to enjoy higher abnormal returns and less earnings management relative to the non-VC-backed IPOs. More importantly, VCs are conducive to more independent board structure, i.e. the proportion of outsiders on board is relatively higher.

It is obvious that the post-investment period is the most vital time for VCs to engage. Receiving intensive and precious value-added services allows VC-backed firms to grow and expand speedily (Shepherd *et al.*, 2000). VCs always keep nurturing firms until they promote them to IPO or sell them via M&A. The pre-IPO and initial performance of VC-backed IPOs are expected to be better than the non-VC-backed firms. However, it is very common that VCs still hold a large proportion of equity stakes after the IPO process, mostly due to the lock-up period regulations which usually last 90 to 180 days. In this case, VC-backed firms can consistently enjoy the post-IPO benefits that generated from VCs, which could contribute to improved post-IPO performance. Hence, the resource-based view adds to the agency perspective by recognizing that access to resources and capabilities is an important driver of firm performance. Croce *et al.* (2013) suggest that VCs have long-lasting effects on invested firms even after they exit, since early decisions and operation structures characterize firms' future development (Barringer *et al.*, 2005). VCs have already influenced the management style and strategy planning patterns when they exit firms. As suggested in many studies, the value-added effects of VCs can notably improve firms' growth of productivity, e.g. the sales growth and employment growth (Davila *et al.*, 2003; Baum and Silverman, 2004; Chemmanur *et al.*, 2011).

2.4.4 The Explanations of Negative Impact

The explanations of negative impact of VC on the long-run performance include adverse selection and the Grandstanding Theory.

(1) Adverse Selection

Plenty of studies stress that VC-backed IPOs could underperform the non-VC-backed IPOs as a result of the adverse selection problem. This theory can be explained from two aspects. Firstly, not all the VC-backed firms are the top firms. If a firm is good enough to operate their own development, manage capital and raise funds, theoretically it does not need to seek for external investors (like VCs) to spread risks or enhance the management. It could be that, only the less capable firms prefer to solicit VCs to assist them to achieve better

future development. Hence, lower quality firms have more incentives to go public if the market valuation exceeds expectations, especially in hot markets (Ritter, 1984; Coakley *et al.*, 2007; Ljungqvist *et al.*, 2006). As an insider, VCs will try to stimulate the firms to IPO even if the timing is not ideal, which is in accordance with the 'Windows of Opportunities and Fads' hypothesis discussed previous sections.

Deriving from the conflicting augments about the effects of VCs on firms' performance, Rosenbusch *et al.* (2013) carefully detect whether and how VCs add value to the invested firms under uncertainty. They find VCs are associated with slightly improved growth but limited impact on firms' profitability. However, the positive effects vanish once intra-industry selection effects are controlled. The results suggest that VCs have the ability to select and invest in more promising industries, rather than select the most promising firms. Besides, the positive effects of VCs are only significant on particular types of performance and for firms in particular categories. The lack of significance of VCs when controlled for the selection within industries point to the fact that the advantages of VCs might be offset by some shortcomings. More specifically, they find that VCs only show the best value-added ability when they step in venture firms at the right stage. It is because young firms are rife with serious information asymmetry, risk, and uncertainty which might mislead VCs selection decisions, while in long-established firms where information is accurate and adequate there is not too much scope for VCs to display their risk-reducing abilities. Likewise, the impact of VCs are not striking on the performance of IPOs as uncertainty and risk are much lower, the value VCs generated is largely discounted. Overall, this research concludes that one should caution the industry selection effect of VC investments, and whether VCs exert the value-added function is largely dependent on the age of invested firms.

(2) Grandstanding Theory

Grandstanding theory implies that the essential incentive of young VCs to grandstand is to gain more reputation by gaining more IPO numbers. For example, Gompers (1996) develops the research of VC-backed IPOs performance by separating VCs in to two groups by age: older VCs and younger VCs. He finds that the underpricing levels of IPOs backed by younger VCs are significantly higher, compared to those IPOs funded by established VCs (18.5% vs 7.8%). What is more, younger VCs also spend less time on the board of directors and the average age of IPOs backed by younger VCs is less than those IPOs backed by older VCs. He claims this result fits with the Grandstanding theory.

2.5 VC Reputation

2.5.1 Measurements of VC Reputation

VC reputation is often analysed from two aspects. The first is related to abilities or skills, e.g. the management skills, capital under management, age, and previous successful IPO numbers. The other aspect is related to experience, such as the industry investment experience, involvement as board members, network centralization, etc. As VCs accrue more investment experience, they build up and accumulate stronger competence within the industry. VC reputation is a crucial dimension to the IPO research methodology but as yet, there is no single agreed measure. Indeed, various studies exploring a wide range of proxies. This section summarises the prior studies which attempted to capture the attributes of VC reputation, and emphasises the development of VC reputation measurements.

Through observing the roles underwriters playing during the process of IPO, many reputation related topics have been developed, e.g. the measurements of underwriter reputation, the formation of underwriter reputation, and the effects of underwriter reputation on post-IPO performance, etc. Carter and Manaster (1990) adopt the rankings of underwriters to measure the reputation and prove that high reputation underwriters are related to reduced IPO underpricing. Carter *et al*. (1998) adopt 3 proxies to measure underwriter reputation, including (1) ranking (the same methods as Carter and Manaster); (2) underwriter reputation is only assorted into 4 groups which is a simpler method than CM's (same as Johnson and Miller, 1988); (3) the market share of underwriters (same as Megginson and Weiss, 1991). This study finds that the explanatory power varies with the reputation proxy. The first proxy (ranking) demonstrates the most significant influence on IPO initial returns and 3-year's post-IPO performance.

(1) Single-item Indicator

In early studies, VC reputation is measured by single-item variables. The most common of these used variables is the age of VC firms, since the lasting duration of firms at least embody their survival capacity, i.e. competitiveness, profitability, and operation capacity. For example, Shu *et al*. (2011) and Cho and Lee (2013) use VC's age. Barry *et al*. (1990) use age as one of the proxies for VCs' skills in guiding the portfolio companies. They suggest that the longer the VCs engage in this industry, the more experience they have in monitoring the portfolio companies and guiding them to a healthy course. Gompers (1996)

also uses the age of VC as the proxy for reputation and splits them into two groups by the average age of VCs in the sample. VC firms that are older than 6 years are defined as high reputation, while the rest are low reputation VCs. The age of VC has also been widely used as a proxy for reputation in studies such as Espenlaub *et al*. (1999), Lee and Wahal (2004), Arthurs and Busenitz (2006), and Cho and Lee (2013).

VC's past performance is another single-item measurement for reputation, which is usually calculated by counting VCs' accomplished investment rounds or deals in the past. These numbers directly and effectively demonstrate VCs' degree of involvement in the capital market as well as their market activity level. A frequently appearing VC can establish their visibility in a shorter time period, thus it is much easier to be distinctive from the competitors. Hence, the more investments VCs conducted the more reputation they accumulate. The past performance of VCs are generally refined from the indicators like: the number of IPOs VC supported; the number of rounds/firms VC invested; the amount of capital VC raised; and the amount of capital VC invested, etc. (for example, Barry et al. (1990); Sorenson and Stuart, 2001; Hsu, 2004; Lee and Wahal, 2004; Kaplan and Scholar, 2005; Chahine and Georgen, 2011; Krishnan *et al*., 2011; Atanasov *et al*., 2012).

The frequency that VC has served on the boards of IPO firms has also been considered as a measure of reputation. For example, Arthurs and Busenitz (2006) use the total number of boards VC has stayed on as a proxy for VC reputation. In the research of Hsu (2004), VC's industry investment experience, measured via the number of deals VC has conducted in the start-up's industrial sector, is used as the main reputation measurement since it symbolizes VC's "domain expertise". Two alternative measurements for reputation are also employed the amount of funds VC raised per year and industry reputation rank constructing based on the sample data. Another popular way to value the quality/reputation of VC is looking at its capital under management. To survive, VCs must keep seeking capital funders who trust their profitability and abilities. Gompers and Lerner (1999) measure reputation by using the ratio of total capital VC raised in the ten calendar years before it expires to the total amount it raised during the lifetime. Gompers and Lerner (1998) and Chemmanur and Loutskina (2006) also adopt the total amount of capital VC firm raised in the previous to proxy for reputation. There are some modified versions of VC investment size, and they can also effectively capture effects of VC reputation, such as the pre-IPO equity holdings of lead VC in the IPO firm (Barry *et al*., 1990); VC total investment amount (Dimov, *et al*., 2007; Lee *et al*., 2011); and the ratio of VC total investment amount relative to the aggregate investment amount (Cho and Lee, 2013). Nahata (2008) uses the percentage of

VC's aggregate investment amount in the VC industry. These measurements are constructed based on an identical rationale which is that the aggregate investment amounts are a reflection of VC's active ability in the IPO market. The larger the investment amount VCs offered, the stronger the incentives for them to monitor and screen the portfolio firms. Additionally, the more capital the VCs invested, the higher the financial strength, which is essential for VCs to become successful.

However, not all the studies agree with the feasibility of these indicators in predicting VC reputation. In the research of Gompers *et al*. (2008) which examining how does public market movements, for example the IPO activities, affect VC activity. VC past investment deals is applied as a proxy for VC experience. However, it does not show any significant impact on either the Tobin's Q, or the IPO activity when the VC industry specialization is controlled. They thus suggest that the network of industry between VCs is important when VCs are sorting investment. Such outcome reveals the viewpoint that using single-item variables to measure VC reputation/experience is incomplete. Croce *et al*. (2013) adopt two measurements to quantify VC reputation: (1) the total assets under management of VC; (2) the cumulative number of investment deals before VC invest the underlying firm. Nevertheless, they conclude that VCs display accordant screening function, regardless of the level of VC reputation. Bulter and Goktan (2013) suggest that less experienced VCs exert unique advantages when transferring private start-ups to public. They distinguish high from low experience by VC age and the total amount of investments prior to the year VC invested into the start-ups, respectively. Less-experienced VCs trend to provide more soft information especially to younger and smaller firms and the benefits are stronger when they are located closer to each other.

The lack of validity of the above indicators might be due to the discordance of reputation level when using VC age and VC's past performance. Some older and prestigious VCs might not be an active investor in the IPO market during a certain time period because they aim at achieving substantially returns via the steady progress and development of the invested firms. In many circumstances, the experienced VCs prefer to nurture only a few early-stage firms at the same period but for many years, and also provide a large amount of capital though several rounds of financing. In contrast, less reputable VCs prefer to participate into many late-stage investment deals, but without spending much time or money in each firms. These VCs have the incentive to augment their reputation by gaining more successful IPO numbers. As a result, the performance of less reputable VC-backed firms might not be substantially improved. If reputation is measured by the IPO frequency,

the actually high quality VCs will be classified as low reputation VCs as they only have very few successful IPOs in the past, whereas less qualified VC turns out to be regarded as reputable VCs.

Having this issue in mind, Nahata (2008) develops a new reputation measurement and explores the reputation effects of VCs on the performance of private firms. The IPO capitalization share of VC is adopted, which is originated from the measurement for underwriter reputation (Megginson and Weiss, 1991). It not only includes the size of VC's investment (IPO size), but also the number of IPO deals VC conducted (IPO frequency). VC's market share in each calendar year is not suggested to be used here because it only reflects the fund arising ability of VC in each single year in which they have taken firms to IPO. Therefore, this study uses the cumulative IPO market capitalization share of VC across the sample years to proxy for reputation. In the longer period, VC's long-lasting and comprehensive impact on IPO firms can be more satisfactorily captured from its average performance.

In line with Nahata (2008) and Krishnan *et al*. (2011), Lee and Masulis (2011) and Shu *et al*. (2011) use VC's IPO market share as the reputation measurement. Chou *et al*. (2013) also use VC's cumulative IPO market share (but based on the IPO market capitalization) as reputation proxy. This study suggests that cumulative IPO market share is a more robust measurement for reputation. The same reputation measurement is also used in Celikyurt *et al*. (2014) and Barry and Mihov (2015). Of all the measurements, VC's IPO market share has the most significant impact on all the long-run performance proxies, and it is the only one that could demonstrate the significant effects of VC reputation. VCs with higher cumulative IPO market share not only benefit their funded IPO firms with better post-IPO long-run performance, but also better corporate governance. Both studies suggest that VC's IPO market share could be a reasonable measurement of VC reputation. From then on, several studies have been conducted to test the validity of this measurement.

(2) Multi-item indicator

Although indictors above can significantly interpret the reputation effect, there remains the concerns that single-item variables might not capture the VC reputation perfectly since reputation is constructed based on a variety of factors. Consequently, one must be very cautious when selecting the proxies.

A natural way to construct multi-item indicator is to use several single-item indictors. For example, Tian (2012) VC reputation is measured by various indicators: (1) VC age; (2) the money funds VC raised in the past 5 years; (3) the total money amount VC raised; (4) the total money amount VC invested; and (5) the number of financing rounds VC has involved in. Atanasov *et al*. (2012) measure VC reputation by using four indicators: VC age; the frequency of VC investment; capital under management; and the network syndication. Alternatively, Hochberg (2011) The reputation of VC contributes to an important portion of VC's positive identity, and it is measured by three indictors: VC age; number of funds VC have raised; and the VC's IPO frequency. Fernhaber and McDougall-Covin (2009) In this study, VC reputation is measured by five variables: VC age; the total money amount of investment; total number of firms under investment; and successful IPO rate. Apart from these four traditional measurements, the "media visibility" is also been used to proxy for reputation, measured as the number of articles published in The Wall Street Journal mentioning the VC in the year of IPO.

Some other studies try to construct an index with several variable to measure reputation. For example, Lin and Smith (1998) create a reputation index of VCs which combines VC age and the identity of lead VC. An above average value of the index is classified as high reputable VCs, while the others are less reputable VCs. VC reputation exhibits the certification role and works effectively in reducing the information asymmetry during the IPO process. Besides, for the sake of long-lasting reputation, more reputable VCs are more likely to keep staying in IPO firms which are less underpriced, instead of selling the shareholdings before IPO. Similarly, Coakley *et al*. (2007) construct a complex index to measure the VC reputation. The VC reputation index consists of two variables: VC age and the number of times VC acts as lead VC across the sample period. A VC whose index is above the mean is classified as a high reputation VC, while the rest are classified as low reputation VCs.

A more comprehensive VC reputation index by taking 5 indicators of VC into consideration at the same time (Lee *et al*., 2011: (1) the total number of start-ups VC invested in; (2) total amount of money VC injected into the start-ups; (3) the money amount of funds the VC raised; (4) VC's IPO frequency in the past five years; (5) VC age. The first two measurements disclose the intensity of VC investment activities. They suggest that a highly visible VC is more likely to be accepted by venture firms and thereby dominating the market much easier. Moreover, a modified version of this reputation index is adopted by Pollock et al. (2015) which includes five different: (1) average amount of funds under

management; (2) average number of funds the VC managed; (3) total number of start-ups VC invested; (4) total amount of funds VC invested in the start-ups; (5) VC's IPO frequency. Removing VC age from the index and using it as a control variable, this research finds that VC reputation is positively correlated with the VC status and it becomes stronger when VC grows older. Besides, IPO frequency plays a more important role to those VCs who are labelled as low reputation.

From the discussion above, the development of the VC reputation measurements and the effectiveness of these proxies in interpreting VC reputation can be seen. Earlier studies usually chose only one indicator, but this has developed over time so that now multi-variable indicators are preferred. These studies have provided great insight into the future VC reputation and the long-term post-IPO performance studies. Among them, two pieces of representative research are explicitly presented below, due to the methodological importance in this field.

2.5.2 VC Reputation and Long-run Performance

The studies of VC reputation are primarily developed on the basis of underwriter reputation studies. Also working as financial intermediaries, investment banks are an indispensable part of the IPO process, and they basically act as the insurance for IPO firms. A large number of studies concentrate on the influence of underwriter reputation on new issued firms' performance (Beatty and Ritter, 1986; Cater and Manaster, 1990; Johnson and Miller, 1988). One is that they both are financial intermediaries which provide a service to the IPO firms. The other similar feature is that the presence of them can convey a signal of quality of the IPO firm to the public, which might influence the investors' judgement and the subsequent behaviour. Firms underwritten by more reputable investment banks are found to demonstrate lower underpricing level. For the roles of VCs, VCs pass on their influence by enhancing funded firms' capabilities in resource allocation and opportunities identification. Such abilities are crucial for new IPO firms to survive from the threats and competition existing in post-IPO environment (Jelic *et al*. 2005; Arthurs and Busenitz, 2006).

In the context of loads of information asymmetry between IPO firms and outside investors, VCs could also play identical "Certification" role as the underwriters. Moreover, fearing the loss of reputation, VCs try to avoid the false certification of IPO firms through

disclosing accuracy and complete information of the IPOs. For example, Espenlaub *et al.* (1999) report a strong positive relationship between IPOs long-run performance, measured by 3-year BHARs, and the VC reputation. Meanwhile, VC-backed IPOs underwritten by VC-affiliated banks or the other financial institutions exhibit better long-run performance than the other IPOs. They therefore conclude that more reputable VCs have stronger Certification function, and they further conclude that VC reputation is positively correlated to the Screening function. Doukas and Gonenc (2003) obtain similar results showing that VC reputation has positive effects on IPOs 3-year BHARs. Meanwhile, the positive impact of underwriter reputation on the long-run performance disappear when VC is associated with the IPO firms. Hsu (2004) points out that high reputation VCs have Certification and Value-added functions. The financing offering from more reputable VCs are three times more likely to be accepted by entrepreneurs than less reputable VCs. Furthermore, more reputable VCs are able to acquire portfolio firms' equity stakes with a 10% to 14% discount. This indicates that the excess value of VCs might be more exceptional than their fundamental financing role, since these additional services could bring extra financial incomes. What is more, the additional benefits brought by more reputable VCs are higher; otherwise venture enterprisers will not sell their equities with discount.

Screening and monitoring role of VC have also guided some studies of the impact VC reputation on the long-run performance. Chemmanur and Loutskina (2006) support the screening and monitoring role of VC, by observing that IPOs funded by more reputable VC display significantly higher profitability and margins, higher R&D expenditures, and sales growth rates in the long-term after issue than the non-VC-backed IPOs. Nahata (2008) adds evidence to screening and monitoring functions. By using a new measurement, VC reputation is found to have a strong link to stand for the positive effects of VCs. This study is based on a sample of private firms, but it is much easier for more reputable VC-backed private firms to get listed successfully, and more reputable VCs can accelerate the process. Barry and Mihov (2015) demonstrate that IPOs backed by the high reputation VCs always enjoy significantly positive abnormal returns, whether they are associated with banks or not. By contrast, IPOs backed by low reputation VCs still suffer from negative abnormal returns.

Value-adding role of VC has also been as the explanations of the positive impact of VC reputation on long-run performance. For example, Fernhaber and McDougall-Covin (2009) validate the Value-adding effects of VCs and point out that the positive effects are owing to VCs' knowledge and reputation. VC-backed firms are found to make better strategic

decisions, and thus more quickly to achieve internationalization, and this positive relationship is stronger if the firms are invested by more reputable VCs. Instead, VCs' ability in corporate governance is picked out by Krishnan *et al*. (2011) when explaining the positive effects of VC reputation. More reputable VCs tend to exert more extensive corporate governance during the post-IPO holding period. Similarly, on a sample of Taiwan IPOs, Shu *et al*. (2011) conclude that IPOs funded by more established VCs enjoy better post-IPO operating performance and R&D expenditures than the IPOs funded by lower reputation VCs.

VC reputation's impact is also affected by some factors. For example, Lee *et al*. (2011) examine the effects of VC reputation on IPOs performance from a variety of aspects. The results are consistent with the above studies – VC reputation can effectively increase the post-IPO operating performance. VC industry specialization and the early-stage investment magnify the positive relationship between VC reputation and operating performance. Another highly debated factor is the geographical distance between VC firms and IPO firms. The distance weakens VC reputation effects on long-run operating performance if the endogeneity problem is controlled.

Furthermore, among the research about the impact of VC reputation on the IPO long-run performance, a great deal justifies the positive relationship between them. More reputable VCs are supposed to improve invested firms' IPO performance due to their additional abilities in Screening, Monitoring and Value-adding. There is little doubt regarding the influence of reputation on long-run performance. In the spirit of the Screening function, more reputable VCs usually have more experience in selecting high quality projects/investments, so they should be able to support for a better long-run performance. Similarly, the "Monitoring" function of VC should also be stronger as VC becomes more reputable because they can offer more experience in monitoring the operation of the firm.

During the post-IPO period, the reduced ownership could cause more serious information asymmetries between the IPO firms and outsiders, which might lead to the performance decreasing. While Jain and Kini (1995) suggest that the Certification function of VCs can efficiently mitigate this problem and they report that VC-backed IPOs significantly outperform the non-VC-backed IPOs in the long-run. Findings of Gompers and Lerner (1997) are consistent with Certification function. Meanwhile, they reject the Conflict of interest hypothesis since IPOs funded by bank-afflicted VCs do not exhibit higher underpricing or lower long-term performance. By contrast, Hamao *et al*. (1998) find

evidence to support the Conflict of interest hypothesis, as well as rejecting the Certification function. They observe that the VC-backed IPOs do not exhibit any significant performance compared to the other IPOs in the long-run.

Hence, as documented in the prior studies, VC reputation has been proved to have significant influence on the post-IPO long-run performance. Therefore, it is plausible to suggest that VCs work hard to earn more reputation in order to be distinctive from their peers. However, the excessive pursuit of reputation might bring adverse effects. Gompers (1996) claims that, for the purpose of building up reputation as soon as possible, young VCs have intentions to grandstand. Less-established and younger VCs are inclined to push the private firms to go public earlier than they ought to. Gaining the reputation by the means of accumulating more IPOs ensures that VCs will raise funds in next rounds and keep surviving. However, going public when not well-prepared will place those firms in an arduous situation that could interfere the further development. The unqualified IPOs have insufficient ability to overcome the difficulties and competition in the IPO market. In the long-run, the post-IPO performance might show a continuous decline. In this case, it can be concluded that VC reputation exerts a two-side influence. On the one hand, as widely suggested, more reputable VCs have positive impact on IPO firm performance; on the other hand, the less reputable VCs seem to exert negative impact.

Nevertheless, the effects of less reputable VCs have also been doubted. Butler and Goktan (2013) explore the role of less-experienced VCs on IPO long-run performance, and find that less-experienced VCs show some comparative advantages in generating "soft information" when compared with the new start-ups who are not able to provide "hard information" about the operating status (e.g. financial reports). Usually less-experienced VCs are less reputable. Hence, in order to build specific personal distinctions, less-experienced VCs might focus on the creation of soft information. This study further underlines that the geographical distance between VCs and start-up firms strongly determines the scale of the benefits associated with the soft information. The underpricing of closer located VCs and IPOs is significantly much lower than farther located VC and IPOs, i.e. 12% vs. 35%.

In summary, the impact of VC reputation on IPO performance have been widely examined though the findings are mixed. More reputable VCs are always older and more experienced, and they can effectively improve IPOs' productivity, growth rate, and performance, etc. On the contrary, less reputable VCs do not seem to exert a profound

influence on IPOs: in most of the studies, low reputation VC-backed IPOs show no significant performance difference than the non-VC-backed IPOs. In many cases, low reputation VCs even exert negative impact on IPO firms' performance. Given that VCs are playing a more and more important role in the IPO market, the reputation of VC and its impact need to be examined as a matter of urgency.

2.6 Conclusion

This Chapter reviews prior studies that are related to VC reputation and post-IPO long-run performance. Firstly, this chapter reviews the studies that document the long-run underperformance of IPOs. In particular, the long-run underperformance of China's IPOs is summarized. Then the chapter reviews the explanations of long-run underperformance. Moreover, the chapter reviews the studies of the impact of VC on long-run performance and the explanations of positive and negative impacts. Finally, the measurement and VC reputation and the impact of VC reputation are summarized.

From the review of prior studies, there are some gaps in the literature. Firstly, the measurement of VC reputation and consequent its impact on the long-run performance are not well studied. This thesis uses a real-world and market-based ranking measure for VC reputation created by the Zero2IPO Research Group for the China market, which is more multifaceted than many of the traditional proxies for reputation used in earlier studies. As a result, the impact of VC reputation is more reliable. Secondly, this thesis examines both the post-IPO long-term stock market performance and operating performance in the context of China and sheds light on the different roles of VC-backing/VC reputation when investors are forward-looking and backward looking. Thirdly, the measurement of BHARs is sensitive to the matched portfolio. For example, some of the literature divides the sample of IPOs to 9 groups by two variables and each group will be the matched portfolio of all IPO firms in the group. However, this thesis makes improvement on the measurement of buy-and-hold abnormal returns by constructing IPO-specific portfolio as the bench mark to each IPO firms. Last but not least, the literature on the roles of China-specific ChiNext board in the impact of VC/VC reputation on the long-run performance is very limited. This thesis fills this gap.

Chapter 3

Hypotheses, Data, and Methodology

The previous chapter presents prevailing conjectures over the impact of VC-backing and VC reputation on IPO performance. Based on the critical assessment of the methodology used in previous studies, this Chapter develops several specific research hypotheses related to the impact of VC-backing and VC reputation on China IPOs' long-run performance. Then, this chapter illustrates the data of this thesis. After that, this chapter further emphasizes the methodologies on how to measure long-run performance and VC reputation. Finally, the empirical models are constructed corresponding to the research questions that have been put forward.

3.1 Hypotheses Development

Previous studies have recognized the universal but puzzling phenomenon of new-issued firms: their unusual high initial performance and low long-run performance. VCs are found to have some positive effects on firms' performance (e.g., Barry *et al*., 1990; Ritter, 1991; Jain and Kini, 1995; Loughran and Ritter, 1995; Brav and Gompers, 1997; Tian, 2012; Barry and Mihov, 2015). The certification function of VC can effectively reduce underpricing through reducing the uncertainty at IPO owing to the severing information asymmetry between issuing firms and public investors. VC's experience in managing and operating funded firms, especially in their dominant industries, is found to improve monitoring and value-added functions to the funded IPO firm.

Therefore, IPO firms who receive the VC investments may be expected to perform differently to the other IPOs. Within the China context, this thesis explores whether VC-

backing and VC reputation have significant effects on the long-term performance of China IPOs.

In addition, previous research informs us that empirical results are very sensitive to the measurement metrics for long-run performance. Previous studies usually mark the three years after IPO as the long-term period, and frequently employ stock market abnormal returns (e.g. CARs, BHARs) and operating performance (e.g. return on asset, return on equity) as the main proxies for performance. However, there is still no consensus on the impact of VC-backing and VC reputation. This thesis will examine both the IPO firms' stock market performance and operating performance. Based on the research results, conclusions can be drawn about the impact of VC-backing and VC reputation in the context of China. There is also the question of whether VC-backing/VC reputation are playing an equal role on different kinds of performance. In total, five hypotheses are developed regarding to the influence of VC on the new-issued firms' long-run performance.

Hypothesis 1

The first hypothesis stems from the concerns about long-term performance differences between VC-backed IPOs and the non-VC-backed IPOs. The dominant conclusion from previous studies suggests that VC can effectively reduce the IPO long-run underperformance by virtue of VC's Monitoring and Value-adding functions. The Monitoring function emphasises VC's roles in promoting growth and innovation and improving the corporate governance within the portfolio firms (Inderst and Mueller, 2009). The advisory role states that VCs provide advice to the management process of the funded firms (Chen and Liang, 2016).

Then, the Value-adding services provided by VC are extraordinarily beneficial to the IPO firms, e.g., assisting firms to make long-term development and marketing strategies, introducing potential supplier and clients, building new distribution channels, recommending suitable candidates for key positions, and attracting new investors. (Baker and Gompers, 2003; Hochberg, 2012). The long-term investments of VC can nurture IPO firms greatly. In addition, several studies also have suggested that VC can effectively reduce the adverse selection and moral hazard problems (e.g. Amit *et al.*, 1998; Kaplan and Stromberg, 2001; Bottazzi and Da Rin, 2002). Hypothesis 1 is that:

> *H_1: The VC-backed IPOs exhibit significantly superior long-run performance than the non-VC-backed IPOs in China.*

Hypothesis 2

Hypothesis 1 enables the understanding of the general role that VC is playing in China. The second hypothesis is developed to examine whether the reputation of VC contributes to any significant impact of VC. In other words, does VC reputation exert a significant impact on IPO long-term performance? Reputation, an abstract concept, is depicted as a reflection of VC firm's quality and strength through the public's impression and evaluation. The importance of VC reputation has become a hot research issue since VCs successfully earned themselves an important place in the capital market.

Proposition here is that if a positive function of VC (Monitoring and Value-added) exits, then it is magnified when VCs are more reputable, due to enhanced productivity and innovation (Jain and Kini, 1995; Brav and Gompers, 1997; Nahata, 2008). More prestigious VC investors are expected to have particular experience and expertise in managing and operating portfolio firms, whereupon they are able to provide forward-looking suggestions and monitoring services to IPO firms. Hence, Hypothesis 2 of this study is:

> _H_2 : VC reputation exhibits significantly positive impact on the long-run performance of IPOs in China._

VC reputation has been measured using many proxy variables in past studies. Findings about the impact of VC reputation are highly dependent on the measurements adopted. Currently, there is no consensus about the optimal proxy for reputation. In order to obtain credible results, this thesis will develop a set of proxies for VC reputation.

Hypothesis 3

Hypothesis 3 is a development of Hypothesis 2. As discussed above, high reputation VCs have more experience and abilities, therefore they are able to provide more benefits to IPO firms. Hence, IPOs funded by more reputable VCs may be expected to outperform the non-VC-backed IPOs. However, the impact of less reputable VCs should not be neglected as well. The third hypothesis put forward here also emphasises the impact of less reputable VCs and it is expressed as:

> _H_3: High (Low) VC reputation exhibits a positive (negative) impact on the long-run performance relative to the non-VC-backed IPO in China._

This hypothesis derives from the Grandstanding theory proposed by Gompers (1996), which points out that less reputable VCs are responsible for the negative impact of VC, where VC-backed IPOs exhibit significantly inferior performance to the non-VC-backed IPOs. More specifically, it indicates that less qualified VCs who are keen to gain more reputation may have an incentive to push firms to IPO prematurely, given the fact that the number of IPOs has been treated as an important standard to evaluate VC's reputation. A renowned reputation is so vital for the next round of fund raising that VC firms will spare no effort to increase their IPO numbers. However, in the long-term, those less reputable VC-backed firms which undertook IPOs prematurely will face more challenges and difficulties.

Hypothesis 4

Another unique characteristic of China stock market is the establishment of the ChiNext board in 2009. This Nasdaq-type board market serves as a supplement to the main board, and it is specifically designed to provide financing opportunities for enterprises that temporarily have difficulties to list on the mainboard but are in need of funding and developments (e.g. the entrepreneurial enterprises, middle- and small-sized enterprises, and especially high-tech enterprises).

For VC investors, the most noteworthy meaning of the ChiNext board is that it provides an ideal exit channel, due to the high criterion of the Main board. This board also works significantly to decentralize the risk of VC investments, accelerate the velocity of high-tech investment resources, and improve efficiency. As shown in Chapter 3, VCs appear much more frequently on the ChiNext board than they do on the Main board, i.e. around two thirds of listed companies on the ChiNext board are VC/PE-backed. As a result, this thesis will examine the performance of IPOs listed on the various boards and the relationship with VC investment. The impact of VC on different boards will be examined separately. The fourth hypothesis is:

>   *H_4:VC exerts significant impacts on post-IPO long-run performance for firms listed on the ChiNext board market and/or Main board market in China.*

Hypothesis 5

Due to the unique contribution VC contributed to the IPO firms, long-term performance of VC-backed IPOs are supposed to perform differently to the non-VC-backed IPOs. Building on Hypothesis 4, the next question is whether VC reputation impact differently across different boards. The fifth hypothesis is then:

H_5 : VC reputation exerts a significant impact on post-IPO long-run performance for firms listed on the ChiNext board market and/or Main board market in China.

3.2 Data

3.2.1 Data Resource

This study focuses on the A-share IPOs listed on China's Shanghai Stock Exchange (SHSE) and Shenzhen Stock Exchanges (SZSE) from the period 2004 to 2012. A-shares are common stocks issued by Chinese-based companies which operating in mainland China and they are only quoted in Chinese Renminbi (RMB). Before 2003, A share IPOs can only be purchased by citizens from the mainland China. Since then, A shares also can be traded by specified foreign investors through the Qualified Foreign Institutional Investor program.

The first A share VC-backed firm got listed on the Main Board in 2002. However, it was not until 2004, the second and subsequent VC-backed IPOs emerged frequently on the China stock market. Besides, the Chinese government began to enforce the "Split-share Reform" in 2004, striving to transfer the government-oriented stock market to a market-oriented one. Starting in 2004 allows the avoid of the potential effects (i.e. structural break) caused by the reform.

The sample terminates in November 2012 because the CSRC had frozen all IPOs since December 2012. Chinese equity indexes had manifested to be some of the world's worst performers since 2009 and had worsened in 2012. In order to stabilize the fragile equity market and redeem investors' confidence, the suspension was not resumed until January 2014. During this period, the regulator had conducted the tightest financial supervision on the companies that are queued to list. In addition, the CSRC was in preparation for the

market reforms on the stock listing system, transferring from the approval-based system to the registration-based system which applied in the developed markets.

Moreover, IPOs listed since 2014 are not involved here was also due to the definition of long-term: the 36-month is the main measure for long-term. Therefore, IPOs should have been floated for at least three years before the long-run post-IPO performance could be estimated. Initially, only 800 IPOs listed between 2004 and 2009 were included in the sample when the data collection commenced in 2013. Later, the sample enlarged to 1,095 in 2016, including the latest available IPOs listed between 2010-2012. Consequently, even though a portion of IPOs listed in 2014 become available in 2017, we have finished the draft and prepared for submission at that moment. Nonetheless, the subsequent IPOs (listed after 2014) will be added up in the most recent future research. Taken the above factors together, the time span of this research starts from 2004 and terminates in 2012.

Data for IPOs is obtained from four databases. The first database is Datastream, which provides the monthly stock prices, the book to market (B/M) ratio, market capitalization, and the accounting numbers for each IPO firm. The second database is CSMAR (China Stock Market & Accounting Research). This database provides a variety of information for China listed companies, such as the offering information, established date, book to market (B/M) ratio, funds raised during IPO (IPO proceeds), and ownership structures. The third database is the official website of the SHSE from which the IPO prospectus for all the IPO firms is collected. The IPO prospectuses provide very detailed ownership structures of the IPO firms from the time of establishment to the time of IPO. In this study, if one or more shareholders disclosed from the IPO firm's prospectus is/are VC investor(s), the IPO firm will be identified as VC-backed IPO.

The fourth resource is the database published by the Zero2IPO Research Group[11]. This institution was founded in 1999 and it is a leading integrated service provider for China's VC and PE industry which includes a great deal of data for the VCs that have participated investment activities in China capital market. Each VC is identified by reference to the 'Annual Directory of 400 domestic and foreign VC firms' published by this service provider. The most remarkable data obtain from this institution is the 'Annual Ranking of VC & PE Institutions' published every year since 2004, which can be used to construct a VC reputation measurement that is crucial in this research. Then, the detailed data for VC

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[11] See the website of Zero2IPO research group: http://www.pedaily.cn/ .

firms is hand-collected from each VC-backed IPO's prospectus, including VC's establishment date, register capitals, ownership, board membership, and equity holdings.

The industry to which the IPO belongs has also been treated as an observed factor that could affect firms' returns. It is argued that VC-backed firms tend to cluster in the high-tech industry, so that returns of VC-backed IPOs could be varied across industries. Generally, all the IPOs from the sample are divided into two sub-groups according to their industry. The high-tech industry is defined following the industry classification standard used by Loughran and Ritter (2004), i.e. the International Classification Benchmark (ICB) (the 2003 edition). However, three years later, the new ICB 2007 edition made some adjustments in some industries. So, these classifications were following Chou *et al.*'s (2013) work, using the 2007 standard. Firms belong to an industry that is in accordance with the ICB standard of high-tech industry will then be defined as a high-tech firm.

3.2.2 Data Description

The initial sample of IPOs accessed from Datastream consisted of 1,446 IPOs from Jan 1st 2004 to Dec 31th 2012. After calculating the BHARs based on portfolios matched by market capitalization and B/M ratio, 1,138 IPOs remained[12]. After merging the sample with the data set obtained from CSMAR, the sample reduced to 1,119 IPOs. The sample was then reduced by dropping IPOs that have BHARs larger or smaller than the mean value by the more than three times of standard deviation of BHARs to limit the effects of outliers. This leaves 1,095 IPOs in the final sample.

Table 3.1 reports the distribution of the 1,095 IPOs during the nine years from Jan 1st 2004 to Dec 31th 2012. The IPO frequency and proceeds are presented by stock exchanges, and whether they are VC-backed. Across all years, the 1,095 IPOs had raised 1,320.57 Billion Yuan. In year 2010 there was the largest number of IPOs, and the 320 IPOs contributed to the largest amount of proceeds among the sample years, which is around 432 Billion Yuan. The second largest number of IPOs happened in year 2011 with 256 IPOs raising over 263 Billion Yuan.

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[2] 308 IPOs are missing because, after the matching process, no satisfactory matched group could be found for them. The matching process is explicitly interpreted in Section 3.3.1.

Analysing the sample by the exchanges, the table illustrates that only 14.5% of the IPOs (159 out of 1,095) are listed on the SHSE, while the remaining 85% (936 IPOs) were all listed on SZSE. Such an uneven distribution is primarily due to the difficulty of getting listed on the Main Board which basically located on the SHSE. With respect to the SZSE, it is mainly dominated by the SME and ChiNext Boards. These two boards are designed for the small- and medium-sized enterprises and the listings requirements are much looser than the Main board. In particular, a large number of firms, especially those high-tech firms who have great potential and high-growth rates, take advantage of the ChiNext Board and get listed successfully. From 2009 to 2012, as many as 701 IPOs were listed on the SZSE, more than 8 times of the number of IPOs (84) listed on the SHSZ.

The VC industry has been experiencing a rapid development in the last decade and is playing an increasing important role in the Chinese stock market. Across 2004 to 2012, there are 456 VC-backed IPOs and 639 non-VC-backed IPOs. Meanwhile, the total proceeds of VC-backed IPOs are 534 Billion Yuan, which accounts for over 40% of the total amount of proceeds from the entire market. From Table 3.1, it can be seen that VC-backed IPOs exhibits a sudden increase in 2010, and slightly decreases in the next two years. Between 2010 and 2012, 351 VC-backed firms successfully went public in China. This is about three times the total number of VC-backed IPOs (107) over the previous 6 years. Nevertheless, the ratio of VC-backed and non-VC-backed IPOs was also increasing through the sample years. In 2006, the number of non-VC-backed IPOs was 7 times as the number of VC-backed IPOs, and then in 2007 the multiple decreased to 2.3 times. By 2011 and 2012, the number of VC-backed IPOs had exceeded the number of non-VC-backed IPOs. This pattern of VC-backed IPO activity is similar to the case that was seen in some of the advanced stock markets, such as the US.

Table 3.1 Distribution of IPOs from 2004-2012

	Full		SHSE		SZSE		VC		NVC	
	N.	Proceeds	N.	Proceeds	N.	Proceeds	N.	Proceeds	N.	Proceeds
2004	87	31.15	52	20.55	35	10.59	7	1.43	80	29.72
2005	13	3.35	1	0.44	12	2.91	4	1.14	9	2.21
2006	40	38.84	5	26.48	35	12.36	5	1.27	35	37.57
2007	96	205.68	13	174.03	83	31.65	29	139.87	67	65.81
2008	74	80.55	4	51.11	70	29.44	23	9.23	51	71.32
2009	73	159.06	6	109.62	67	49.45	37	27.12	36	131.94
2010	318	432.05	21	21.00	297	297.00	137	155.26	181	276.79
2011	256	263.54	36	95.03	220	168.51	130	143.29	126	120.25
2012	138	88.35	21	25.57	117	62.79	84	55.43	54	32.92
Total	1,095	1,302.57	159	523.82	936	664.71	456	534.04	639	768.53

Table 3.1 illustrates the distribution of 1,095 A share IPOs listed on Shanghai Stock Exchange (SHSE) and Shenzhen Stock Exchange (SZSE) from Jan 2nd 2004 to Dec 31th 2012. Proceeds of IPO are presented on the unit of Billion yuan.

Table 3.2 Industry Classification by ICB (2007)

Industry	Supersector	Sector	High-Tech
0001 Oil & Gas	0500 Oil & Gas	0530 Oil & Gas Producers	NO
		0570 Oil Equipment, Services & Distribution	NO
		0580 Alternative Energy	NO
1000 Basic Materials	1300 Chemicals	1350 Chemicals	√
	1700 Basic Resources	1730 Forestry & Paper	NO
		1750 Industrial Metals & Mining	NO
		1770 Mining	NO
2000 Industrials	2300 Construction & Materials	2350 Construction & Materials	NO
	2700 Industrial Goods & Services	2710 Aerospace & Defense	NO
		2720 General Industrials	NO
		2730 Electronic & Electrical Equipment	√
		2750 Industrial Engineering	NO
		2770 Industrial Transportation	NO
		2790 Support Services	NO
3000 Consumer Goods	3300 Automobiles & Parts	3350 Automobiles & Parts	NO
	3500 Food & Beverage	3530 Beverage	NO
		3570 Food Producers	NO
	3700 Personal & Household Goods	3720 Household Goods & Home Construction	NO
		3740 Leisure Goods	NO
		3760 Personal Goods	NO
4000 Health Care	4500 Health Care	4530 Health Care Equipment & Services	NO
		4570 Pharmaceuticals & Biotechnology	√
5000 Consumer Services	5300 Retail	5330 Food & Drug Retailers	NO
		5370 General Retailers	NO
	5500 Media	5550 Media	NO
	5700 Travel & Leisure	5750 Travel & Leisure	NO
6000 Telecommunications	6500 Telecommunications	6530 Fixed Line Telecommunications	NO
		6570 Mobile Telecommunications	√
7000 Utilities	7500 Utilities	7530 Electricity	NO
		7570 Gas, Water & Multi-utilities	NO
8000 Financials	8300 Banks	8350 Banks	NO
	8600 Real Estate	8630 Real Estate Investment & Services	NO
	8700 Financial Services	8770 Financial Services	NO
9000 Technology	9500 Technology	9530 Software & Computer Services	√
		9570 Technology Hardware & Equipment	√

Table 3.2 lists the 3-digit ICB industry classification released in 2007. There are totally 10 industries and each industry have one or more super sectors. The high technology industries are defined according to the 3rd digit. These six industries: 1350 Chemicals; 2730 Electronic & Electrical Equipment; 4570 Pharmaceuticals & Biotechnology; 6570 Mobile Telecommunications; 9530 Software & Computer Services; 9570 Technology Hardware & Equipment are defined as high-tech industries.

Table 3.2 provides the industry classification for companies according to the 2007 edition of Industry Classification Benchmark (ICB). The ICB allocates companies to subsectors and labels each subsector with a unique code. A company is defined as a high-tech company if its industry lies in one of the 6 industries with the three-digital ICB codes: 1350, 2730, 4570, 6570, 9530 and 9570.

Table 3.3 reports the distributions of IPOs according to the listed board, industry and ownership. Of the 159 main board IPOs, only 50 are VC-backed. In comparison, among all the 936 IPOs listed on the other two boards, 406 (nearly 45%) are funded by VCs. This indicates that VC-backed IPOs are relatively smaller, hence the SME and ChiNext boards are much more suitable for high-tech firms to get listed than the main board.

Table 3.3 Distribution of IPOs by Boards, Industry, and Ownership

		VC	NVC	Total
Board	**Main**	50	109	159
	ChiNext/SME	406	530	936
	Total	456	639	1,095
Industry	**High-Tech**	215	257	472
	Non-High-Tech	241	382	623
	Total	456	639	1,095
Ownership	**SOE**	130	163	293
	Non-SOE	323	474	797
	Total	453	637	1,090

Table 3.3 reports the distribution of IPO firms by boards, industries, and ownerships during the year 2004-2012.

Furthermore, IPOs are also classified by high-tech industry and non-high-tech industry. The numbers are 472 and 623 respectively, and nearly half of the high-tech IPOs are VC-backed (215). Such numbers fit with the background of the China stock market in which high-tech firms experienced noticeable expansions in recent years, and the contribution of VCs is non-trivial. However, since more than half of the VC-backed IPOs are non-high-tech firms, this shows that VCs do not confine their investments solely in high-tech projects. For example, some non-high-tech industries such as electric commerce, communications media, mobile internet and catering have made swift and dramatic progress since 2010 and a majority of them have drawn their investments from VCs. In line with Table 3.10 (from Chapter 3), it confirms that VCs have shifted their attention to a broader range of industries.

3.3 Methodology

3.3.1 Long-term Market Performance

<u>Buy and Hold Abnormal Returns (BHARs)</u>

This research uses the 3 years BHARs to represent for the long-run post-IPO performance. This metric has been popular in prior studies (e.g. Gompers and Lerner, 2003; Levis, 1993; Liu *et al*., 2012; Ritter, 1991). Gompers and Lerner (1997) suggest that the performance differential between VC- and non-VC-backed IPOs is sensitive to both estimation periods and methodologies. Although the longer interval of event period might lead to a greater underperformance, the variability of returns can be better captured by the BHARs (Loughran and Ritter, 1995). Another advantage of BHARs is that, unlike CARs, it contains the effects of compounding whereas the CARs does not. In this case, CARs are usually larger than BHARs if the individual stock returns are more volatile than the market index (Conrad and Kaul, 1993). Besides, Loughran and Ritter (2000) find out that BHARs capture approximately 80–90% of the actual abnormal returns. Moreover, according to Brav (2000) and Liu *et al*. (2012), BHARs is an appropriate long-term performance measurement for China IPO firms as it can precisely capture the investor experience.

Specifically, the 3-year Buy and Hold Returns (BHRs) are calculated according to the event study method which treats the date of IPO as the starting point of the underlying event and the next three years as the event window. BHARs is then the difference between the three-year's BHRs of an IPO firm and the three-year's BHRs of its benchmark. The benchmark of sample IPOs could be chosen in various ways. A widely used one benchmark is the market index which reflects the aggregate value of the stock market. The difference between BHRs illustrates the abnormal returns of the IPO firm against the market index. However, the disadvantage of the market index is that it cannot capture the distinct characteristics of each IPO. To calculate the BHARs of every IPO, it is important to select a comparable portfolio. Hence, another benchmark will be employed: a unique portfolio matched to each IPO, following the method used by Fama and French (1993), Loughran and Ritter (1995), and Brav and Gompers (1997).

To construct the matched portfolio, firstly data is collected for all A share listed firms listed on both the SHSE and SZSE from 1993 to 2004. The matching method used in this thesis is to assign each IPO in the sample a specific (matched) portfolio consists of those listed firms with similar values of both the size and M/B ratio. For IPOs in our sample, size

is represented by the 'market capitalization' of the firm at the end of the IPO year. Size of the listed firms to construct the matching portfolio will be used as the market capitalization of each listed firms at the end of each fiscal year. The M/B ratio used here is the M/B ratio at the end of each fiscal year[13].

The matching process is as follows. Given an IPO i listed in year t, its matched portfolio includes the listed firms with the size and M/B ratio that are no more than 25% higher than its own size and M/B ratio respectively and no less than 25% lower than its own size and M/B ratio respectively as well in year t. Then, firms listed two years before year t will be selected to construct the final matched portfolio. Finally, each IPO from the sample is matched with a specific portfolio which has the same level of size and M/B ratio.

The calculation of BHARs (Ritter, 1991) is presented as following: the first step is the calculation of BHRs of each sample IPO at time T:

$$BHR_{it} = \left[\prod_{t=1}^{T}(1 + R_{it}) - 1\right] \times 100\%$$

Where R_{it} is the monthly return of IPO_i at month t; The equally-weighted BHR for the corresponding matching portfolio (BHR_{mt}) that consists of n IPOs at month t is

$$BHR_{mt} = \frac{1}{n}\sum_{1}^{n}\left[\prod_{t=1}^{T}(1 + R_{nt}) - 1\right] \times 100\%$$

Where R_{nt} is the monthly return of IPO_n at month t. Therefore, the BHARs for each sample IPO is the difference between BHR of IPO firm and its matched portfolio:

$$BHAR_{it} = \prod_{t=1}^{T}(1 + R_{it}) - \frac{1}{n}\sum_{1}^{n}\left[\prod_{t=1}^{T}(1 + R_{nt})\right]$$

According to previous studies, e.g. Boissin and Sentis, 2014, Michel et al., 2014, Mauer et al., 2015, Otchere and Vong, 2016, and Hoechle et al., 2018, in the main analysis, we use 3-year, i.e. 36-month BHARs.[14]

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[13] Brav and Gompers (1997) assert that there should not have too much bias in the book value "because the increment in book value due to retained earnings in the first year is likely to be very small".

[14] see Kim et al. (1995), Jain and Kini (1995), Espenlaub et al. (1999), Chen et al. (2000), Doukas and Gonenc (2003), Chen et al. (2004), Cai et al. (2008), Chang et al. (2010), Gregory et Al. (2010), Moshirian et al. (2010),Krishnan et al.

3.3.2 Long-term Operating Performance

Relative to the stock market performance of an IPO firm, the operating performance is equally important. The operating performance of a company is mostly acknowledged as the performance measured by accounting data, or the returns obtained from the operating activities. It is very different from the stock market performance. The stock market performance is forward-looking, which mostly reflects the expectations or predictions about the firms' value in the future. By contrast, the operating performance are more likely to be backward-looking since it is built on the real past accounting-based performance appearing on the financial sheets. Consequently, it is possible that the stock performance and operating performance of a firm may be weakly correlated (if at all) during short time intervals. Investing large amounts of capital into the project may exhibit low or even negative operating returns. However, as long as the investors and the public hold confidence with its projects, a firm's stock prices will not necessarily decrease.

The operating performance of a firm can be measured and analysed from several different aspects, for instance, the profitability, solvency, efficiency, operation capacity, and growth capacity, etc. These ratios give users insight into the firm's performance and management. VC-backing has been widely shown to generate mixed impact on the operating performance of firms. Return on equity and return on assets are the most commonly used measurement for operating performance. This thesis adopts the return on equity as an example to measure the operating performance, following Jain and Kini (1994), Loughran and Ritter (1997), Coakley *et al*. (2007). There are two versions for the return on equity.

Return on equity (ROE)

ROE is an enduring indicator that reflects firm's profitability and measures the returns/profits distributed to shareholders relative to the capital they provided. Generally, it is calculated by using the net income divided by the shareholders' equity, but with several different versions. In this study, ROE is calculated based on the average shareholders' equity, which is the average of shareholders' equity between the beginning of and the end of the fiscal year. If VCs work efficiently in fostering firms, the VC-backed companies

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(2011), Su et al. (2011), Su and Bangassa (2011), Bessler and Seim (2012), Brau, et al. (2012), Liu et al. (2012), Tian (2012), Agathee et al. (2014).

should be associated with higher ROE. What is more, the effects will be magnified if the VC is more reputable.

However, sometimes high ROE does not necessarily mean high profitability and some high-quality firms might exhibit low ROE. In some industries where large capital investments are not required, they usually exhibit high ROE level. On the contrary, some industries require enormous inputs at the early stage of development and might wait for years before those input converted to returns. Hence, they might show very low or even negative ROE in certain periods.

ROE after reduction non-recurring profit and loss

This is the ROE after deducting non-recurring profit and loss from the profit, e.g. the windfall profits, and the unexpected losses. Paying attention to this item is helpful to restrain profit manipulation by listed firms. It also facilitates the investors to have a better understanding about the true operation and management condition of listed firms. This item is calculated by using the net profit distract the non-recurring profit and loss and then dividing the results by the average shareholders' equity. For a well-operated listed firm with strong profitability, its ROE after reduction non-recurring profit and loss should show a similar trend with the ROE.

In line with the previous studies, the abnormal IPO operating performance is calculated by using the median change as the basic measure (see the studies, Jain and Kini, 1994; Mikkelson *et al*., 1997; Loughran and Ritter, 1997; Chi and Padgett, 2006; and Coakley *et al*., 2007). It is because operating performance usually does not follow a normal distribution and it can be seriously skewed. To measure the post-IPO long-run operating performance, the median changes in these indicators are calculated during the one fiscal years before listing and three fiscal years after listing. Thus, the long-term changes of ROE after IPO relative to pre-IPO level can be expressed as: ROE (+3) – ROE (-1).

3.3.3 VC reputation

In this research, the primary objective is to examine the impact of VCs on IPO performance and whether the reputation of VCs exerts any significant influence on the performance of IPOs. Therefore, the main variables of interest should be relevant to the characteristics of VC and, of course especially, the VC reputation. Impact of VC reputation on firms'

performance have been discussed extensively. However, due to the nature of reputation, there is still no agreed measurement. What is more important, the effects of VC reputation are very sensitive to the measurement used. As a result, for the sake of more comprehensive research results, this thesis will employ multiple indicators to proxy for the VC reputation. Inspired by the methods suggested from the previous studies five types of measurements will proxy for VC reputation. However, before the introduction of the measurements, it is very necessary to define the Lead VC. When a firm had syndicated VCs, this thesis emphasis the reputation of Lead VC.

For those IPO firms that funded by more than one VC investors, the lead VC's reputation will be used to stand for the integrated impact of all the VCs. Lin and Smith (1998), Hochberg *et al*. (2007), and Krishnan *et al*. (2011) define a 'lead VC' as investing the largest amount of capital in the funded firm at the time of IPO. The lead VCs are likely to hold more shares and board seats in the IPO firms, and even in the post-IPO period lead VCs still tend to engage a lot. As a result, focusing on lead VCs allow to capture the greater guidance that IPOs received from VCs. Due to the data availability, the exact amounts VCs invested in each IPO are not known, hence the 'lead VC' is defined as holding the largest equity stake in the issue firm before the IPO. An alternative measure is to define the lead VC as the one who holds the largest post-IPO equity stakes. It may be noted that there does not seem to be too much difference between these two ways to define lead VC because the VC who holds the largest equity stakes before IPO mostly is the one who holds the largest equity stakes after IPO, so the second way to define the 'lead VC' will only be used in some additional tests as robustness checks.

The five types of measures for VC reputation is listed as follows:

(1) *VC Ranking*

The first measurement of VC reputation is the ranking of VCs based on the Annual Ranking of VC/PE Institutions (thereafter, short for "VC Ranking") issued by the Zero2IPO Research Group. It is a compositional ranking of all the VCs that had investment activities in the China capital market and the ranking is renewed every year according to the current year's performance of VC investors. As explained by the Zero2IPO research Group, the evaluation of VC ranking is based on five main aspects, including the Capital under Management, the Amount of Capital Raised, Investment, Exits, and the Comprehensive Returns. To the best of our knowledge, this is the first study that use this ranking as a proxy for VC reputation.

Table 3.4 lists the explicit weights of each indicator to construct the VC ranking every year from 2006 to 2012. Unfortunately, in 2004 and 2005, although the specific factors they adopted are notified to the public, the exact weights are not given. A notable change is that from 2007, the percentage of "Exit Amount" was removed from the "Exit" section, and then added to the "Comprehensive Returns" section. Since then the "Comprehensive Returns" section has become the most important evaluation standard accounting for the highest weights when they rank the VCs. The explicit instructions of the indicators are listed as following:

Table 3.4 VC Ranking Standards Across 2004 to 2012.

	Capital under Management	Capital Raised	Investment		Exit		Comprehensive Return Levels
			N.	Capital Amount	N.	Amount	
2004	√	√	√	√	√	√	√
2005	√	√	√	√	√	√	√
2006	10%	15%	20%	20%	15%	10%	10%
2007	5%	15%	15%	20%	15%	-	30%
2008	10%	10%	15%	20%	10%	-	35%
2009	15%	15%	20%	20%	5%	-	25%
2010	15%	10%	15%	20%	10%	-	30%
2011	10%	10%	15%	20%	10%	-	35%
2012	5%	20%	15%	15%	10%	-	35%

Resources: the Annual rankings for VC/PE institutions in China provided by the Zero2IPO research group from the year 2004 to 2012.

Capital under Management measures the capital managed by VC institution that could be used to invest in China by the end of each current year. Financing Amounts measures the total amount of capital raised by the VC institution during the current year that can be used to invest in China. Investment is divided into: Number of deals invested, i.e. total number of deals that have been funded by VC during the current year; and Investment Amount, i.e. total amount of capital that have been used to invest in the funded deals during the current year. Exit is the number of successful exit cases in the current year of VC, including IPO and M&A, etc. Comprehensive Returns. This is a comprehensive score based on all the exit cases of each VC in the current year. The important characteristics that must be considered for each exit project are: the way of exit, exit amount, Return of Capital Multiple (ROC) (the return of book value multiple), capital raised by the entrepreneurial company

(applied to IPO exit), VC's shareholding before IPO (applied to IPO exit), subsequent financing of the entrepreneurial company, and whether VC is a lead investor.

According to the reported data of these indicators and the corresponding weights, each VC will be allocated a comprehensive score that is calculated as the sum value of each indicator multiplied by its weight. Thereafter, the ranking of VCs in each year is generated by following the descending order of the scores. If two or more VCs end up with the same score, they are ranked by the score they get first in the Comprehensive Returns, then Investments, Capital raised, and then the Capital under Management. Hence, the VC which obtains the highest score will become the best VC institution in China in the underlying year. For some other examples, the highest 20 scores become the Top 20 VCs, and the highest 50 scores are the Top 50 VCs.

The advantage of using the VC ranking as a proxy for reputation is twofold. Firstly, this integrative index captures the all-round performance of VCs. Secondly, it places an emphasis on the importance of profitability to VC's reputation since the returns of VC, as the dominance factor, accounts for the largest proportion. In this study, the ranking of each VC at the year is recorded, and then two dummy variables are constructed according to the recorded ranking:

The first is *Top$_{20}$*. This variable equals to 1 if the IPO is backed by one of the top 20 VCs and equals to 0 if IPOs are backed by the latter ranking VCs. The other is *Top$_{50}$*. This variable equals to 1 if the IPO is backed by one of the top 50 VCs and equals to 0 if IPOs are backed by the latter ranking VCs. The two variables will be separately used in the regressions to examine the impact of VC reputation on the IPO long-run performance.

Although the VC Ranking may have great advantages compared to the single-indicator measurements used in prior studies, it is still flawed because it neglects the time factor. Given the fact that the building of reputation needs a long-term accumulation and continuous efforts, it is necessary to take the VC's previous performance into consideration. However, the VC ranking only evaluates the comprehensive performance of VC in each single year. This study designs four additional variables which take the time factor into account when measuring the VC reputation.

(2) *VC IPO Market share*. In the spirit of Nahata (2008) and Krishnan *et al.* (2011), this study will use the VC's cumulative IPO market share during the sample period as a second proxy for reputation. IPO market share is a multi-factor measurement that evaluates VC's comprehensive strength in supporting the IPO companies because the frequency and quality of VC's investment could reflect VC's reputation simultaneously. The VC cumulative IPO market share is calculated starting from the year 2004 because before 2004 there was nearly no VC-backed A share IPOs. Specifically, two approaches will be used to calculate VC's IPO market share: one is based on the IPO proceeds, the other is based on IPO market capitalization. The first IPO market share of VC i in year t is calculated as:

$$VC\ Market\ Share_{i1} = \frac{\sum_{j=2004}^{t} VC\ Proceeds_{ij}}{\sum_{j=2004}^{t} Market\ Proceeds_{j}}$$

Where $\sum_{j=2004}^{t} VC\ Proceeds_{ij}$ is the total proceeds of all IPOs the VC i has invested from 2004 until the current year *t*; $Market\ Proceeds_{j}$ is the total proceeds of all A share IPOs backed by VC in the market at the year *j*. $\sum_{j=2004}^{t} Market\ Proceeds_{j}$ is the cumulative proceeds of all IPOs from 2004 to current year t. proceeds is obtained by using the issue (shares) number times the issue price. The second approach is based on the market capitalization, which is obtained by using the number of all shares times the issue price. Substituting proceeds by the market capitalization generates a second metric for market share of VC i in year t:

$$VC\ Market\ Share_{i2} = \frac{\sum_{j=2004}^{t} VC\ Capitalization_{ij}}{\sum_{j=2004}^{t} Market\ Capitalization_{j}}$$

where $\sum_{j=2004}^{t} VC\ Capitalization_{ij}$ is the total market capitalization of all IPOs the VC i has invested from 2004 until the current year *t*; $Market\ Capitalization_{j}$ is the total capitalization of all A share IPOs backed by VC in the market at the year *j*. $\sum_{j=2004}^{t} Market\ Capitalization_{j}$ is the cumulative market capitalization of all IPOs from 2004 to current year t. More reputable VCs ought to occupy a larger proportion of the market share in the IPO market and this indicator could capture VC Screening and Monitoring function.

(3) *VC IPO Number*

The third measurement of reputation is VC's cumulative IPO number. This single-factor variable is a traditional measurement and is widely used. It could efficiently capture VC's market activeness during a long-term period (Lerner, 1994; Wahal, 2004). The number of IPOs has been treated as one of the most important standards to evaluate a VC. Given that IPO is not only the most successful way to gain huge returns, but also the most significant way to build its awareness and enhance its visibility, VCs are willing to pay great efforts to support the venture firms to IPO (Gompers and Lerner, 1998). Meanwhile, this parameter also shows the experience and expertise of VC in investing companies and in supporting private companies to IPO. The variable is calculated by counting the total number of successful IPOs a VC has participated from the sample period 2004 to the year of IPO. This way captures the continuous ability of VCs by using the cumulative method. The expectation here is that the greater the number of IPOs VCs achieved in the past, the more the reputation they accumulated.

(4) *VC Age*

The age of VC is one of the very earliest measurements for VC reputation, and it is the most direct indicator that reflects the time factor (Wahal, 2004; Hochberg *et al.*, 2007; Sorenson, 2007). Being able to keep operating for a long period, not only reflects VC's ability to raise the subsequent financing, but also stands for VC's adaptability to the changing environment. The longer the VC has existed, the more widely known it is, especially to venture firms who are seeking for investments. Hence this indicator is the fourth proxy of VC reputation. In this study, the age of VC is calculated by using the nature log of the time length (measured in days) between VC's established date and list date of IPO it invested. It may be expected that the older the VC is, the greater is the reputation. However, there is one problem of using the VC age as reputation measurement: age cannot appropriately distinguish between active and inactive investors (Nahata, 2008).

(5) *VC Size*

Apart from the previous four proxies, another indicator is adopted to predict the reputation of VC. This indictor focuses on a VC's scale and financial strength, which are not considered in the other metrics. Therefore, the fifth measurement is the size of VC

which reflects a VC's financial background. Capital holdings of a VC determines whether the VC runs a large project or is able to provide the subsequent rounds of investment. This study uses the registered capital to measure the financial strength of VCs. This variable is calculated by using the natural log of the register capital when the VC firm was established. It may be expected that VCs with stronger financial backgrounds will exhibit higher reputation.

Table 3.5 reports the characteristics of lead VC's reputation metric for the 456 VC-backed IPOs. The first two rows show the distribution of the VC rankings. Among the 456 VC-backed IPOs, 161 are funded by Top 20 VCs and 193 are funded by Top 50 VCs. For each VC-backed IPO, the average equity stake held by VC before issue is 9.7%, which reduces to 7.15% after issue. The average age of VC investors is 2372 days (around 6.5 years) with the registered capital of about 744 Million Yuan.

Table 3.5 Lead VC reputation.

Rankings	N.	1	0
Top 20	456	161	295
Top 50	456	193	263

Alternative Measurements	N.	Mean	Std. Dev.	Min.	Max
Total VC Shareholding (Pre-IPO), %	455	9.70	7.32	0.07	46.87
Total VC Shareholding (After-IPO), %	455	7.15	5.55	0.05	35.11
VC Age	452	2,372.07	2,144.17	336	18,723
VC Size	440	774.32	2,066.71	0	35,000
VC IPO Number	456	4.07	7.16	1	48
VC IPO Market Share$_1$, %	455	2.62	6.20	0.07	65.48
VC IPO Market Share$_2$, %	455	2.46	6.60	0.02	82.11

Table 3.5 is based on the 456 VC-backed IPOs sample. Lead VC is the VC who holds the largest equity stakes before IPO. High reputation is defined as the largest 25% of each VC reputation variable. *VC Age* is measured by days between VC's establishment date and the IPO date; *VC IPO#* is the cumulative number of IPOs VC has funded prior; *VC MS$_1$* is VC's cumulative IPO maker share calculated by using the IPO proceeds and it is measured by %; *VC MS$_2$* is VC's cumulative IPO maker share calculated by using the IPO market capitalization and it is measured by %; *VC size* is measured by Million yuan.

The average VC's cumulative market shares are 2.62% and 2.46%, calculated by IPO proceeds and IPO market capitalization respectively. It is notable that they both exhibit a wide range, the former ranging from 0.07% to 65.48% and the latter from 0.02% to 82.11%.

In addition, the average IPO number of each VC is 4, but the maximum is 48. Such data reveals that there are a few lead VCs which are frequently participating in the IPO market. An example is the Shenzhen Capital Group Co. Ltd. (SCGC), one of the most influential and largest venture capital investment companies in China, which has funded 48 IPOs in this sample. Also, from 1999 to 2016, it has invested in 703 projects with a cumulative investment amount of over 260 billion yuan.

Table 3.6 records the Pearson correlation matrix of the 7 reputation measurements of the lead VCs. First of all, there are strong positive correlations between ***Top 20*** and ***Top 50*** (nearly 90%), and the ***VC MS₁*** and ***VC MS₂*** (nearly 95%), which are not surprising. While correlations of the other variables are all positive but much weaker, all being less than 0.40. Among them, cumulative IPO number exhibits relatively stronger correlations with the other reputation measurements, including VC ranking and VC cumulative market share. It may be that the number of IPOs a VC funded previously might be an important parameter when evaluating the VC's capacity and reputation.

Table 3.6 Lead VC Reputation Correlation Matrix

	Top 20	Top 50	VC Age	VC IPO#	VC MS₁	VC MS₂	VC Size
Top 20	1						
Top 50	0.8624*	1					
VC Age	0.1150*	0.1716*	1				
VC IPO#	0.3675*	0.3354*	0.1847*	1			
VC MS₁	0.2376*	0.2302*	0.2805*	0.3278*	1		
VC MS₂	0.1999*	0.1937*	0.2609*	0.2338*	0.9405*	1	
VC Size	0.2327*	0.2118*	0.0052	0.1591*	0.0953*	0.1041*	1

Table 3.6 reports the Pearson correlation matrix of the seven VC reputation measurements based on the lead VC of the 456 VC-backed IPOs. * denotes the significance at least 5% level.

Another finding is that the registered capital of VC and the age of VC have no significant correlation, given the correlation is nearly zero (0.0052). This indicates the registered capital of VCs has no link with the length of its lifespan. Registered capital of VCs also has a very weak correlation with VC's cumulative market shares, implying the size of registered capital of VCs might reflect diverse impact of VC reputation compared to the other proxies. Additionally, there also shows relatively low correlations between the ranking of VC (Top 20/50) and the conventional VC reputation proxies.

Taken together, none of the correlations between those reputation proxies is especially strong. This leads to an interesting conjecture: impacts of VC reputation might be diverse, depending on the proxies used. It also raises another interesting issue - that of how the conventional reputation measurements used in previous studies are related to the ranking of VC released by the Zero2IPO research group. Analysis in a later chapter will address this issue.

3.3.4 High and Low Reputation

In order to distinguish the effect of different levels of reputation, variables are created to separate the high reputation VCs from low reputation VC. For the ranking of VCs, IPOs backed by Top 20 VCs are defined as the high reputation VC-backed IPOs, while the rest are classed as low reputation VC-backed IPOs.

For the sake of empirical analysis of this thesis, a dummy variable **Top-20** is created, which is equal to 1 if IPOs are backed by the top 20 VCs, and zero otherwise (i.e. for the low reputation VC-backed IPOs and non-VC-backed IPOs). A second dummy variable **Non-Top-20** is equal to 1 if IPOs are backed by the VCs whose ranking are after 20, and 0 for the rest, including IPOs backed by Top 20 VCs, and the non-VC-backed IPOs.

For the other four types of reputation proxies, two dummy variables are also created for each of them. For example, for the VC IPO market share, the dummy variables are $High_{ms}$ and $Low_{ms.}$ The VCs with the value of market share in the highest quantile (top 25%) will be defined as the 'high reputation VCs', while the others are classified as 'low reputation VCs'. Accordingly, $High_{ms}$ will be equal to 1 for the IPOs funded by 'high reputation VCs', and 0 for the other VC-backed IPOs and non-VC-backed IPOs. In contrast, Low_{ms} will be equal to 1 for the IPOs funded by 'low reputation VCs', and 0 for the other VC-backed IPOs and non-VC-backed IPOs. By analogy, dummy variables to separate IPOs backed by reputable and less reputable VCs are constructed, including $High_{Num}$, $High_{Age}$ and $High_{Size}$, and Low_{Num}, Low_{Age} and Low_{Size}.

Table 3.7 illustrates the characteristics of lead VCs' reputation of the 456 VC-backed A share IPOs are divided into two groups: high reputation VC backed and low reputation VC backed. Around 110 IPOs are funded by reputable VCs, and the remaining 340 IPOs are funded by less reputable ones. The characteristics of the high reputation group are all significantly higher than the low reputation group, as would be expected. On average, more

reputable VCs are 4 times older in age than and as high as 13 times larger in size than less reputable VCs. The number of VC-backed IPOs and the market shares occupied are all about 8 times higher than the latter ranking VCs.

Table 3.7 High and Low reputation

	High			Low			Difference	
	N.	Mean	Median	N.	Mean	Median	t-test	wilco.
VC Age	113	5,228	4,234	339	1,420	1,247	-25.60***	-15.93***
VC IPO#	112	11.9	7.0	344	1.5	1.0	-17.06***	-16.88***
VC MS$_1$, %	113	8.70	6.00	342	0.62	0.48	-14.44***	-15.95***
VC MS$_2$, %	113	8.35	5.12	342	0.51	0.41	-12.75***	-15.95***
VC Size	107	2,573.91	1,868.00	333	196.07	100.00	-11.90***	-15.58***

Table 3.7 is based on the 455 VC-backed IPOs sample. Lead VC is the VC who holds the largest equity stakes before IPO. High reputation is defined as the largest 25% of each VC reputation variable. *VC Age* is measured by days between VC's establishment date and the IPO date; *VC IPO#* is the cumulative number of IPOs VC has funded prior; *VC MS$_1$* is VC's cumulative IPO maker share calculated by using the IPO proceeds and it is measured by %; *VC MS$_2$* is VC's cumulative IPO maker share calculated by using the IPO market capitalization and it is measured by %; and the *VC size* is measured by Million yuan. The values in the brackets are p-values. *** denote the significance at 1% levels.

3.3.5 Variables of IPO Firms

This study controls for observable IPO characteristics that might potentially have influence on the issuer's performance in the long-run. The logic of inclusion of independent variables in the equation is as follows:

VC-backed. This variable is used to distinguish VC-backed IPOs from the non-VC-backed IPOs. It is a dummy variable which equals to 1 for VC-backed IPOs and 0 for the non-VC-backed ones.

Underpricing. This is the variable which controls for the potential impact of the initial returns of IPO firms on long-run performance. As suggested by the literature, VC investments are found to have a significant impact on reducing the underpricing through their Certification function (Megginsion and Weiss, 1991). Due to the problem of information asymmetry during IPO process, outsiders are nearly blind about the actual situation of the issuing firms (Sahlman, 1990). To become more attractive, some IPO firms have strong incentives to abate the offering price, thereby providing high initial returns to their potential investors as compensation. However, as informed investors, VCs'

purpose is to obtain high returns in a long-term period through assisting the invested firms to acquire the maximum profits. Hence, VC investors would initially select better quality firms to invest. The appearance of VC could not only reduce the uncertainty of outside investors during IPO, but also symbolize the IPO firm's high quality. This means that VC-backed IPOs do not necessarily have to lower the offering price to make themselves more attractive. Accordingly, VC-backed IPOs may be associated with low underpricing. More importantly, since they are more qualified, VC-backed IPOs should further exhibit superior post-IPO performance in the long-run.

By contrast, Welch (1989) proposes that if VCs can bring higher quality firms to public, then VC-backed IPOs should present higher underpricing than the less qualified firms. Later, the signalling hypothesis suggested by Jain and Kini (1994) further proposes that firms with signal of high initial returns have superior post-IPO operating performance. As commonly known, VCs prefer to invest in well-performed firms, public investors are easily attracted by the signals conveyed by VC-backed IPOs. Investor sentiment could push the first day share price to a high level, leading VC-backed IPOs to exhibit high underpricing. In this case, the high underpricing of VC-backed IPOs is associated with better long-run performance.

Consequently, to control the initial performance is required for the underpricing of IPO firms. Particularly, in China the underpricing is much more serious than in Western stock markets. In order to explore whether VCs exert a significant function on China IPOs, the first stage is to examine whether VCs could explain the variations of the underpricing, and then examine the association between underpricing and the IPO long-run performance. The underpricing of each IPO firm is calculated as the return of the first day relative to its offering price. Hence the underpricing of the *IPO_i* can be expressed by:

$$Underpricing_i = \frac{P_{i1} - P_{i0}}{P_{i0}}$$

Where the P_{i1} is the closing price of the first trading day; and the P_{i0} is the offering price of the IPO firm.

Table 3.4 illustrates the underpricing of the sample IPOs from 2004 to 2012. The average underpricing level of China A share IPOs is 60%. Both the T-test and Wilcoxon Rank-sum test show that VC-backed IPOs enjoy significantly lower underpricing than the non-VC-

backed IPOs at 1% level. This is consistent with the Certification role of VCs[15], which is in line with the findings of Megginson and Weiss (1991), Lerner (1994), Coakley *et al.* (2009), and etc. Since the long-run performance measures calculated in this study have excluded the first day returns, this study can correctly explore the relationship between underpricing and the long-run performance.

IPO Proceeds. In the empirical models, the natural log of IPO proceeds, ***IPO Proceeds***, is one of the control variables. It is a control variable that has been applied in the numerous studies. The size of IPOs is measured by the proceeds each IPO raised at the time of offering. It is calculated by using the offering price multiplied by the total number of shares issued. The proceeds raised at IPO first demonstrate the scale of the IPO firm, since large and high-quality firms are able to issue larger number of shares, thereby raising larger volume of money (Carter *et al.*, 1998). Besides, the amount of capital successfully raised can be used as a primarily basis when predicting the growth capacity of IPO firms. Furthermore, it also reveals the degree of market awareness to the intensive investors. Hence, it is reasonable that the size of IPO would exhibit some impact on the long-term performance of the IPOs.

Age. The age of IPO firm is a very intuitive measure of the company's ability to survive the changing environment, which is another commonly considered characteristic (Barry *et al.*, 1990; Krishnan *et al.*, 2011, etc.). An older company might have more experience in operating firms and can occupy larger market shares. Also, they are easier to become high-profile. Therefore, it is likely that the older the IPO firm is, the easier is for them to adapt the post-IPO markets. Hence, they seem to have a larger possibility to perform better in the post-IPO period. In the research, IPO firm's age is calculated by using the natural log of the number of days between the IPO date and the firm's establishment date, expressed as ***IPO Age***.

SOE. The most significant and unique characteristic of the Chinese stock market is that it is tightly government-dominated. The interference from government exists even during the IPO examination process. It is found that applicants with government background are able to proceed to IPO more smoothly and efficiently (Piotroski and Zhang, 2014; Long and

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[15] We further carry out the empirical regressions regarding the impact of VC/VC reputation on underpricing. The regression results remain unchanged as the difference tests, i.e. VC-backed IPOs exhibit significantly lower underpricing than non-VC-backed IPOs. In addition, IPOs backed by more reputable VCs enjoy significantly lower underpricing than IPOs backed by more reputable VCs, as well as the non-VC-backed IPOs. The empirical results are shown in Appendix 1.2.

Zhang, 2014), and the state-owned firms manipulate their performance as a result of close connections with government (Fan *et al.*, 2007).

After listing on the stock market, there are various issues with the state-owned IPO firms. For example, they will face a less efficient structure of corporate governance because the control rights of the firm will be transferred from the operator/manager to the state-owned shareholders. Governments will undertake the decision-making process on behalf of managers and other shareholders, which critically weakens other shareholders' control rights. In fact, it is very common that the government will undertake some activities which only meet their own objectives but are not appropriate or even detrimental to IPO firms. For instance, they may lead to the over-investment of IPO firm. Aiming at high economic growth (e.g. stimulating the GDP growth rate, employment rate), government usually encourages the IPO firm to enlarge the scale of investment. The IPO firms will receive subsidies from government, even if they fail the investment. Therefore, IPO firms will put their money into all kinds of new projects without considering the potential returns or the relevance to their main business. Such behaviour not only causes serious deficits to the state-owned IPOs, but also leads to the wasting of capital resources. What is more, since it is the government who is actually in charge of the operation of IPO firm, it is very hard to for the supervision team to carry out an effective supervising mechanism.

Similarly, in VC-backed state-owned IPOs, the government will also affect the impact VCs may exert. It is predicted that the government-backed IPO firms will exhibit inferior long-run performance than the non-government backed IPOs (Chen *et al.*, 2004; Wang, 2005; Wu *et al.*, 2012, etc.). Furthermore, it is also suggested that VC-backed state-owned IPOs will also underperform the VC-backed privately-owned IPO firms. To distinguish the effect of state-ownership, a dummy variable is created which is assigned the value of 1 if any shares of the IPO firm are held by the government, and 0 otherwise.

High-Tech. Performance of firms is closely related to the industries they belong to, and it can be explained from several angles. Optimal ownership structure may differ according to the industry. Defond and Park (1999) point out that the CEO turnover rate is significantly and positively related to the competitiveness of the industry, which means that the relative performance evaluation within the same industry is conducive for the board to recognize unqualified CEOs, while the competitiveness positively improves this impact. The high-tech industry is known to be highly competitive, and the mangers of the firm need to adopt different developing strategies compared to the traditional industries. Besides, high-tech

firms usually exhibit high growth rates and high returns. Hence, there are reasons to control for the industry's impact on firms' performance.

Additionally, the impact of VCs might also be biased if the industry's effects are ignored, given the fact that VCs are more likely to focus on high-tech projects with high growth potential. Also, VCs tend to develop expertise in a relatively narrow set of industries. Their specialized in industry knowledge, combined with their privileged position as corporate insiders, facilitated their monitoring role (Barry *et al.*, 1990). This gives us insights that VC's impact might be closely related to the industry of the project/firm. Lee and Wahal (2004) report that VC-backed IPOs are found to be clustered in the high technology industry such as software and biological research and located in the area/states close to VCs' headquarters (geographic concentrations). Lee *et al.* (2011) find that VC industry specialization and the early-stage investment magnify the positive impact of VC reputation. Rosenbusch *et al.* (2013) further confirm that VCs have the ability to select and invest in the more promising industries, rather than selecting the most promising firms.

It can also be noted that, outcomes of VC investments may differ according to industries. Hsu (2013) proposes that when undergoing big technology changes within an industry, VCs tend to shorten the investment periods and push firms to public earlier, which means that they lessen the pre-IPO preparation period for VC-backed venture firms. Due to the specificity of high-tech industries, the sample is divided into two major groups: the high-tech industry IPOs and traditional industry IPOs. Consequently, a dummy variable is created which equals to 1 for high-tech industries, and 0 for the rest.

ChiNext. A potential concern in examining the performance of newly public firms is the effect from the boards. The properties of IPO firms on the ChiNext board are quite distinct from those listed on the Main Board. Firstly, their size is much smaller, and the listing requirements are much looser. Secondly, a majority of firms get listed on the ChiNext board at their growing stage, while listed firms on the Main Board are usually mature enterprises. As a result, the quality difference between the IPOs across the different boards might lead to diverse patterns of the aftermarket performance. Apart from this reason, there is another factor that might influence the impact of VCs. Since one of the primary objectives of this board is to provide an exit channel for VC capital, a large proportion of firms on ChiNext board have a background of VC investment. Hence, there might be some variation in performance for the VC-backed IPOs from ChiNext board. A dummy variable is constructed to specify the influence of the board on IPO's long-run performance. Since the

property of SME board is similar to the ChiNext board, the SME board is classified in the same group as ChiNext board. Hence, this variable equal to 1 for IPOs listed on the Main Board, and zero for IPOs listed on ChiNext and SME boards.

Table 3.8 demonstrates the summary statistics of the control variables of the 1,095 IPOs in the sample and the comparison between VC-backed and non-VC-backed IPOs. Overall, across the IPO companies, the average waiting time to get listed since offering is 12 days. The shortest waiting length is only 6 days, whereas the longest can be 50 days. Then the average underpricing level of all the IPOs is 60%, which is lower compared to the many studies, such as Chi and Padgett (2005), Yu and Tse (2006), Chang *et al*. (2008), Song et al. (2008). However, there are also some IPOs that exhibit extremely high initial returns and the maximum could be as high as 627%. Such high values mean that underpricing is still a severe problem in the China IPO market. Both the T-test and Wilcoxon rank-sum test show that VC-backed IPOs exhibit significantly shorter gaps and lower underpricing levels than the non-VC-backed IPOs at 1% level. This indicates that VC-backed IPOs enjoy lower costs in terms of time and capital, thereby less uncertainty during the IPO process.

What is more, the average age of IPO firms is 2,828 days (around 7.7 years). VC-backed IPOs (3,012 days) are significantly older than the non-VC-backed IPOs (2,698 days) at the 1% level. This is the reverse of Gompers and Lerner (2000), Lee and Wahal (2004), and Krishnan *et al*. (2011), where VC-backed IPO firms are found to be significantly younger. While the average proceeds of all IPOs are 1.2 Billion Yuan. It seems that the average proceeds of VC-backed IPOs are only slightly lower than the non-VC-backed IPOs. The test statistics are mixed with the Wilcoxon rank-sum test being significant at the 1% level while the t-test being insignificant. It indicates that most of VC-backed firms raise a large amount of proceeds at IPO, but the average proceeds are pulled down by some small-sized issues.

For the full sample, the average state-owned shareholdings prior and post-IPO are 13.15% and 9.57%, respectively. For both prior-IPO and post-IPO, the mean state-owned shareholdings of VC-backed IPOs are about half that for the non-VC-backed IPOs, with this difference being significant at 1% level. In contrast, there is no significant difference between the median values. Therefore, it may be that VCs might have invested into several firms that have large state-owned shareholders, but the state-owned shares of the majority of IPO firms are small.

Table 3.8 Descriptive of IPO Characteristics

Panel A: Characteristics of the full sample IPO Firm

	N	Mean	S.D.	Min	Max
Gap (Days)	1,094	12.06	3.85	6	50
Underpricing	1,090	0.6	0.77	-0.26	6.27
IPO firm Age (Days)	1,094	2,828.66	1,746.71	70	10,004
Proceeds	1,090	1.2	3.62	0.04	59.59
State-owned pre-IPO, %	1,090	13.15	28.95	0	100
State-owned post-IPO, %	1,090	9.57	21.09	0	92.39

Panel B: Comparison between VC-backed IPOs and non-VC-backed IPOs

	VC-backed			Non-VC-backed			Diff. Test	
	N	Mean	Median	N	Mean	Median	t-stat.	wilco.
Gap (Days)	455	11.61	11	639	12.39	12	3.33***	5.34***
Underpricing	452	0.51	0.31	638	0.66	0.42	3.18***	4.34***
IPO firm Age (Days)	455	3,012	2,917	639	2,698	2,499	-2.95***	-3.18***
Proceeds	452	1.18	0.64	638	1.20	0.53	0.1	-4.09***
State-owned pre-IPO, %	453	8.28	0	637	16.60	0	4.72***	0.3
State-owned post-IPO, %	453	6.28	0	637	11.92	0	4.39***	0.14

In **Table 3.8**, the Gaps and IPO firms' age is measured by days; the IPO proceeds, is measured by Billon Yuan; the underpricing and state-owned equity stakes are measured by the percentage (%). *** denote the significance at the 1% level.

To sum up, the Table 3.8 reveals that VC-backed IPOs exhibit shorter waiting times, lower underpricing, larger proceeds and are older than the non-VC-backed IPOs. In addition, the stated-owned equity stakes in the VC-backed IPOs are lower compared with the non-VC-backed IPOs.

3.3.6 A Summary of Variables

In this subsection, we provide a table 3.9 to summarize all variables that have been discussed and will be used in our regression.

Table 3.9. A summary of variables

Variable	Definition
Long-run performance:	
BHARs	Buy and Hold Abnormal Returns
ROE$_1$	Return on equity
ROE$_2$	Return on equity after reduction non-recurring profit and loss
VC reputation:	
Top-20	One if the VC is ranked top 20, zero otherwise
Top-50	One if the VC is ranked top 50, zero otherwise
VC Age	The age of VC
VC IPO#	The number of IPOs VCs achieved in the past
VC MS$_1$, %	VC IPO Market share based on the IPO proceeds
VC MS$_2$, %	VC IPO Market share based on the IPO market capitalization
VC Size	Capital holdings of a VC
Other variables	
VC-backed	One if the IPO is backed by VC, zero otherwise
Underpricing	The the return of the first day relative to its offering price
IPO Proceeds	The proceeds each IPO raised at the time of offering
Age	The number of days between the IPO date and the firm's establishment date
SOE	One if the IPO is state-owned, zero otherwise
High-tech	One if the IPO is in high-tech industries, zero otherwise

3.4 Models

3.4.1 Difference Tests

To compare the performance difference between VC-backed IPOs and non-VC-backed IPOs, the t-test is used to test whether there are significant differences between the means of the two groups. The Wilcoxon signed-rank test is adopted an alternative method to test performance difference. It is a non-parametric statistical test whose main principle is to assess whether the sample's population mean ranks are different and it does not require a distribution.

Wilcoxon signed-rank test has been widely used in the studies regarding IPO performance between different groups, e.g. Coakley, *et al*., 2007, and Gangi and Lombardo, 2008. Assuming that two samples are independent, this test can be applied to compare the performance between the VC-backed group and non-VC backed group. The null hypothesis in this context is that the difference between the median of VC-backed group and non-VC-backed group is zero. As mentioned above, the W value can be calculated from the standard way, and subsequently the Z-statistic will be calculated.

3.4.2 Regression Models

Our research aim is to investigate the impact of VC-backing and VC reputation on the IPO performance. However, it is worth noting that our study is similar to the "event study", in which the event is "IPO". This thesis asks whether the returns from IPO are impacted by VC-backing and VC reputation. Therefore, we calculate the BHAR 3 years after the time of IPO as the dependent variable. For each IPO firm, there is one "event", i.e. one chance to get listed. Therefore, for each IPO firm, there is only one observation in our sample. As a result, the methodology related to 'time' is not able to be applied, including random/fixed effects, GMM and etc. Instead, this thesis does the analysis with cross-sectional data and OLS is the main method.

To correct for the heteroscedasticity, the White's robust standard errors are used when estimating the coefficients of variables in the regressions. The primary objective of the models is to examine the impact of VC and/or VC reputation on IPO firm's long-run performance, therefore the models only exhibit slightly difference for each hypothesis.

(1) Model 1 − VC and IPO long-term Performance

The first model is to examine the Hypothesis 1 which highlights VC's Monitoring and Value-adding function. Empirically, the model will try to identify the impact of VC on the IPO long-run performance. The dependent variable **LR Perf.$_i$** represents the long-run performance of *IPO$_i$*, measured by 36-month BHARs ($BHAR_{36}$), ROE1 and ROE2. In this regression, the main explanatory variable of interest is **VC backed**. In addition to this variable, 5 control variables measuring IPO firms' characteristics are also included. The coefficient of **VC backed** will reveal the impact of VC on IPO's long-run performance. Then the regression model is expressed as following:

$$LR\ Perf_i = \beta_0 + \beta_1 VC\ backed_i + \beta_2\ Underpricing_i + \beta_3 \ln(Proceeds)_i$$
$$+ \beta_4 \ln(IPO\_Age)_i + \beta_5\ D_{SOE_i} + \beta_6 D_{High-tech_i} + \varepsilon_i \qquad (3.1)$$

(2) Model 2 − VC reputation and IPO Long-term performance

This model is derived from Model 1, aiming to examine the impact of VC reputation on IPO firms' long-term performance. Using this model also enables an examination of the Hypothesis 2. Therefore, compared to Model 1, the main independent variable here is the proxy for VC reputation (**VC Rep**), while the other variables remain unchanged. The regression model will be repeated by regressing the various VC reputation measurements on both stock market performance and operating performance respectively.

Firstly, this model is implemented only on VC-backed IPOs as the data for **VC Rep** of non-backed IPOs is missing values. Under this circumstance, coefficient of **VC Rep** indicates whether VC reputation can differentiate the performance of IPOs which are all funded by VCs. Secondly, in the spirit of Coakley *et al*. (2007) and Nahata (2008), this model is re-examined but on the basis of full sample of IPOs. Value for **VC Rep** of all the non-backed IPOs are marked as zero. Therefore, the coefficient of **VC Rep** reveals whether VC reputation differentiates the performance of all the IPOs no matter they have received VC funding or not.

$$LR\ Perf_i = \beta_0 + \beta_1\ VC\ Rep_i + \beta_2\ Underpricing_i + \beta_3 \ln(Proceeds)_i$$
$$+ \beta_4 \ln(IPO\_Age)_i + \beta_5\ D_{SOE_i} + \beta_6\ D_{High-tech_i} + \varepsilon_i \qquad (3.2)$$

(3) Model 3 – High/Low VC reputation

Model 2 emphasises the general impact of VC reputation on IPO long-term performance. However, it does not distinguish whether such impact vary across different levels of reputation as proposed in Hypothesis 3. Hence, Model 3 examines this issue. Two variables represent IPOs funded by more reputable VCs and IPOs funded by less reputable VCs, i.e. $High_{Rep}$ and Low_{Rep}. For each proxy of reputation, the regression includes dummy variables $High_{Rep}$ and aLow_{Rep}. Model 3 is expressed as:

$$LR\ Perf_i = \beta_0 + \beta_1\ High_i + \beta_2\ Low_i + \beta_3 Underpricing_i + \beta_4 \ln(Proceeds)_i$$

$$+ \beta_5 \ln(IPO\_Age)_i + \beta_6\ D_{SOE_i} + \beta_7\ D_{High-tech_i} + \varepsilon_i \qquad \textbf{(3.3)}$$

$High_i$ is a dummy variable equals to 1 for IPOs funded by more reputable VCs and equals to 0 for the rest of VC-backed IPOs and non-VC-backed IPOs. It is applied to each reputation measurements, $High_{20}$, $High_{50}$, $High_{MS1}$, $High_{MS2}$, $High_{Num}$, $High_{Age}$ and $High_{Size}$.

Low_{Rep} is the dummy variable that equals to 1 for IPOs funded by less reputable VCs and equals to 0 for the other VC-backed IPOs and non-VC-backed IPOs. The corresponding dummy variables for low reputation are Low_{20}, Low_{50}, $Low_{MS(1)}$, $Low_{MS(2)}$, Low_{Num}, Low_{Age} and Low_{Size}.

Using this model, it is possible to detect whether the high-reputation and/or the low-reputation VC-backed IPOs exhibit significantly different performance, compared with non-VC-backed IPOs. The coefficients of $High_{Rep}$ indicate whether the high reputation VC-backed IPOs significantly outperform or underperform the non-VC-backed IPOs, while the coefficients of Low_{Rep} will then predict whether the low reputation VC-backed IPOs significantly outperform or underperform the non-VC-backed IPOs as well.

(4) Model 4 – VC and Boards

Testing the Hypothesis 4 requires the analysis by boards. IPOs are divided into two groups: IPOs listed on the Main board, and IPOs listed on the ChiNext board and SME board. In

this way, it is possible to examine VC's effects across different boards, and whether the effects are distinctive. Hence, Model 4 is the same as Model 1 in terms of its form. Unlike Model 1 (regressed on full sample), Model 4 is regressed using IPOs from each group.

(5) <u>Model 5 – VC Reputation and Boards</u>

This study also aims to test the impact of different levels of VC reputation across different boards. Model 5 is designed for testing Hypothesis 5. Model 5 is the same as Model 3 in terms of its from, but it is regressed separately on the two groups of IPOs (i.e. IPOs in Main board and IPOs in ChiNext/SME board).

3.5 Conclusion

In this chapter, we develop five hypotheses related to the impact of VC-backing and VC reputation on China's IPOs' long-run performance and the influence of boards where the IPO is listed on the impact. Then the chapter explains how to construct the data. In particularly, the information on the VC of each IPO firm is manually collected from IPO prospectus. The abnormal returns are calculated for each IPO by constructing a benchmark for each IPO. Finally, the chapter demonstrates the methodology to study the research questions. It should be noted that our analysis is similar to the 'event study', where the IPO is the 'event'. Therefore, the abnormal returns after the IPO are used to measure the performance and each IPO will only have one observation in our sample. That is, our data is cross-sectional. As a result, the methodology of panel data or GMM cannot be applied in our analysis.

Chapter 4

Results and Findings

This chapter presents the empirical results on our research questions, i.e. the association between VC-backing/VC reputation and IPO post-issue long-run performance in China and how the boards where the IPOs are listed affect the association. The 36-month post-issue BHARs suggest that China IPOs significantly underperform their matched portfolios, whereas VC-backed IPOs significantly outperform the non-VC-backed IPOs by 14%. A higher reputation does not affect the long-run stock performance within VC-backed IPOs. When compared to non-VC-backed IPOs reputable VCs exert a positive impact on share price performance. Furthermore, this significant impact is driven mainly by the IPOs listed on the SME and ChiNext boards, rather than IPOs listed on the main board. Finally, it is found that neither VC-backing nor VC reputation have a significant influence on the long-run post-IPO operating performance, measured using ROE.

4.1 Long-run Post-IPO Stock Performance

Table 4.1 reports the average 12-month, 24-month, and 36-month BHARs of IPOs calculated with different benchmark portfolios during the years 2004-2012. In Panel A, the BHARs are calculated based on portfolios matched by both market capitalization and M/B ratio. The underperformance of the sample IPOs reduces as time lapses. For example, the 12-month abnormal returns are 11.49% lower than the matched portfolios, but this difference shrinks to 5.72% 24 months after IPO and shrinks further to 3.25% 36 months after IPO. Such findings are similar to Aggarawal and Rivoli (1990) who find that one year after IPO, returns are 13.73% lower than the benchmark. Meanwhile, it is also consistent

with Chan *et al.* (2004) who propose that the three-year's BHARs of China A share IPOs only slightly underperform the matched firms by using size and M/B ratio.

The last four columns demonstrate the distribution of IPOs by two separated groups: the out-performing (BHARs above 0) and the underperforming (BHARs below 0) groups. After one-year of listing, there are 356 over-performing IPOs with an average $BHAR_{12}$ of 28.19%, and the 739 underperforming IPOs have an average $BHAR_{12}$ of -30.61%. Over time the post-IPO periods reveal that the outperformed IPOs perform better and better; in contrast, the underperforming IPOs perform worse and worse. The negative abnormal returns of the full sample are primarily due to the large proportion of underperforming IPOs. There are significant differences between the under-performed and out-performed IPOs. Take $BHAR_{36}$ as an example, the number of under-performed IPOs is 1.5 times more than the number of out-performed IPOs. Moreover, the average $BHAR_{36}$ of out-performing IPOs and the underperforming IPOs becomes 70.90% and -54.01%, respectively.

Panel B of Table 4.1 reports the BHARs of sample IPOs based on the benchmark portfolios that matched only by market capitalization coving the period from 2004 to 2012. First of all, after the matching process, there are 1,259 IPOs. Then, 23 IPOs cannot be found in the CSMAR database are eliminated. Lastly, there are 1,211 IPOs left after winsorizing the sample by three times the standard deviation of $BHAR_{36}$ to avoid the interference from extreme values (outliers). Although the average BHARs calculated in this way are slightly lower than (around 2%) the average of BHARs in Panel A, they show a similar trend. The 12-month BHARs is -13.04%, which becomes less negative in the next two years.

Panel C of Table 4.1 reports the BHARs of sample IPOs based on the benchmark portfolios matched only by M/B ratio coving the period from 2004 to 2012. Firstly, after the matching process there are 1,265 IPOs, but a further 24 IPOs are not shown in the CSMAR database. Finally, 1,215 IPOs remain after winsorizing the sample by three times the standard deviation of $BHAR_{36}$ to avoid the interference from extreme values (outliers). The average BHARs calculated following this matching approach are much lower than the previous two approaches, e.g. average $BHAR_{36}$ is -9.44%, which is 3 times lower than Panel A and 2 times lower than Panel B.

Table 4.1 BHARs of IPOs from 2004 to 2012

	N.	Mean	S.D.	Min	Max	Outperformed		Underperformed	
						N.	Mean	N.	Mean
Panel A: Matched by Market cap and M/B ratio, BHAR (%)									
$BHAR_{12}$	1,095	-11.49***	45.51	-385.26	295.85	356	28.19	739	-30.61
$BHAR_{24}$	1,095	-5.72***	53.44	-303.26	403.13	394	43.05	701	-33.14
$BHAR_{36}$	1,095	-3.25***	87.00	-301.61	390.51	445	70.90	650	-54.01
Panel B: Matched by Market Capitalization, BHAR (%)									
$BHAR_{12}$	1,211	-13.04***	44.17	-279.43	306.38	355	29.98	856	-30.88
$BHAR_{24}$	1,211	-7.27***	50.89	-269.63	403.72	404	42.97	807	-32.42
$BHAR_{36}$	1,211	-4.71***	82.55	-254.15	353.10	455	71.60	756	-50.63
Panel C: Matched by M/B ratio, BHAR (%)									
$BHAR_{12}$	1,215	-16.70***	50.44	-326.57	396.43	329	30.39	886	-34.19
$BHAR_{24}$	1,215	-10.09***	52.52	-279.96	398.67	394	43.94	821	-36.01
$BHAR_{36}$	1,215	-9.44***	87.86	-282.06	355.27	443	75.88	772	-58.41

Table 4.1 reports the 12-month, 24-month, and 36-month BHARs of IPOs from the period 2004 to 2012. In **Panel A**, the BHARs are calculated by the benchmark portfolio groups matched by market capitalization and M/B ratio; In **Panel B**, the BHARs are calculated by the benchmark portfolio groups matched by market capitalization; In **Panel C**, the BHARs are calculated by the benchmark portfolio groups matched by and M/B ratio. *** denote the significance at 1% level.

Overall, according to the different matching approaches shown in Table 4.1, the underperformance of the sample IPOs is robust to different benchmarks. Generally, the long-run post-IPO stock market performance of new issuers is inferior to firms that have traded for years, but the underperformance seems to alleviate when the post-IPO time increases. What is more, as post-IPO time increases the over-performing IPOs exhibit even higher positive abnormal returns, while the underperforming IPOs exhibit even more negative abnormal returns. Such results disagree with the explanation put forward by Fama (1998) who argues that the long-run underperformance of IPOs is caused by the "bad model problem". In contrast, results in this thesis suggest that the decline in stock returns is a genuine reflection of decreasing market performance, which is consistent with numerous previous studies, e.g., Loughran and Ritter (1995), Brav and Gompers (1997), Espenlaub *et al*. (1999), Ljungqvist *et al*. (2006), Coakley *et al*. (2007), Cai *et al*. (2008), Chahine and Filatotchev (2007), Chang *et al*. (2010), Gao (2010), Su *et al*. (2011) and Tian (2012), Chen *et al*. (2014), etc.

4.2 VC and Long-run Stock Performance (H$_1$)

Table 4.2 reports the average 12-month, 24-month, 36-month BHARs of 1,095 IPOs calculated based on the benchmark portfolios matched by market capitalization and M/B ratio. The table also presents the comparison of BHARs between the VC-backed and non-VC-backed IPOs by cohort year from 2004 to 2012. Two tests are used to examine the statistical difference between these two groups: (1) t-test that tests the difference in means; and (2) Wilcoxon rank-sum test that tests the difference in medians.

First of all, on average both VC-backed and non-VC-backed IPOs underperform the benchmarks during the 12 months and 24 months after IPO. VC-backed IPOs exhibit less negative post-IPO BHARs compared to the non-VC-backed IPOs, and this advantage extends over time. At the 12th month after IPO, the two groups show very close BHAR$_{12}$ (-11.27% *vs*. -11.71%), and the difference widens over the next 12 months with the BHAR$_{24}$ of -2.84% to -8.60%, but the differences between them are not significant. However, in a longer period, both the difference tests prove that VC-backed IPOs exhibit significantly larger BHAR$_{36}$ than the non-VC-backed IPOs at the 1% level. Furthermore, VC-backed IPOs enjoy positive BHAR$_{36}$ (7.04%), whereas the non-VC-backed IPOs are still underperforming, with the BHAR$_{36}$ of -10.59%.

Table 4.2 BHARs of VC-backed and Non-VC-backed IPOs

Year	Total N.	Total $BHAR_{36}$	VC N.	VC $BHAR_{36}$	NVC N.	NVC $BHAR_{36}$	Diff. Test t-test.	Diff. Test wilco.
2004-2012	1,095	-3.25	456	7.04	639	-10.59	-3.32***	-2.53**
2004	87	-35.95	7	-6.86	80	-38.5	-0.68	-1.39
2005	13	-179.05	4	-98.20	9	-214.99	-1.96**	-1.39
2006	40	-67.91	5	-82.40	35	-65.84	0.28	-0.27
2007	96	-19.70	29	-6.11	67	-25.58	-1.38	-1.60
2008	74	14.70	23	37.63	51	4.36	-1.40	-1.34
2009	73	1.31	37	11.39	36	-9.05	-2.02**	-1.63
2010	318	-3.73	137	-7.94	181	-0.55	1.29	2.10**
2011	256	26.77	130	26.32	126	27.22	0.10	0.34
2012	138	-2.46	84	7.37	54	-17.76	-1.16	-0.63
	N.	$BHAR_{24}$	N.	$BHAR_{24}$	N.	$BHAR_{24}$	t-stat.	wilco.
2004-2012	1,095	-5.72	456	-2.84	639	-8.60	-1.51	-0.79
2004	87	4.29	7	5.18	80	-5.12	-0.62	-1.30
2005	13	-152.13	4	-91.96	9	-178.87	-1.41	-0.93
2006	40	-63.09	5	-55.61	35	-64.16	-0.29	-0.23
2007	96	-15.10	29	-13.71	67	-15.70	-0.24	-0.73
2008	74	13.76	23	14.78	51	13.30	-0.07	0.04
2009	73	0.28	37	9.97	36	-9.67	-1.72*	-2.00**
2010	318	-10.38	137	-19.66	181	-10.39	2.87***	3.18***
2011	256	9.55	130	5.62	126	13.60	1.23	1.75*
2012	138	8.30	84	11.47	54	3.38	-0.84	-0.58
	N.	$BHAR_{12}$	N.	$BHAR_{12}$	N.	$BHAR_{12}$	t-stat.	wilco.
2004-2012	1,095	-11.49	456	-11.27	639	-11.71	-0.13	1.31
2004	87	2.94	7	7.57	80	2.54	-0.48	-0.97
2005	13	-15.91	4	43.49	9	-42.31	-2.94***	-1.85*
2006	40	-99.00	5	-76.38	35	-102.23	-0.37	-0.26
2007	96	-21.83	29	-20.44	67	-22.44	-0.25	-0.10
2008	74	0.64	23	-7.91	51	4.50	1.26	1.24
2009	73	-0.17	37	2.34	36	-2.74	-0.51	-0.73
2010	318	-18.84	137	-25.62	181	-13.72	3.70***	3.58***
2011	256	-0.22	130	-4.66	126	0.29	1.74	1.71*
2012	138	0.36	84	-2.16	54	2.45	0.78	0.35

In **Table 4.2**, $BHAR_{12}$, $BHAR_{24}$ and $BHAR_{36}$ are measured in terms of %; The BHARs are calculated on the portfolios matched by market capitalization and M/B ratio; *, **, *** denote the significance at 10%, 5%, and 1% levels, respectively.

Given the average BHAR$_{36}$ for the full sample of IPOs is still negative (-3.25%), it may be concluded that the long-run underperformance of China IPOs is driven by the non-VC-backed IPOs. These results add evidence to the VC's Certification and the Monitoring roles. VCs can mitigate the information asymmetries, reduce costs, and bring more benefits to the portfolio firms, thereby increasing the post-IPO performance. Decomposing the sample by years, VC-backed IPOs generally outperform the non-VC-backed IPOs.

Regarding the average BHARs of the total 1,095 IPOs, Table 4.2 reveals that the 13 IPOs listed in 2005 experienced the most serious underperformance in the following three years, i.e. the BHAR$_{24}$ is -152.13% and the BHAR$_{36}$ is -179.05%. Firms listed in 2006 exhibited the second largest underperformance, implying that the dramatic stock prices fall was a market-wide phenomenon between 2006 and 2008. It is true that during this period, China's stock market plunged by nearly 70%, although the GDP was increasing at a steady pace. Conversely, in the following years, IPOs exhibited less underperformance and in some years even possessed positive abnormal returns. For instance, the BHAR$_{36}$ of IPOs issued in 2011 is as high as 26.77%. In general, Table 4.2 shows that China's new issuers generally experience underperformance during the three years after IPO, while the VC-backed IPOs are more likely to exhibit superior performance compared with the non-VC-backed IPOs.

To examine whether VC-backed IPOs significantly outperform the non-VC-backed IPOs as proposed in H$_1$, Model 4.1 is used. In order to obtain robust empirical results, various measurements for long-run stock market performance calculated by various matched portfolios (as shown in Table 4.1) are used. Table 4.3 reports the results of the three cross-sectional regressions, which are very consistent. For example, in Column (1), when the BHAR$_{36}$ is calculated based on the portfolios matched by market capitalization and M/B ratio, VC-backed IPOs significantly outperform the non-VC-backed IPOs by 14 percent. Using the BHAR$_{36}$ calculated by alternative matched portfolios, identical results pertain: VC-backed IPOs significantly outperform the non-VC-backed IPOs.

The control variables in the three regressions provide some evidence in detecting why VC-backed IPOs outperform the non-VC-backed IPOs. Overall, the five variables show a significant association with BHARs to varying degrees. Firstly, the age of VC is positively associated with the 36-month BHARs[16], indicating the older firms are more likely to enjoy

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[16] In Column (1), the VC age will be significantly positive at 10% level if we go for a one-tail test; in Column (2), it is significantly positive at 5% level by two-tail test; and in Column (3), it is significantly positive at 1% level by two-tail test as well.

higher BHARs in the long run. Secondly, the underpricing is negatively associated with the 36-month BHARs, which means that the lower underpricing would predict higher long-run performance. It may be noted that the state-owned IPOs are found to have poorer 36-month BHARs than the privately-owned IPOs.

Table 4.3 Impact of VC on Long-run Stock Market Performance

	BHAR$_{36}$		
	(1)	**(2)**	**(3)**
VC-backed	0.140	0.111	0.167
	(0.009)***	(0.021)**	(0.001)***
IPO Age	0.055	0.072	0.089
	(0.120)	(0.023)**	(0.007)***
Underpricing	-0.078	-0.086	-0.171
	(0.038)**	(0.011)**	(0.000)***
Proceeds	0.049	0.053	-0.064
	(0.141)	(0.065)*	(0.028)**
SOE	-0.164	-0.147	-0.227
	(0.007)***	(0.007)***	(0.000)***
High-tech	0.225	0.206	0.241
	(0.000)***	(0.000)***	(0.000)***
_cons	-1.061	-1.232	-0.078
	(0.029)**	(0.004)***	(0.859)
Adj-R^2	0.0426	0.0448	0.0852
N.	1,086	1,200	1,203

Table 4.3 reports the OLS cross-sectional regressions of VC against the 36-month BHARs of China A share IPOs. In Column (1), the BHAR$_{36}$ are calculated based on the benchmark portfolios matched by market capitalization and M/B ratio; In Column (2), the BHAR$_{36}$ are calculated based on the portfolios matched by the market capitalization; In Column (3), the BHAR$_{36}$ are calculated based on the portfolios matched by the M/B ratio. The values in the brackets are p-values. *, **, *** denote the significance at 10%, 5%, and 1% levels, respectively.

As shown in Table 4.4, VC-backed IPOs have significantly greater age, lower underpricing and less state-owned equity stakes than the non-VC-backed IPOs. Such findings are consistent with VC's screening and certification functions, which have also been found by Loughran and Ritter (1995), Brav and Gompers (1997), Brown (2003) and Hochberg (2011).

Furthermore, from Table 4.3, the high-tech IPOs perform significantly better than the IPOs in the traditional industry at the 1% level in the long run. This means that the positive role of VCs still holds after the potential effects of high-tech industry are controlled. In addition, the IPO proceeds exhibit different results across the three regressions[17]. However, as illustrated in Table 4.4, the average proceeds of VC-backed IPOs are not significantly different from non-VC-backed IPOs, though the median is significantly larger.

Overall, the results support Hypothesis 1, suggesting that VCs appear to improve IPO firms' long-run performance significantly through their screening, monitoring, and value-adding functions. However, these findings run contrary to the findings of Wang *et al*. (2003), Coakley *et al*. (2007), and Chen and Liang (2016). In these studies, VC-backed IPOs are found to perform significantly worse than the non-VC-backed IPOs.

4.3 VC Reputation and Long-Run Stock Performance

4.3.1 VC Reputation and BHARs (H2)

This part explores the impact of VC reputation on IPO firms' long-term market performance as proposed in Hypothesis 2, and Model 4.2 will be applied to empirically test the relationship. In Model 4.2, the long-run stock market performance (dependent variable) is measured by the 36-month BHARs based on the benchmark portfolios matched by market capitalization and M/B ratio[18]. The main variable of interest is the lead VC's reputation, and it is measured by seven proxies. It is important to note that Model 4.2 is estimated with the sample of VC-backed IPOs only. Coefficients of VC reputation therefore indicate whether the reputation of the lead VC significantly impacts the long-run performance within the sub-sample of VC-backed IPOs.

Table 4.4 reports the results of the regressions on various reputation proxies. The results are unanimous, while none of the coefficients are significant. Such results mean that VC reputation, in fact, cannot explain differences in the long-run performance of IPOs that have been funded by venture capitalists, leading to the rejection of Hypothesis 2 conditional on the sample of IPOs that are backed by IPOs. These findings are contrary to a variety of

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[17] In Column (1), the **Proceeds** is not significant by two-tail test, but it is significantly positive at 10% level if going for a one-tail test; in Column (2), **Proceeds** is significantly positive; and in Regression (3), **Proceeds** is significant negative.
[18] In the following regressions regarding the long-run stock market performance, if not particularly mentioned they are all measured by the $BHAR_{36}$ calculated based on the benchmark portfolios matched by market capitalization and M/B ratio.

studies in which VC reputation is found to have a significant positive association with the post-IPO long-run stock market performance, such as, Megginson and Weiss (1991), Brav and Gompers (1997), Gompers and Lerner (2003) and Krishnan *et al.* (2011). Krishnan *et al.* (2011) insist that the VC's IPO market share is the only robust measurement that captures reputation's positive impact across all the performance measurements they used. Specifically, an increase of one standard deviation in VC's IPO market share is associated with a 24 percent increase in stock returns. Their alternative reputation measurements (VC's capital under management, the cumulative IPO market share, VC age and VC past IPO number) are also positively correlated with stock returns at the 5% significant level. However, not all of them are significantly associated with other performance measurements, e.g., ROA, M/B and survival rate.

The inconsistency between the findings of this study and those of previous studies is likely due to the IPO sample used, i.e. the VC-backed IPOs only. This suggests that conditional on the VC investments, the VC reputation may not be significant. Admittedly, this result suffers from potential selection bias because non-VC-backed IPOs are excluded. In a later section, this thesis will include non-VC-backed IPOs with the construction of dummy variables on VC reputation. Earlier studies included non-VC-backed IPOs in their samples. These studies included both a VC reputation variable and a VC-backed dummy in their regression models.

However, their inclusion of non-VC-backed IPOs introduce a potential bias. The studies mentioned above use zero to replace the reputation variable for the non-VC-backed IPOs. However, in the absence of any VC investors, it will make more sense if VC reputation variables are recorded by missing values. This is because the value 'zero' implies that the degree of VC reputation is very low, but this is not equivalent to the nonexistence of VC reputation. The large proportion of 'zeros' in the non-binary dependent variable (*VC reputation*) might create a strong trend in the observations, thereby making the VC reputation much easier to become significant. Therefore, it is unclear whether the significant coefficients for VC reputation in previous studies are the result of an artificial trend only.

Table 4.4 VC Reputation and $BHAR_{36}$ on the VC-backed IPOs

	$BHAR_{36}$						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Top-20	0.053						
	(0.534)						
Top-50		0.027					
		(0.738)					
VC Age			-0.012				
			(0.836)				
VC IPO#				0.003			
				(0.541)			
VC MS$_1$					-0.734		
					(0.260)		
VC MS$_2$						-0.771	
						(0.208)	
VC Size							-0.012
							(0.595)
IPO Age	0.033	0.033	0.034	0.031	0.030	0.028	0.038
	(0.559)	(0.556)	(0.545)	(0.572)	(0.595)	(0.616)	(0.521)
Underpricing	-0.113	-0.113	-0.112	-0.110	-0.108	-0.108	-0.105
	(0.070)*	(0.069)*	(0.074)*	(0.078)*	(0.084)*	(0.083)*	(0.105)
Proceeds	-0.090	-0.086	-0.085	-0.082	-0.083	-0.080	-0.085
	(0.098)*	(0.110)	(0.118)	(0.123)	(0.121)	(0.137)	(0.174)
SOE	-0.128	-0.129	-0.125	-0.127	-0.119	-0.118	-0.130
	(0.164)	(0.160)	(0.186)	(0.116)	(0.197)	(0.200)	(0.173)
High-tech	0.192	0.193	0.196	0.192	0.191	0.191	0.198
	(0.019)**	(0.019)**	(0.018)**	(0.019)**	(0.020)**	(0.020)**	(0.020)**
_cons	0.800	0.766	0.848	0.732	0.782	0.759	0.837
	(0.298)	(0.318)	(0.311)	(0.340)	(0.308)	(0.322)	(0.341)
Adj-R^2	0.0221	0.0215	0.0219	0.0221	0.0244	0.0251	0.0185
N.	450	450	446	450	449	449	418

Table 4.4 reports the cross-sectional OLS regressions of the 7 VC reputation proxies against the $BHAR_{36}$ of 450 VC-backed IPOs. The $BHAR_{36}$ is calculated based on the benchmark portfolios matched by market capitalization and M/B ratio. Numbers in the brackets are p-values. *, **, *** denote significance at 10%, 5%, and 1% levels, respectively.

In addition to the treatment of zero as the reputation of VC for the non-VC-backed IPOs, prior studies also add the dummy variable for VC-backed IPOs. According to Krishnan *et al.* (2011), this is to capture the marginal effect of VC reputation over the average impact of VC backing. However, whether this method gives unbiased results is not clear, because the variations of VC reputation within the non-VC-backed IPOs are still recorded as 'zero'. A potential solution to this issue is to apply the Heckman two-step method to control for the selection bias of VCs. Namely, in the first step, the selection of VC is controlled and then in the second step the sample of VC-backed IPOs are used to estimate the effects of VC reputation. This method will be applied in next section as the additional analysis.

To compare with previous research studies, the Model 4.2 is re-examined using all IPOs and recording VC reputation of non-VC-backed IPOs as zero. However, for the Zero2IPO measurement of reputation, it is not appropriate to make such an adjustment because zero is not ranking. Therefore, this thesis only runs the regressions using the other five measurements of reputation.

Table 4.5 reports the results using all 1,095 IPOs. The analysis finds that VC reputation, measured by VC Age, VC's cumulative IPO quantities and VC size, appears to play a positive role in improving IPOs' long-run performance at various significance levels[19]. This exercise appears to be consistent with the Krishnan *et al.* (2011), where VC reputation is positively associated with the IPO market returns. However, the VC reputation measured by two market share metrics exhibits no significant effects on long-run performance, indicating that the IPO market shares of VC as a measurement of VC reputation in China may be potentially problematic. Such findings are in opposition to Nahata (2008) and Shu *et al.* (2011), who insist that market share is the only measurement that could reveal the significant impact of VC reputation. Taken together, the results from the full sample regression reveal that VC reputation exhibits a positive impact, measured by VC age and size, on the long-term market performance of IPO firms, suggesting the acceptation of Hypothesis 2 when measuring VC reputation with VC age and size. However, combine this with the findings from Table 4.4, it seems that the positive impact of VC reputation is only statistically significant when comparing to the non-VC-backed IPOs. Conditional on the VC-backing, reputation has no significant impact on long-run performance.

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[19] The p-value of **VC IPO#** shown in the bracket is 0.103, this could be roughly treated as a weak significant at 10% level.

Table 4.5 VC reputation and BHAR$_{36}$ on Full sample IPOs

	BHAR$_{36}$				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
VC Age	0.018				
	(0.010)***				
VC IPO#		0.008			
		(0.103)†			
VC MS$_1$			-0.147		
			(0.813)		
VC MS$_2$				-0.338	
				(0.567)	
VC Size					0.013
					(0.015)**
IPO Age	0.056	0.060	0.063	0.063	0.058
	(0.117)	(0.090)*	(0.076)*	(0.077)*	(0.109)**
Underpricing	-0.079	-0.079	-0.083	-0.083	-0.070
	(0.035)**	(0.037)**	(0.028)**	(0.028)**	(0.068)*
Proceeds	0.048	0.055	0.055	0.056	0.062
	(0.152)	(0.098)*	(0.097)*	(0.092)*	(0.076)*
SOE	-0.168	-0.158	-0.155	-0.154	-0.167
	(0.005)***	(0.009)***	(0.011)**	(0.011)**	(0.006)***
High-tech	0.223	0.231	0.237	0.237	0.224
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
_cons	-1.050	-1.128	-1.137	-1.143	-1.229
	(0.031)**	(0.020)**	(0.020)**	(0.019)**	(0.016)**
Adj-R^2	0.0425	0.0389	0.0366	0.0369	0.0421
N.	1,082	1,086	1,085	1,085	1,054

Table 4.5 reports the cross-sectional OLS regression of five VC reputation proxies against the BHAR$_{36}$ of the 1,095 VC-backed IPOs. The BHAR$_{36}$ is calculated based on the benchmark portfolios matched by market capitalization and M/B ratio. Numbers in the brackets are p-values. *, **, *** denote significance at 10%, 5%, and 1% levels, respectively; † denote significance very close to 10%.

4.3.2 High vs. Low VC reputation (H$_3$)

This section examines Hypothesis 3, i.e. whether the impact of VC reputation would differ with the level of reputation. Lead VCs in the sample are separated into two groups:

reputable VCs and less reputable VCs[20]. Then the relevant VC-backed IPOs are divided into IPOs backed by reputable VCs and IPOs backed by less reputable VCs, represented by two dummy variables, i.e. **_High_** and **_Low_**. The dependent variable is the long-term IPO market performance. The empirical analysis will investigate the effects of VC reputation measured by the Zero2IPO ranking firstly and then this section will also report the results with standard VC reputation measurements used in prior studies.

(1) VC Rankings

The Ranking of VCs is regarded as the main reputation measurement in this research. The first set of reputation variables is based on the ranking of top 20 VCs, and the second set on the ranking of top 50 VCs.

Table 4.6 demonstrates the results of testing the relationship between the VC ranking and $BHAR_{36}$. The first column shows the basic effects of the high and low reputation without taken any other factors into consideration. Both the **_Top-20_** and the **_Non-Top-20_** are positively and significantly related to the $BHAR_{36}$ at the 1% level. Specifically, the result indicates that the Top 20 Ranking VC-backed IPOs outperform the non-VC-backed IPOs by 20.4 percentage points and the IPOs backed by the non-Top-20 VCs outperform the non-VC-backed IPOs by 16.3 percentage points. Given all the coefficients for **_Top-20_** are larger than for **_Non-Top-20_**, this could be viewed as evidence that the more reputable VC-backed IPOs perform better than the less reputable VC-backed IPOs compared with the non-VC-backed IPOs, although the result is not conclusive on its own.

Columns (2) to (6) show the effects of high and low VC reputation when different control variables are added separately once at a time. Then in Column (7), three continuous variables are controlled together in the regression; while in the last column, the other three dummy variables are further added. All columns show similar results to the prior regressions, while the only difference is that coefficients of the **_Top-20_** and **_Non-Top-20_** reduce as more control variables are added. For example, compared with Column (1), **_Top-20_** falls from 20.4 to 14.9 and **_Non-Top-20_** falls from 16.3 to 13.7 in Column (8), but they are all significant at 1% level.

The results indicate that IPOs funded by more reputable VCs enjoy superior post-IPO stock market returns than the non-VC-backed IPOs in the long run, consistent with the

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findings of Jain and Kini (1995), Gompers and Lerner (1997), Espenlaub *et al.* (1999), Doukas and Gonenc (2003), Hochberg *et al.* (2007) and Krishnan *et al.* (2011). These studies report that VC reputation plays a certification role for IPO firms, since more reputable VCs significantly reduce the information asymmetry that is caused by the reduction in managerial ownership in the aftermarket period. Additionally, more reputable VCs have more experience so that they can provide more monitoring in the operation and offer more value-adding services to the invested IPOs firms.

The results for the control variables are consistent with the prior expectations. For most cases, the coefficient of each variable shows consistent value and significance across different regressions. Being individually tested in the regression as shown in Column (2), the ***IPO Age*** is found to have a significant and positive association with long-term performance. It implies that older firms are more capable to overcome the challenges after listing, thereby having better long-term performance. The significance of the impact reduces as more control variables are included. The variable ***Proceeds*** exhibits no significant correlation with the $BHAR_{36}$ across the various regressions. Barry *et al.* (1990) find that the IPO proceeds have a significant positive relationship with the initial returns. However, Espenlaub *et al.* (1999) find that the proceeds of IPO do not have a significant impact on IPO long-term CARs.

The ***Underpricing*** and ***SOE*** variables are both negatively associated with $BHAR_{36}$, indicating that the lower under-priced IPOs enjoy a better long-term post-IPO performance. This finding is similar to Krugman (1999) who explains this relationship via investor sentiments. The author's conjecture is the investor sentiment which drives up the initial returns of IPO firms. However, in the long-term, all the prices of firms will converge to their true value. Hence, in the long-term IPO firms will display a decreasing stock market performance. The significantly negative coefficient of ***SOE*** is consistent with prior expectations that connections with government actually do more harm than good to IPO firms. For instance, having a state-owned shareholder will reduce the efficiency of corporate governance. Consequently, the results support Cai *et al.* (2008) that the connection with governments is negatively correlated with IPO performance, but disagree with findings of Sun (2003), Wang (2005), Chang *et al.* (2010), and Su *et al.* (2011).

Lastly, the industry dummy ***High-tech*** is significantly and positively associated with $BHAR_{36}$. The abnormal returns of IPOs in high-tech industry are around 20 percentage points higher than the abnormal returns of IPOs in the traditional industry. As widely acknowledged, the most notable feature of the high-tech industry is its extraordinary growth

rate. This finding is consistent with Su *et al*. (2011) but runs contrary to Chen *et al*. (2000). Many studies have found that VC investment is very sensitive to the industry it invested (Gompers *et al.,* 2008). Bradley and Jordan (2002) and Rosenbusch *et al*. (2013) both report that after controlling for the effects of industry, the positive impact of VCs vanishes.

Overall, the regression results suggest that VC reputation may exert a positive impact on IPO performance. However, it is worth noting that the adjusted R^2 is relatively small in our results. The low value of adjusted R2 suggests that the BHAR is also affected by other significant factors, despite it has been significantly affected by VC reputation and other control variables. These factors could be stock-market-related factors. For example, the expectation of the investors in the IPOs is different for different IPOs, which may explain the variations of the BHAR across IPOs. The effects of the Zero2IPO ranking will now be further-examined through loosening the criteria to separate high reputation from low reputation VCs. The IPOs funded by VCs ranked in the top 50 are now defined as IPOs backed by high reputation VCs (***Top-50***), and the remaining IPOs backed by VCs are defined as low reputation VC-backed IPOs (***Non-Top-50***). Table 4.7 reports the regression results examining the impact of these two variables on the BHAR$_{36}$. The results presented in this table are very consistent with the results presented in Table 4.6.

Across the regressions, all the coefficients of ***Top-50*** and ***Non-Top-50*** are positively and significantly associated with the BHAR$_{36}$. Nevertheless, the coefficients of both variables decrease as more control variables are added to the regression. In Column (1), it shows that compared with the 36-month BHARs of non-VC-backed IPOs, the BHARs of IPOs backed by VCs with high reputation are higher by 18.8 percentage points, while the BHARs of IPOs backed by VCs with low reputation are higher by 17 percentage points.

The positive impact of VCs with high reputation seems to be slightly stronger only. As a matter of fact, the difference between them decreases as more factors are controlled. In Column (8), coefficients of ***Non-Top-50*** and ***Top-50*** are virtually identical. This trend informs us that the performance of IPOs backed by VCs with high reputation and the performance of IPOs backed by VCs with low reputation converge as the criterion to define high and low reputation loosens. In Table 4.7, the regression results of the control variables are very similar to the results of Table 4.5, implying that their impact on the IPO long-term performance remains unchanged.

Table 4.6 Top-20 VC and BHAR$_{36}$

	BHAR$_{36}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Top-20	0.204	0.189	0.175	0.187	0.207	0.187	0.165	0.149
	(0.008)***	(0.014)**	(0.023)**	(0.016)**	(0.007)***	(0.014)**	(0.033)**	(0.054)*
Non-Top-20	0.163	0.153	0.151	0.161	0.170	0.148	0.143	0.137
	(0.008)***	(0.012)**	(0.014)**	(0.009)***	(0.005)***	(0.015)**	(0.020)**	(0.024)**
IPO Age		0.0771					0.064	0.055
		(0.029)**					(0.074)*	(0.121)
Underpricing			-0.119				-0.107	-0.078
			(0.001)***				(0.004)***	(0.038)**
Proceeds				0.0427			0.0094	0.048
				(0.160)			(0.773)	(0.148)
SOE					-0.211			-0.164
					(0.000)***			(0.006)***
High-tech						0.228		0.224
						(0.000)***		(0.000)***
_cons	-0.106	-0.697	-0.0277	-0.574	-0.0509	-0.198	-0.628	-1.055
	(0.002)***	(0.011)**	(0.498)	(0.086)*	(0.173)	(0.000)***	(0.193)	(0.031)**
Adj-R^2	0.0085	0.0117	0.0185	0.0093	0.0189	0.0244	0.0196	0.0418
N.	1,095	1,094	1,090	1,090	1,090	1,095	1,090	1,086

In **Table 4.6**, Ranking of Top 20 is based on Lead VC's ranking in each fiscal year. BHAR$_{36}$ is calculated based on the portfolio matched by M/B ratio and market capitalization. Numbers in the brackets are p-values. *, **, *** denote significance at 10%, 5%, and 1% levels, respectively.

Table 4.7 Top-50 VC and BHAR$_{36}$

	BHAR$_{36}$							
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Top-50	0.188	0.175	0.163	0.174	0.197	0.167	0.155	0.142
	(0.009)***	(0.014)**	(0.023)**	(0.016)**	(0.006)***	(0.018)**	(0.031)**	(0.048)**
Non-Top-50	0.170	0.159	0.156	0.167	0.172	0.158	0.148	0.141
	(0.008)***	(0.013)**	(0.014)**	(0.009)***	(0.007)***	(0.012)**	(0.021)**	(0.027)**
IPO Age		0.077					0.064	0.055
		(0.029)**					(0.074)*	(0.121)
Underpricing			-0.119				-0.107	-0.078
			(0.000)***				(0.004)***	(0.038)**
Proceeds				0.044			0.010	0.049
				(0.150)			(0.757)	(0.144)
SOE					-0.212			0.225
					(0.000)***			(0.000)***
High-tech						0.228		0.208
						(0.000)***		(0.000)***
_cons	-0.106	-0.698	-0.0274	-0.583	-0.051	-0.198	-0.636	-1.06
	(0.002)***	(0.011)**	(0.502)	(0.080)*	(0.175)	(0.000)***	(0.186)	(0.029)**
Adj-R^2	0.0083	0.0116	0.0184	0.0092	0.0188	0.0242	0.0195	0.0418
N.	1,095	1,094	1,090	1,090	1,090	1,095	1,090	1,086

In **Table 4.7**, Ranking of Top 50 is based on Lead VC's ranking in each fiscal year. The BHAR$_{36}$ is calculated using the portfolios matched by the M/B ratio and Market Capitalization; Numbers in the brackets are p-values. *, **, *** denote significance at 10%, 5%, and 1% levels, respectively.

Table 4.8 presents a set of supplementary tests based on alternative long-term BHARs measurements. The first two regressions show the impact of Top 20 ranking, and the last two are based on Top 50 ranking. Models in Columns (1) and (3) are regressed on the 36-month BHARs calculated based on the benchmark matched only by market capitalization. The models in Columns (2) and (4) are regressed on the 36-month BHARs that matched by M/B ratio only.

In Table 4.9, the 36-month BHARs based on the portfolio matched by market capitalization and M/B ratio, but a different definition of lead VC is adopted. The lead VC is identified here as that VC which holds the largest amount of post-IPO equity. Consequently, the variables *Top-20* and *Non-Top-20* correspond to the post-IPO lead VC's ranking.

Overall, the results of supplementary regressions (illustrated in Tables 4.8 and 4.9) are in accordance with the main regressions (illustrated in Tables 4.6 and 4.7). The apparent positive impact of VC reputation is robust regardless of which measurements of VC reputation or what kind of long-run performance calculation are used, although it is not statistically tested within these regressions. Consequently, these findings iterate the conclusion that, IPOs backed by higher reputation VCs and lower reputation VCs both exhibit significantly better performance than the non-VC-backed IPO[21].

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[21] Further analysis (un-tabulated) reveals that the difference between high and low reputation VCs to be insignificant at the 0.1 level.

Table 4.8 VC Ranking and alternative BHARs

	Matched by Market Cap	Matched by M/B	Matched by Market Cap	Matched by M/B
	(1)	(2)	(3)	(4)
Top-20	0.127	0.178		
	(0.074)*	(0.016)**		
Non-Top-20	0.106	0.163		
	(0.053)*	(0.004)***		
Top-50			0.129	0.177
			(0.051)*	(0.010)***
Non-Top-50			0.102	0.162
			(0.072)*	(0.006)***
IPO Age	0.072	0.089	0.073	0.089
	(0.023)**	(0.007)***	(0.023)**	(0.007)***
Underpricing	-0.085	-0.171	-0.085	-0.171
	(0.012)**	(0.000)***	(0.012)**	(0.000)***
Proceeds	0.052	-0.064	0.053	-0.064
	(0.071)*	(0.027)**	(0.069)*	(0.028)**
SOE	-0.147	-0.227	-0.148	-0.228
	(0.007)***	(0.000)***	(0.006)***	(0.000)***
High-tech	0.206	0.241	0.205	0.241
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
_cons	-1.225	-0.072	-1.227	-0.075
	(0.005)***	(0.869)	(0.005)***	(0.8615)
Adj-R^2	0.0442	0.0846	0.0442	0.0846
N.	1,200	1,203	1,200	1,203

In **Table 4.8**, Ranking of Top 20/50 is based on Lead VC's ranking in each fiscal year. $BHAR_{36}$ is calculated based on the portfolio matched by M/B ratio or matched by market capitalization. Numbers in the brackets are p-values of each coefficient. *, **, *** denote significance at 10%, 5%, and 1% levels, respectively.

Table 4.9 Alternative Lead VCs and BHAR$_{36}$

	Market Cap and M/B		Market Cap and M/B	
	(1)	(2)	(3)	(4)
Top-20	0.160	0.144		
	(0.040)**	(0.063)*		
Non-Top-20	0.146	0.140		
	(0.017)**	(0.022)**		
Top-50			0.153	0.142
			(0.034)**	(0.049)**
Non-Top-50			0.149	0.141
			(0.020)**	(0.026)**
IPO Age	0.064	0.055	0.064	0.055
	(0.075)*	(0.121)	(0.074)*	(0.121)
Underpricing	-0.107	-0.078	-0.107	-0.078
	(0.004)***	(0.038)**	(0.004)***	(0.038)**
Proceeds	0.010	0.049	0.010	0.049
	(0.765)	(0.146)	(0.755)	(0.143)
SOE		-0.164		-0.164
		(0.006)***		(0.006)***
High-tech		0.225		0.225
		(0.000)***		(0.000)***
_cons	-0.632	-1.058	-0.637	-1.06
	(0.191)	(0.030)**	(0.186)	(0.030)**
N.	1,090	1,086	1,090	1,086

In **Table 4.9**, lead VC is defined as the one who is holding largest number of post-IPO equity stakes. Ranking of Top 20/50 is based on Lead VC's ranking in each fiscal year. BHAR$_{36}$ is calculated based on the portfolio matched by M/B ratio and market capitalization. Numbers in the brackets are p-values of each coefficient. *, **, *** denote 10%, 5%, and 1% significance levels, respectively.

(2) Alternative VC Reputation Measurements

Table 4.10 reports the impact of alternative VC reputation measures on IPO long-run performance. The alternative measurements are VC IPO market share (proceeds; market capitalization), VC age, VC IPO number, and VC size. The dependent variable used in these regressions is still the BHAR$_{36}$ matched by market capitalization and M/B ratio.

Generally, for VC reputation measured by VC market share, VC age and VC IPO number, the IPOs funded by more reputable VCs exhibit significantly superior $BHAR_{36}$ than the non-VC-backed IPOs. Table 4.10 shows that the coefficients for **_Hig_h** are higher than for **_Low_**, although the IPOs funded by less reputable VCs also outperform the non-VC-backed IPOs. The results obtained here are in line with the regressions based on VC rankings conducted previously and are also consistent with many previous studies.

The positive impact of IPO market share reaffirms the findings of Nahata (2008), Krishnan *et al*. (2011), Lee and Masulis (2011), Shu *et al*. (2011) and Chou *et al*. (2013), although the findings of a positive impact of VC age and VC IPO number are not identical. These studies all suggest that VC's market share is a more (the only) robust measurement to predict reputation's impact, rather than the VC age or VC past performance. However, the findings here are consistent with Lerner (1994), Hochberg *et al*. (2007) and Sorenson (2007), who all conclude that more experienced VCs (i.e., older VCs and VCs that have better past performance) are more capable of supporting firms to go public than the less experienced VCs. They also conclude that more experienced VCs or more reputable VCs may improve the post-IPO long-term performance through better corporate governance, reduced earnings management, enhanced quality and competitiveness in IPO firms.

The results shown in Column (5) present the effects of VC size on the IPO long-run performance. Such results contradict the results with other measurements of reputation. IPOs funded by VCs with higher registered capital do not show significantly different performance with the non-VC-backed IPOs, but IPOs funded by VCs with lower registered capital significantly outperform the non-VC-backed IPOs. Such findings indicate that it is less reputable VCs rather than the more reputable VCs that exert significant influence on IPOs' long-term performance. This is inconsistent with the findings of previous studies which also use VC size as the reputation measurements. However, in these studies, they use VC's capital under management, a totally different concept to VC's registered capital, to proxy VC size.

Table 4.10 Alternative Reputation Measurements and $BHAR_{36}$

	VC IPO MS$_1$	VC IPO MS$_2$	VC Age	VC IPO#	VC Size
	(1)	(2)	(3)	(4)	(5)
High	0.161	0.157	0.169	0.171	0.064
	(0.068)*	(0.075)*	(0.059)*	(0.054)*	(0.481)
Low	0.134	0.136	0.134	0.130	0.179
	(0.022)**	(0.020)**	(0.021)**	(0.025)**	(0.002)***
IPO Age	0.056	0.056	0.055	0.055	0.058
	(0.116)	(0.118)	(0.119)	(0.123)	(0.104)
Underpricing	-0.079	-0.078	-0.078	-0.077	-0.077
	(0.037)**	(0.038)**	(0.039)**	(0.040)**	(0.041)**
Proceeds	0.049	0.049	0.048	0.049	0.054
	(0.142)	(0.143)	(0.147)	(0.140)	(0.104)
SOE	-0.166	-0.166	-0.168	-0.164	-0.162
	(0.006)***	(0.006)***	(0.006)***	(0.006)***	(0.007)***
High-tech	0.225	0.225	0.222	0.224	0.222
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
_cons	-1.066	-1.063	-1.055	-1.061	-1.139
	(0.028)**	(0.029)**	(0.030)**	(0.029)**	(0.019)**
Adj-R^2	0.0419	0.0419	0.0421	0.0419	0.0440
N.	1,086	1,086	1,086	1,086	1,086

Table 4.10 Lead VC is defined as the one who is holding the largest pre-IPO equity stakes. The highest quartile (25%) of each measurement are defined as the high reputation, and the rest 75% are low reputation. The five reputation measurements are explained as: VC IPO MS$_1$: cumulative market share at IPO year calculated based on the proceeds; VC IPO MS2: cumulative market share at IPO year calculated based on the market capitalization; VC IPO Number: cumulative number of IPOs by VC up to the IPO year; VC size: registered capital. Numbers in the brackets are p-values. *, **, *** denote significance at 10%, 5%, and 1% levels, respectively.

It is a more accurate measurement because the capital under management of VCs is time-varying which might differ from year to year. Therefore it catches the up-to-date VCs' capacity to manage fund, while registered capital is just the amount of money the founder of VCs provided at the very beginning, and does not reflect VCs' ability and development of reputation in the later years. Consequently, a significant note of caution is required about the reliability of using VC's registered capital as a measurement of VC reputation.

In summary, in this section, the general conclusion is that VC reputation may exert a positive impact on IPO's long-term market performance. The IPOs backed by more reputable VCs appear to perform better than the IPOs backed by less reputable VCs compared with non-VC-backed IPOs, but this conclusion remains to be tested statistically[22].

4.3.3 The Impact of Boards (H₄ and H₅)

Given the special role of China's ChiNext Board in the development of the VC industry, as well as its notable distinction with the Main board, a further step is to explore the impact of VCs across different boards. In order to examine this issue, the full sample is divided into two groups: one is the group of IPOs listed on the main board, the other group is the IPOs listed on the ChiNext board and the SME board. In later case, two boards are brought together for the reason that they are both designed for small and medium sized firms with high growth potential. Firstly, Table 4.11 reports the regressions which include the lead VC reputation measured by Top 20/Top 50 ranking.

The Top 20 and Top 50 variables both yield similar patterns of results, but VCs seem to exert mixed influences across different boards. On the one hand, on the main board neither the coefficients of *Top-20/50* nor the *Non-Top-20/50* are significant. On the other hand, VCs exert a significant positive impact on the IPOs listed on the ChiNext and SME boards, and the impact is greater from more reputable VCs. This is consistent with the results on the full sample of IPOs (see Table 4.6 and Table 4.7).

Considering these results by boards and on the full sample, the apparent positive impact of VC reputation on the overall China IPO market is driven largely by the impact on IPOs listed on the ChiNext and SME boards. This finding if verified by statistical testing, would indicate that VC reputation plays a greater role (i.e. the Monitoring and Value-adding function) in relatively small-sized and growing start-ups. In contrast, VCs add little to the performance of the IPOs that qualify for a listing on the main board. It might be because the IPOs listed on the main board are large and mature enough to build a healthy operating system and corporate governance structure. As a result, their managers might have enough experience to regulate their business quite well without too much help from VCs. What is

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[22] Further analysis (un-tabulated) reveals that the difference between high and low reputation VCs to be insignificant at the 0.1 level.

more, the insignificant impact of VC-backing might also be the results of conflicts of interests or the moral hazard problem between firm managers.

Table 4.11 VC Ranking and BHAR$_{36}$ by Boards

	BHAR$_{36}$		BHAR$_{36}$	
	Main	**Other**	**Main**	**Other**
Top-20	-0.113	0.192		
	(0.580)	(0.023)**		
Non-Top-20	0.020	0.144		
	(0.916)	(0.028)**		
Top-50			-0.113	0.176
			(0.580)	(0.024)**
Non-Top -50			0.020	0.149
			(0.916)	(0.029)**
IPO Age	0.076	0.071	0.076	0.071
	(0.397)	(0.070)*	(0.397)	(0.071)*
Underpricing	-0.295	-0.074	-0.295	-0.074
	(0.048)**	(0.063)*	(0.048)**	(0.063)*
Proceeds	0.112	0.026	0.112	0.027
	(0.052)*	(0.598)	(0.052)*	(0.583)
SOE	0.181	-0.199	0.181	-0.200
	(0.235)	(0.006)***	(0.235)	(0.005)***
High-tech	0.298	0.202	0.298	0.203
	(0.087)*	(0.000)***	(0.087)*	(0.000)***
_cons	-2.162	-0.901	-2.162	-0.911
	(0.055)*	(0.145)	(0.055)*	(0.140)
Adj- R^2	0.0534	0.0387	0.0534	0.0386
N.	155	931	155	931

In **Table 4.11**, Ranking of Top 20/50 is based on Lead VC's ranking in each fiscal year. BHAR$_{36}$ is calculated by using the portfolio matched by market capitalization and M/B ratio. "Other" stand for the IPOs listed on the SME board and the ChiNext boards; Numbers in the brackets are p-values; *, **, *** denote significance at 10%, 5%, and 1% levels, respectively.

With respect to the control variables, the relationship between both underpricing and the high-tech industry and the long-term market performance on different boards is in line with results shown on the full sample. Moreover, the age of IPO firms exhibits no significant impact on the full sample, while it has a significant and positive association with the 36-month BHARs of IPOs listed on ChiNext and SME boards. The older the small and medium sized growing start-up firms, the better the stock performance they have in the long run post-IPO. Although the capital raised at IPO (proceeds) cannot predict the performance across the full sample of IPOs, it works significantly and positively for those IPOs listed on the Main board. In contrast, the IPO proceeds do not have significantly explanatory power for IPO performance on the ChiNext and SME boards. Last but not least, the state-owned equity stakes exhibit different impact with the full sample. The SOE variable is significantly and negatively associated with performance across the full sample and ChiNext IPOs, while being not associated with performance on the Main board IPOs. Such finding reveals that the state-owned shareholders would undermine the performance of start-up IPOs, while having no significant influence on the mature and large size IPOs.

In addition to the results in Table 4.11, Table 4.12 also reports the relationship between VC reputation and the 36-month BHARs on different boards, where the reputation of VCs is measured by five alternative measurements. Results shown in the table are consistent with the results with VC reputation measured by VC rankings (Table 4.9), including the impact of control variables. In summary, VC reputation only exerts an apparent impact on long-run performance on the ChiNext and SME boards and the impact is greater where VC reputation is high (e.g. the older VCs, or VCs with higher market share or more past IPO number)[23].

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[23] Further analysis (un-tabulated) reveals that the difference between high and low reputation VCs to be insignificant at the 0.1 level.

Table 4.12 Alternative Reputation Measurements and BHAR$_{36}$ by Boards

	VC MS$_1$		VC MS$_2$		IPO Quantity		Age		VC Size	
	Main	**Other**	**Main**	**Other**	**Main**	**Other**	**Main**	**Other**	**Main**	**Other**
High	-0.085	0.205	-0.045	0.189	0.038	0.184	-0.130	0.182	-0.217	0.116
	(0.695)	(0.037)**	(0.837)	(0.054)*	(0.887)	(0.054)*	(0.693)	(0.057)*	(0.327)	(0.246)
Low	-0.013	0.146	-0.038	0.151	-0.065	0.150	-0.041	0.157	0.160	0.180
	(0.946)	(0.020)**	(0.836)	(0.016)**	(0.706)	(0.017)**	(0.804)	(0.013)**	(0.394)	(0.004)***
IPO Age	0.075	0.074	0.072	0.072	0.072	0.070	0.077	0.071	0.066	0.072
	(0.408)	(0.063)*	(0.425)	(0.067)*	(0.424)	(0.073)*	(0.394)	(0.071)*	(0.454)	(0.065)*
Underpricing	-0.300	-0.075	-0.301	-0.075	-0.288	-0.075	-0.293	-0.074	-0.310	-0.075
	(0.044)**	(0.060)*	(0.043)**	(0.061)*	(0.060)*	(0.062)*	(0.055)*	(0.063)*	(0.038)**	(0.062)*
Proceeds	0.109	0.029	0.107	0.028	0.111	0.027	0.113	0.026	0.101	0.029
	(0.057)*	(0.547)	(0.060)*	(0.561)	(0.055)*	(0.575)	(0.059)*	(0.588)	(0.062)*	(0.551)
SOE	0.186	-0.202	0.181	-0.201	0.178	-0.198	0.184	-0.202	0.205	-0.199
	(0.225)	(0.005)***	(0.239)	(0.005)***	(0.243)	(0.006)***	(0.228)	(0.005)***	(0.176)	(0.006)***
High-tech	0.300	0.203	0.303	0.203	0.300	0.203	0.303	0.202	0.278	0.202
	(0.085)*	(0.000)***	(0.082)*	(0.000)***	(0.085)*	(0.000)***	(0.082)*	(0.000)***	(0.109)	(0.000)***
_cons	-2.114	-0.958	-2.074	-0.937	-2.119	-0.913	-2.187	-0.908	-1.973	-0.946
	(0.061)*	(0.123)	(0.065)*	(0.130)	(0.060)*	(0.139)	(0.061)*	(0.142)	(0.065)*	(0.125)
Adj-R^2	0.0519	0.0388	0.0513	0.0386	0.0522	0.0384	0.0521	0.0388	0.0648	0.0394
N.	155	931	155	931	155	931	155	931	155	931

In **Table 4.12,** Lead VC is defined as the VC who holds the largest pre-IPO shareholdings in the IPO firm. BHAR$_{36}$ is calculated by using the portfolio matched by market capitalization and M/B ratio. VC MS$_1$ is the VC's IPO market share calculated by the IPO proceeds; VC MS$_2$ is the VC's IPO market share calculated by IPO market capitalization; "Other" stands for the IPOs listed on the SME board and the ChiNext boards. Numbers in the brackets are p-values; *, **, *** denote significance at 10%, 5%, and 1% levels, respectively.

4.4 Long-run Post-IPO Operating Performance

Having examined the stock market performance of IPO firms, this section focuses on the operating performance. The operating performance of a company is most frequently measured by accounting data and is very different from the stock market performance. The stock market performance is forward-looking, mostly reflecting the expectations or predictions about the firms' value in the future. By contrast, operating performance measures are more likely to be backward-looking since they are built on accounting data reported in annual accounts. Consequently, it is possible that the stock performance and operating performance of a firm could move in different directions for a number of years. An IPO firm may exhibit low or even negative operating returns at the initial post-IPO stage. However, as long as the investors and the public hold positive attitudes and have confidence in the company's future success, its stock price might still be high.

Table 4.13 illustrates the summary of the operating performance of the China A share IPOs listed from 2007 to 2012, covering a 7-year window from three years prior IPO to three years post IPO. Due to the data availability, IPOs listed in 2004 and 2005 are excluded. As there are only 5 available IPOs in 2006, the year 2006 is also excluded from the sample. Hence, the sample starts from 2007 to 2012, and includes a total of 1,084 IPOs. In the spirit of the previous studies[24], the median values of the operating performance measurements (ROE and ROE after reduction non-recurring profit and loss, thereafter ROE_1 and ROE_2) are reported for the full sample as well as the IPOs listed in each year.

The first three rows of Table 4.13 show the median of the ROE_1 and ROE_2 of the 1,084 IPOs from 2007 to 2012. Correspondingly, Figure 4.1 illustrates the moving trend of these two variables using two-line chats: figure (a) is the trend of the median, and figure (b) is the trend of the mean[25]. Comparison between figure (a) and figure (b) shows that the medians of both indicators are about 5 percentage points lower than their means, but they exhibit nearly identical moving trends. Both ROEs exhibit a substantial decline as firms get listed, and they keep decreasing to even lower levels in the next three years. The trend of red line (ROE_2) is exactly the same with the blue line (ROE_1), so the description here will focus on ROE_1. The median of ROE_1 at year -3, i.e. three years before IPO, is 31.13%, however it halves to 14.64% at the IPO year, i.e. year 0. Then the ROE_1 further reduces by half again in the following year (year +1) and maintains this level in the next two years,

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[24] See the studies, Jain and Kini (1994); Mikkelson et al. (1997); Loughran and Ritter (1997); Chi and Padgett (2006); and Coakley et al. (2007).
[25] We also calculate the mean value of the operating performance, as it is very close to the median the table.

ending up with 7.71% at year +3, i.e. three years after IPO. The data indicates that, in general, China A share IPOs experience a significant deterioration in profitability in the long run.

Table 4.13 also reports the operating performance of the 1,084 IPOs by listing years and Figure 4.2 illustrates the corresponding moving tendency. The yearly tendency of the medians of ROE_1 and ROE_2 are generally consistent with the declining tendency of the full time period. For instance, IPOs listed in 2007 and 2008 exhibit smaller ROE_1 reductions (about 2.5 times lower) than in other years, while IPOs listed in 2010 exhibit the largest ROE_1 declines, dropping by almost 6 times at year +3 compared with year -3, i.e. from 35.85 to 6.31. For 2011 and 2012, the ROE_1 has decreased by around 4 times. Overall, by analysing the operating performance for both full period and each year, it appears that China A share IPOs show long-run underperformance in post-issue period. In particular, performance of IPOs listed in 2010 and 2011 exhibit greater declines than their counterparts listed in other years.

Table 4.14 illustrates the mean and median changes of operating performance during the window from one-year prior IPO to three years after IPO (-1 to +3), one year prior IPO to two years after IPO (-1 to +2) and one year before to one year after IPO (-1 to +1). The median and mean ROE_1 of IPOs reduce substantially compared with the value in the pre-IPO period, falling off by 21.78 and 24.23 percentage points after trading for 3 years respectively. These reductions in profitability are even more serious than those reported by Chi and Padgett (2006), which suggest that the median change in ROE from year -2 to 3 is -16.46% for the China IPOs.

The last four columns of Table 4.14 report the distribution of IPOs by performance, i.e. returns above zero and below zero. Surprisingly, the overwhelming majority of IPOs underperform, whether measured by ROE_1 or ROE_2. As many as 1,021 IPOs show negative ROE_1 from year -1 to +3, with a median of -22.04. In contrast, only 21 out of the total 1,042 IPOs have positive ROE_1.

This serious deterioration in profitability is consistent with Jain and Kini (1994) who find that the five-year post issue operating performance of IPOs (measured by ROA and operating cash flow deflated by total asset) drops substantially relative to pre-IPO level. Furthermore, the results are also consistent with the studies of Levis (1993), Cai and Wei (1997), Loughran and Ritter (1997), Pagano *et al*. (1998), Wang *et al*. (2003), Chan *et al*. (2004), and Chi and Padgett (2006). Such operating performance behaviour might be

inflated by the windows of opportunity theory, where the pre-IPO accounting numbers might be manipulated to 'window-dress' a firm's profitability (Baker and Wurgler, 2002).

Table 4.13   ROEs of IPOs from 2007 to 2012

		Time						
		-3	**-2**	**-1**	**0**	**1**	**2**	**3**
Full	N.	1,075	1,076	1,059	1,083	1,083	1,084	1,084
	ROE_1	31.13	30.10	28.99	14.64	8.28	7.77	7.71
	ROE_2	28.72	28.42	27.44	13.54	7.56	6.98	6.71
2007	N.	120	121	103	121	121	121	121
	ROE_1	25.76	24.23	26.07	18.45	9.62	9.30	11.39
	ROE_2	25.04	22.46	25.66	17.10	8.93	8.62	10.44
2008	N.	72	72	72	77	77	77	77
	ROE_1	26.48	31.51	31.70	15.13	11.98	12.34	11.61
	ROE_2	26.42	28.04	30.01	13.69	11.30	12.00	10.24
2009	N.	111	111	111	111	111	111	111
	ROE_1	33.21	37.45	28.98	22.76	9.74	9.53	8.04
	ROE_2	29.02	33.98	28.59	21.36	8.98	9.05	6.68
2010	N.	346	346	348	347	347	347	347
	ROE_1	35.85	28.97	28.27	13.33	7.54	6.33	6.31
	ROE_2	31.19	27.53	26.59	12.68	6.76	5.83	5.41
2011	N.	276	276	275	277	277	278	278
	ROE_1	29.67	30.62	31.61	13.39	7.27	6.57	6.92
	ROE_2	27.97	29.42	29.00	11.81	6.76	5.66	6.13
2012	N.	150	150	150	150	150	150	150
	ROE_1	28.60	32.71	28.72	13.14	8.78	8.37	7.82
	ROE_2	27.30	31.74	27.44	11.92	7.63	7.58	6.58

In **Table 4.13**, the ROE_1 and ROE_2 are expressed by means of %.
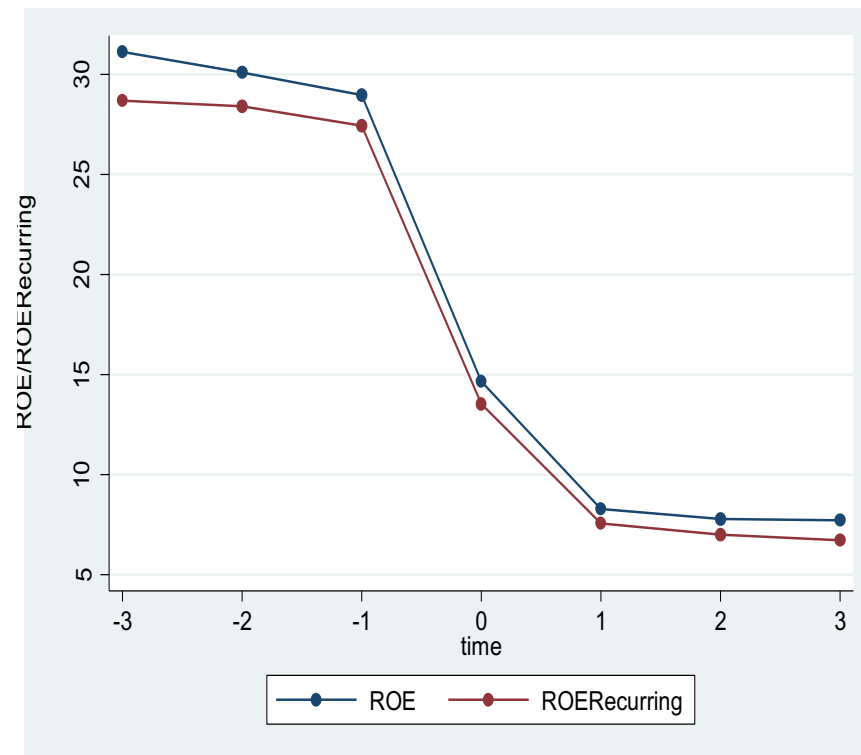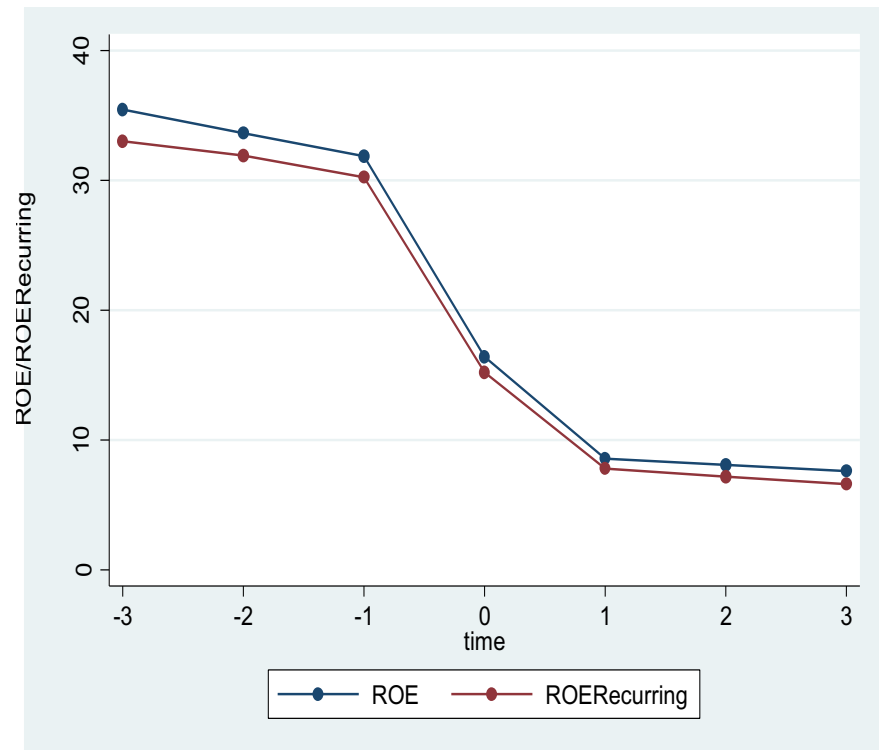
(a) Median   **(b) Mean**

Figure 4.1 Operating Performance of IPOs**.** Line charts of operating performance of A share China IPO listed between 2006-2012 in the window 3-years prior IPO to the 3-years post IPO. Three variables are used to proxy for operating performance: ROE (blue line); ROE after reduction of non-recurring profit and loss, short for ROE Recurring (Red line); (a) is tendency of median and (b) is the tendency of mean.
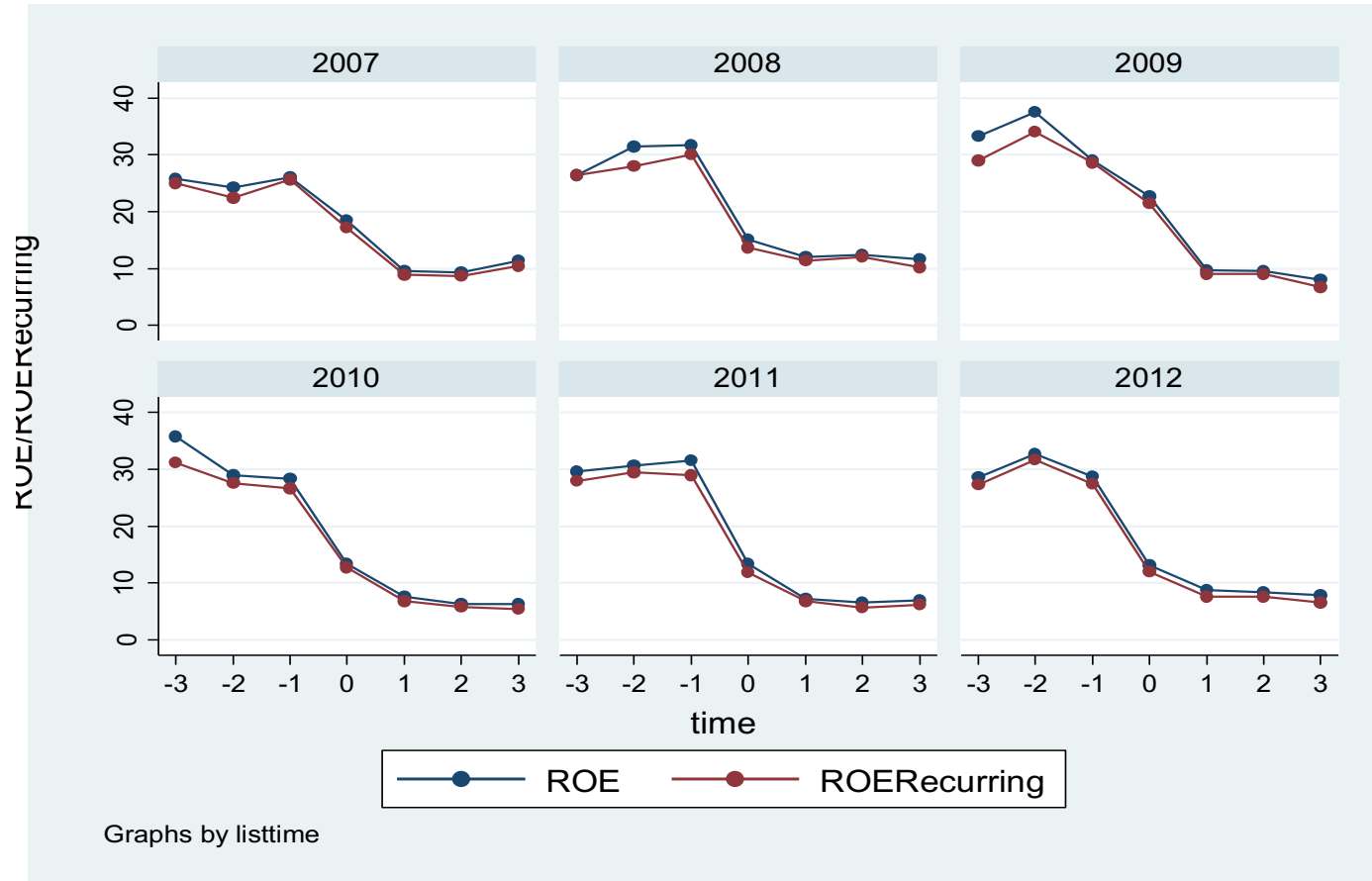
Figure 4.2 Line charts of Median operating performance of A share China IPO listed between 2006-2012 in the window 3-years prior IPO to the 3-years post IPO by cohort year. Two variables are used to proxy for operating performance: ROE (blue line); ROE recurring (Red line).

Table 4.14 Changes of ROEs

	N.	Mean	Median	S.D.	Min	Max	>0			<0		
							N.	Mean	Median	N.	Mean	Median
Panel A. ROE$_1$												
Year -1 to +3	1,042	-24.23	-21.78	16.22	-183.76	19.50	21	5.93	3.59	1,021	-24.85	-22.04
Year -1 to +2	1,042	-23.94	-21.73	15.21	-152.75	9.29	19	3.40	2.92	1,023	-24.45	-21.93
Year -1 to +1	1042	-23.40	-21.36	14.19	-153.97	15.32	14	3.81	2.43	1,028	-23.77	-21.51
Panel B. ROE$_2$												
Year -1 to +3	1,030	-23.67	-21.37	15.72	-170.90	12.81	24	-2.88	3.01	1,006	-24.16	-21.61
Year -1 to +2	1,030	-23.21	-20.98	14.73	-150.95	8.42	23	-3.68	1.52	1,007	-23.66	-21.62
Year -1 to +1	1,030	-22.48	-20.20	13.91	-152.91	31.72	17	-4.54	4.69	1,013	-22.78	-20.32

In **Table 4.14**, the change of ROE$_1$ and ROE$_2$ are measured by means of %.

4.5 VC and Post-IPO Operating Performance (H_1)

This section focuses on VCs' impact on IPO firms' long-term operating performance. The operating performance of IPO companies is calculated based on a window from one-year prior IPO to three years after IPO. There are two reasons. The main reason is that we would like to investigate the long-performance of IPO, i.e. the returns from the 'event' of IPO. Apparently from 1 year before the event of IPO to 3 years after the event of IPO is a best to measure the returns from the 'event' of IPO. The more years included before IPO, the more contamination there might be. The second reason is that as shown in figures 4.1 and 4.2, the ROE before the event of IPO are sort of stable. There are no significant fluctuations of ROE from 3 years before IPO to 1 year before IPO. Thus, it is reasonable that the results of the change of ROE from the time 2(3) years before IPO to 3 years after IPO are similar. Table 4.15 reports the comparison of the median ROE_1 between the VC-backed IPOs and non-VC-backed IPOs by years. In the last column, it shows the z-value of Wilcoxon rank-sum test which is used here to test the difference between the median values of the two groups.

The full sample's ROE_1 by years (the first three columns of Table 4.15) shows that at three years after IPO all the IPOs underperform the level one-year pre-IPO substantially. IPOs issued after 2010 appear to suffer from more serious profitability reductions during the three years post-IPO period, and IPOs listed in 2011 exhibit the largest declines. Comparison between the overall VC-backed IPOs and non-VC-backed IPOs reveals no significant difference. Moreover, analysing the sample of each year reiterates this finding and is in line with the full sample: both the VC-backed and non-VC-backed IPOs listed in 2011 are the most underperformed during three-year post-IPO period and there is no significant difference between the VC-backed and non-VC-backed IPOs.

Table 4.16 reports the comparison of the median of ROE_2 between the VC-backed IPOs and non-VC-backed IPOs. This shows that the characteristics of ROE_2 follow a very similar pattern to the ROE_1. For instance, VCs do not appear to exhibit any significant impact on improving IPOs' long-run operating performance; and IPOs listed in 2011 are the most underperformed IPOs across the three years' post-IPO period. This might be because in 2011, China was facing a very tough economic environment from both domestic and overseas sides. The obvious declines of performance can be attributed to multiple factors such as domestic inflation, monetary tightening, appreciation of RMB, as well as European debit crisis. Many new IPOs show substantially decreased growth rates, and a considerable

proportion even exhibit negative growth rates compared to their pre-IPO level. In general, such results reveal that the decline in post-IPO operating performance is common across China A share IPOs, and VCs are not found to have any significant impact on alleviating the serious underperformance of the funded IPOs.

Table 4.15 Changes of ROE_1 of VC-backed and Non-VC-backed IPOs

Year	Total		VC		NVC		wilco.
	N.	-1 to +3	N.	-1 to +3	N.	-1 to +3	
2007	100	-15.03	30	-12.94	70	-15.74	-0.72
2008	71	-19.98	21	-21.47	50	-18.13	0.98
2009	106	-20.04	51	-20.98	55	-19.02	0.78
2010	345	-22.34	150	-21.28	195	-23.73	-0.78
2011	273	-25.14	138	-25.29	135	-25.02	-0.16
2012	147	-21.64	86	-21.77	61	-20.52	-0.22
2007-2012	1,042	-21.78	476	-21.69	566	-22.02	0.64
	N.	-1 to +2	N.	-1 to +2	N.	-1 to +2	wilco.
2007	100	-18.10	30	-17.31	70	-19.03	-1.06
2008	71	-19.65	21	-19.82	50	-19.60	0.42
2009	106	-18.63	51	-19.58	55	-18.45	0.71
2010	345	-22.40	150	-21.72	195	-22.86	-0.78
2011	273	-24.76	138	-23.73	135	-25.07	0.08
2012	147	-20.23	86	-21.20	61	-19.18	0.32
2007-2012	1,042	-21.73	476	-21.59	566	-21.95	0.62
	N.	-1 to +1	N.	-1 to +1	N.	-1 to +1	wilco.
2007	100	-16.98	30	-16.22	70	-16.94	-0.46
2008	71	-21.35	21	-22.33	50	-19.87	0.239
2009	106	-19.61	51	-19.25	55	-19.65	0.66
2010	345	-20.96	150	-20.73	195	-20.96	0.36
2011	273	-24.00	138	-23.57	135	-24.23	-0.31
2012	147	-21.10	86	-21.08	61	-21.26	0.54
2007-2012	1,042	-21.36	476	-21.48	566	-21.33	1.10

Table 4.15 reports the median of changes in ROE between the three years after IPO (year +3) and the one-year prior IPO (year -1) by two groups: the VC-backed and non-VC-backed. The unit of the ROE in the table is percentage (%); and the last column shows the z-value of the Wilcoxon rank-sum test.

Table 4.16 Changes of ROE$_2$ of VC-backed and Non-VC-backed IPOs

Year	Total		VC		NVC		
	N.	-1 to +3	N.	-1 to +3	N.	-1 to +3	wilco.
2007	91	-15.75	26	-14.87	65	-15.75	-0.30
2008	71	-19.80	21	-20.47	50	-16.26	1.06
2009	109	-19.85	53	-19.85	56	-19.65	0.83
2010	342	-21.58	149	-21.01	193	-22.01	-0.85
2011	271	-23.95	136	-23.88	135	-23.95	0.01
2012	146	-21.06	85	-21.80	61	-19.48	0.02
2007-2012	1,030	-21.37	470	-21.29	560	-21.57	0.71
	N.	-1 to +2	N.	-1 to +2	N.	-1 to +2	wilco.
2007	91	-18.36	26	-18.80	95	-17.94	0.00
2008	71	-17.62	21	-17.43	50	-17.72	0.37
2009	109	-18.76	53	-18.01	56	-18.87	0.54
2010	345	-21.61	150	-20.71	195	-21.98	-0.22
2011	271	-23.12	136	-22.72	135	-23.57	0.41
2012	146	-19.84	85	-20.40	61	-18.71	0.38
2007-2012	1,030	-20.98	470	-20.77	560	-21.17	0.90
	N.	-1 to +1	N.	-1 to +1	N.	-1 to +1	wilco.
2007	91	-16.42	26	-18.45	65	-15.72	0.10
2008	71	-18.94	21	-20.17	50	-18.63	0.20
2009	109	-18.96	53	-18.29	56	-19.43	0.62
2010	342	-19.79	149	-19.59	193	-20.01	0.23
2011	271	-23.00	136	-22.76	135	-23.14	0.52
2012	146	-19.51	85	-19.51	61	-18.41	0.61
2007-2012	1,030	-20.20	470	-20.44	560	-19.98	1.42

Table 4.16 reports the median of changes in ROE$_2$ between the three years after IPO (year +3) and the one-year prior IPO (year -1) by two groups: the VC-backed and non-VC-backed. The ROE$_2$ is measure by percentage (%), and the last column shows the z-value of the Wilcoxon rank-sum test; *, **, *** denote the significance at 10%, 5%, and 1% levels, respectively.
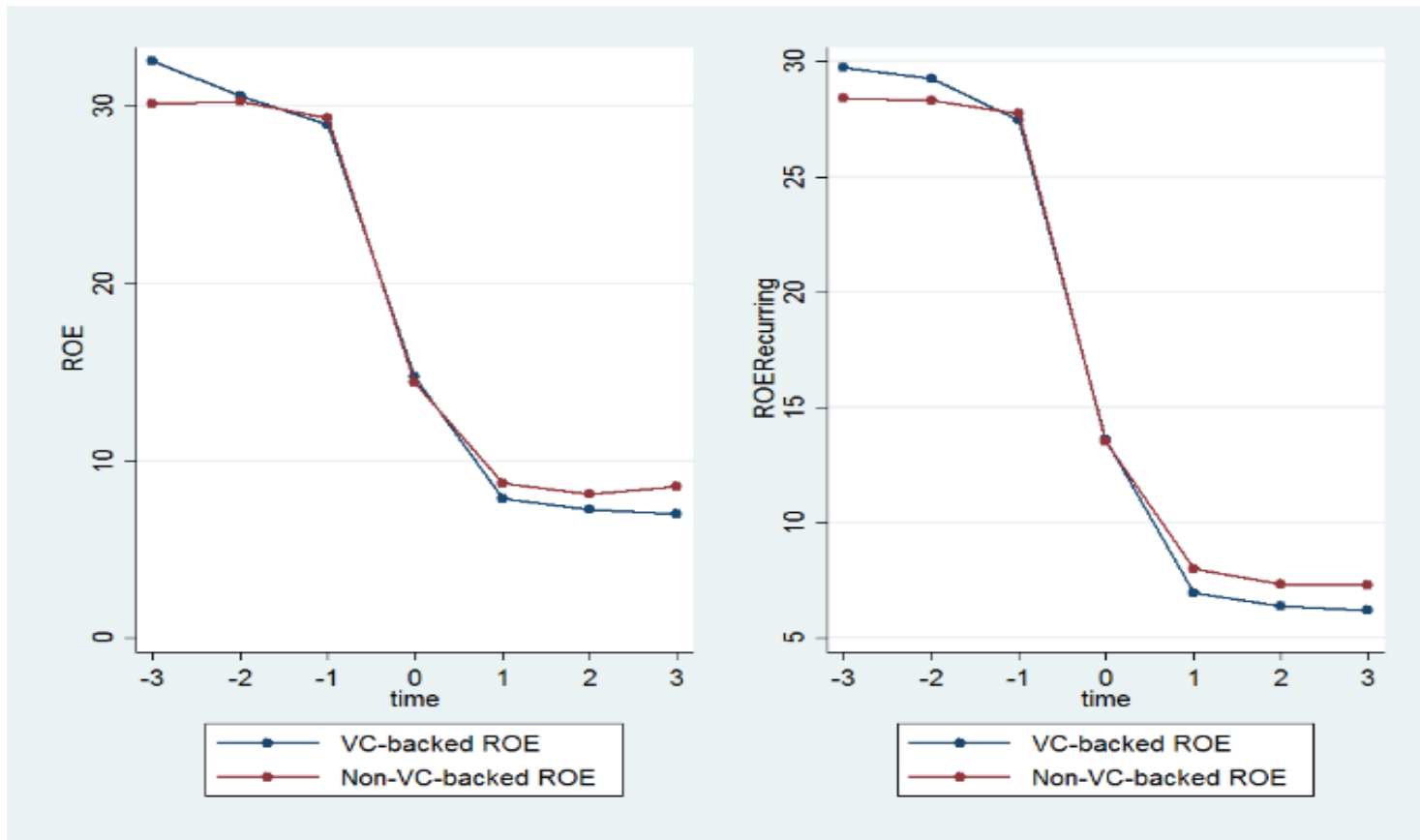
(a) ROE₁   **(b) ROE₂**

Figure 4.3 Comparison of operating performance between the VC-backed IPOs and non-VC-backed IPOs covering the window 3-years prior IPO to the 3-years post IPO. All the operating performance are measured by the median value. **(a)** is the comparison of ROE_1 and **(b)** is the comparison of ROE_2.

As a supplement, Figure 4.3 illustrates the trends of ROE_1 and ROE_2 of the VC-backed (blue line) and non-VC-backed IPOs (red line) in two separate line charts for the three-year periods prior and after IPO. The ROE_2 displays the same declining trend as ROE_1, so the figure of ROE_1 will be used for the interpretation. The line chart reveals that at year -3, i.e. three years before IPO, VC-backed IPOs enjoy evidently better ROE_1 than the non-VC-baked IPOs, but this gap almost disappears at year -2. Then at year -1 it is surpassed by the non-VC-backed IPOs, and ROE_1 of all the IPOs then drops dramatically at the IPO year (year 0).

Moreover, during the following three post-IPO years, the ROE_1 of VC-backed IPOs shows a more serious decline than the ROE_1 of the non-VC-backed IPO. Taken together, the figures and statistics illustrate that VC-backed IPOs experience greater operating performance reductions in the post-IPO period than the non-VC-backed IPOs, but the difference is not statistically significant. Such results are different with those in Krishnan *et al*. (2011) and Shu *et al*. (2011), where the operating performance (measured by ROA) of VC-backed IPOs is significantly higher than the operating performance of the non-VC-backed IPOs.

Next, Model 4.1 is regressed to examine the impact of VC-backing on the operating performance, which is also an examination of Hypothesis 1. Table 4.17 reports the results, where the ***VC-backed*** is used as main independent variable, while ***ROE_1 and ROE_2*** as the dependent variables, respectively. Both regressions verify that there is no significant difference of operating performance between the VC-backed IPOs and non-VC-backed IPOs, which leads to the rejection of Hypothesis 1. Overall, China A share IPOs exhibit serious profitability deductions in the three-year post-IPO period relative to the pre-IPO level. However, VCs do not play a significant role in improving the underperformance. This runs contrary to the Certification theory of Jain and Kini (1995) which insists that VC-backed IPOs exhibit significantly superior operating performance to non-VC-backed IPOs, and the screening hypothesis of Espenlaub *et al*. (2014) which suggests VC-backed IPOs are of higher quality that should perform better in the long-run.

None of these studies supports Wang *et al*. (2003) and Chen and Liang (2016) which suggest significantly inferior post-IPO operating performance of VC-backed IPOs. Coakley *et al*. (2007) find that the differences of operating performance between VC-backed IPOs and non-VC-backed IPOs are not significant, but their cross-sectional results imply VCs do not have a significant and positive impact. Therefore, the results only support the first

part of my findings. To some extent, the results of this thesis support the findings of the following studies. Gangi and Lombardo (2008) reject the Certification and the Value-added function of VCs but conform to the Adverse selection function. They find that VC-backed IPOs exhibit constantly diminishing operating performance and profitability ratios over time. Chahine *et al*. (2012) suggest that syndication investments of VCs will lead to the increase of pre-IPO accounting numbers and reductions in post-IPO performance. However, the results of this thesis differ from these studies' suggestions that VCs have a significantly negative impact on IPO long-run performance, i.e. this thesis finds no significant difference at all. The findings here are consistent with Mikkelson *et al*. (1997) and Rosa (2003) as they identify that VC-backed firms do not exhibit significantly superior long-run post-IPO operating performance relative to the non-VC-backed IPO firms.

The coefficients of the control variables shown in Table 4.17 generate some different findings with those reported in Table 4.3[26]. From the examination of VCs' impact on market performance and operating performance, only the age of IPO firms shows the same effects, which is significantly positive. Older firms enjoy better post-IPO performance. It appears that IPO proceeds have no significant influence on the ROE, which is partly consistent with Table 4.3, where proceeds exhibit mixed impact. On the contrary to the findings in Table 4.3, the underpricing and state-owned background are significantly and positively associated with operating performance. Such findings are consistent with the proposition that state-owned IPOs perform superior to the privately-owned IPOs because they get additional benefits from the government. Their operating losses are easily to be made up by government subsidies. High-tech IPOs exhibit significantly lower ROE compared with IPOs in the traditional industry. This is plausible since many high-tech firms invest a great proportion of capital into the research and development of the products in the post-IPO period. Hence, a longer time period than three years may be required before high-tech firms exhibit improved performance.

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[26] Table 5.3 illustrates the results of the OLS regression of the variable *VC-backed* against the 36-month BHARs. The regressions exhibit that VC plays a significantly positive role in improving IPOs' long-run stock market performance.

Table 4.17 Impact of VC on Long-run Operating Performance

	ROE$_1$	ROE$_2$
	(1)	**(2)**
VC-backed	-0.879	-0.989
	(0.252)	(0.187)
IPO Age	1.478	1.604
	(0.003)***	(0.001)***
Underpricing	2.567	2.313
	(0.000)***	(0.000)***
Proceeds	0.056	-0.099
	(0.909)	(0.836)
SOE	8.046	7.148
	(0.000)***	(0.000)***
High-tech	-3.038	-2.722
	(0.000)***	(0.000)***
_cons	-36.88	-35.18
	(0.000)***	(0.000)***
Adj-R^2	0.1263	0.1081
N.	1,013	1,003

Table 4.17 reports the OLS cross-sectional regressions against the changes of ROE$_1$/ROE$_2$ of 1,028 China A share IPOs. In column (1), the dependent variable is changes of ROE$_1$ between year -1 and year +3; In column (2), the dependent variable is changes of ROE$_2$ between year -1 and year +3. The values in the brackets are p-values. *, **, *** denote the significance at 10%, 5%, and 1% levels, respectively.

4.6 VC Reputation and Long-run Operating performance

4.6.1 VC Reputation and ROEs (H$_2$)

The above section reports no significant impact of VCs on IPOs' operating performance. This section will focus on examining whether the reputation of VCs has any impact. This research question is specified in Hypothesis 2 and the Model 4.2 is adopted to carry out the

examination. As in Section 4.3.1, Model 4.2 is also applied twice: first on the sub-sample of VC-backed IPOs, and then on the full sample of IPOs.

Table 4.18 reports the results (Model 4.2) based on the VC-backed IPOs, where the main dependent variable is the VC reputation and the dependent variable is the ROE_1. Seven regressions are listed here because seven proxies are used to measure the VC reputation. Only the *VC Age* shows significantly positive association with ROE_1 at 1% level, with a coefficient of 0.001. This means that as the age of VC increases by 1%, the ROE_1 of VC-backed IPOs will increase by 0.1 percentage point. As suggested by Nahata (2008), older VCs have more experience in their specialised industries, thereby bringing better performance to the IPO firms.

However, the other six measurements (VC's ranking, number, IPO market share, and the size) consistently illustrate that the VC reputation does not have any significant influence on the ROE_1. The results suggest that generally the reputation of VCs cannot effectively distinguish the operating performance of the IPOs they funded from other VC-backed IPOs, implying the rejection of Hypothesis 2. These results accord with the findings in Section 4.3, i.e. VC reputation has no significant impact on the long-run stock market performance ($BHAR_{36}$).

Table 4.19 provides the empirical results of the modified Model 4.2, but it seems that the reputation of VCs fails to present any association with the ROE_1 no matter which proxy is used, including the *VC Age*[27]. Overall, the results lead to the rejection of Hypothesis 2, concluding that VC reputation fails to exert any significant impact on the IPO long-run operating performance.

In addition, the control variables in these two tables generally tell the same story, and they are all significant. The older the IPO firm is or the higher is the underpricing, the higher is the operating performance. Meanwhile higher IPO proceeds lead to lower operating performance. State-owned IPOs perform significantly better than the privately-owned VC-backed IPOs, but the high-tech IPOs perform significantly worse than IPOs of the traditional industry.

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[27] In Table 5.19, there are only 5 regressions. It is because the variable Top 20 and Top 50 are dummy variables, and the value zero means that the ranking of VC is after 20/50. While for non-VC-backed IPOs, no available VC rankings could be found and it is impracticable to replace the missing value in Top 20/50 by zero.

Table 4.18 VC Reputation and ROE$_1$ on the VC-backed IPOs

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				ROE$_1$			
Top-20	0.591						
	(0.689)						
Top-50		0.214					
		(0.881)					
VC Age			0.001				
			(0.001)***				
VC IPO#				-0.038			
				(0.702)			
VC MS$_1$					4.592		
					(0.707)		
VC MS$_2$						8.745	
						(0.446)	
VC Size							0.000
							(0.219)
IPO Age	2.615	2.612	2.458	2.610	2.616	2.632	2.922
	(0.007)***	(0.007)***	(0.010)**	(0.007)***	(0.007)***	(0.006)***	(0.002)***
Underp.	1.919	1.907	1.577	1.857	1.892	1.867	2.124
	(0.082)*	(0.084)*	(0.151)	(0.094)*	(0.087)*	(0.091)*	(0.047)**
Proceeds	-3.842	-3.807	-4.621	-3.819	-3.850	-3.919	-4.235
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
SOE	5.763	5.759	4.563	5.791	5.725	5.713	4.176
	(0.001)***	(0.001)***	(0.007)***	(0.001)***	(0.001)***	(0.001)***	(0.010)***
High-tech	-4.198	-4.180	-4.581	-4.135	-4.107	-4.091	-3.473
	(0.003)***	(0.004)***	(0.001)***	(0.004)***	(0.004)***	(0.004)***	(0.012)**
_cons	-3.007	-3.251	5.017	-2.867	-2.815	-2.236	-1.184
	(0.829)	(0.815)	(0.721)	(0.837)	(0.840)	(0.873)	(0.934)
Adj-R^2	0.0924	0.0921	0.1146	0.0924	0.0925	0.0934	0.1021
N.	470	470	466	470	469	469	454

Table 4.18 reports the cross-sectional OLS regression of seven VC reputation proxies against the changes of ROE$_1$ between year -1 and year +3 based on the sample of 470 VC-backed IPOs from 2007-2012. Numbers in the brackets are p-values; *, **, *** denote the significance at 10%, 5%, and 1% levels, respectively.

Table 4.19 VC Reputation and ROE_1 on the Full sample IPOs

	ROE₁				
	(1)	(2)	(3)	(4)	(5)
VC Age	0.000				
	(0.221)				
VC IPO#		-0.047			
		(0.614)			
VC MS₁			-2.021		
			(0.867)		
VC MS₂				0.878	
				(0.938)	
VC Size					0.000
					(0.526)
IPO Age	1.766	1.820	1.814	1.814	1.953
	(0.006)***	(0.005)***	(0.005)***	(0.005)***	(0.002)***
Underpricing	2.874	2.805	2.848	2.845	3.033
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Proceeds	-1.153	-1.118	-1.104	-1.111	-0.911
	(0.067)*	(0.075)*	(0.079)*	(0.077)*	(0.152)
SOE	6.930	7.212	7.175	7.167	6.525
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
High-tech	-3.160	-3.073	-3.078	-3.077	-2.828
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.004)***
_cons	-27.37	-27.80	-28.00	-27.94	-31.36
	(0.004)***	(0.003)***	(0.003)***	(0.003)***	(0.001)***
Adj-R²	0.0784	0.0774	0.0771	0.0771	0.0766
N.	1,024	1,028	1,027	1,027	1,012

Table 4.19 reports the cross-sectional OLS regression of 5 different VC reputation proxies against the changes of ROE_1 between year -1 and year +3, based on the full sample of 1042 China A share IPOs from 2007-2012. Numbers in the brackets are the p-values; *, **, *** denote the significance at 10%, 5%, and 1% levels, respectively.

4.6.2 High vs. Low Reputation (H_3)

This section focuses on examining the impact of different levels of VC reputation on IPO firms' operating performance, as proposed in Hypothesis 3. Model 4.3 is employed in this section, where the dependent variable is the proxy for post-IPO operating performance. Specifically, it is the difference of ROE_1/ROE_2 between the one year prior-IPO and three years after IPO. The main reputation measurement will be the ranking of the lead VC.

(1) VC Ranking

Table 4.20 reports a series of regression results using the changes in ROE_1 and ROE_2 between year -1 to +3 as the dependent variable, respectively. The VCs with the ranking of top 20/50 VCs are defined as VCs with high reputation (***Top-20/Top-50***) and the rest VCs are defined as VCs with low reputation (***Non-Top-20/Non-Top-50***). Columns (1) and (2) reports the relationship between high and low VC reputation and the changes in ROE_1, while Columns (3) and (4) are based on the ROE_2. All four regressions yield very consistent results: none of the coefficients of the VC reputation metrics exhibit significant signs. Such results indicate that the level of VC reputation makes no significant difference in explaining the long-run post-issue operating performance of IPO firms. IPOs backed by the more reputable VCs exhibit no significant difference of performance from the non-VC-backed IPOs, neither do the IPOs backed by less reputable VCs. Therefore, this leads to the rejection of Hypothesis 3.

Consequently, this thesis rejects the Screening hypothesis of VC reputation where VC exerts significant positive impact on IPO long-run performance. The results also contradict the findings of Jain and Kini (1995), Jain (2001), and Chemmanur and Loutskina (2014). However, the results here are analogous to, but not the same with, the findings of Coakley *et al*. (2007). They conclude that VCs exhibit no significant impact on the IPO performance, although they also find that VC reputation exhibits a significant negative impact on the post-IPO five-year's operating performance.

The effects of control variables reported in the four regressions are also highly consistent. The coefficients of the ***IPO Age*** are significantly and positively associated with the changes in ROE_1/ROE_2 at 1% level, which is consistent with many prior researches proposing that older firms have more experience in coping with the challenges after they get listed (e.g., Barry *et al*. 1990; Megginson and Weiss, 1990; Lerner, 1994; Ljungqvist *et al*., 2006; Coakley *et al*., 2007). The initial returns (***Underpricing***) and ROE_1/ROE_2 display a significantly positive association at 1% level. This is consistent with Jain and Kini (1994)'s Signalling hypothesis which suggests that firms with high initial returns will have superior post-IPO operating performance. It is also consistent with the findings of Lee and Wahal (2004). However, the results here are different from Nahata (2008) who does not find a significant relationship between underpricing and operating performance as well as between VC reputation and operating performance.

Table 4.20 VC Ranking and the Operating performance

	ROE$_1$	ROE$_1$	ROE$_2$	ROE$_2$
	(1)	(2)	(3)	(4)
Top-20	-1.275		-0.924	
	(0.239)		(0.383)	
Non-Top-20	-0.603		-0.951	
	(0.489)		(0.265)	
Top-50		-1.542		-1.168
		(0.130)		(0.240)
Non-Top-50		-0.342		-0.780
		(0.704)		(0.376)
IPO Age	1.471	1.457	1.603	1.596
	(0.004)***	(0.004)***	(0.001)***	(0.001)***
Underpricing	2.563	2.553	2.316	2.312
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Proceeds	0.077	0.075	-0.098	-0.092
	(0.876)	(0.879)	(0.838)	(0.848)
SOE	8.047	8.095	7.144	7.163
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
High-tech	-3.025	-3.001	-2.726	-2.711
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
_cons	-37.08	-36.97	-35.20	-35.22
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Adj-R^2	0.1256	0.1263	0.1071	0.1072
N.	1,013	1,013	1,003	1,003

In **Table 4.20**, Ranking of Top 20/50 is based on Lead VC's ranking in each year; Numbers in the brackets are the p-values; *, **, *** denote the significance at 10%, 5%, and 1% levels, respectively.

The IPOs that have government shareholders (***SOE***) display significantly higher ROEs than the privately-owned IPOs at 1% level. This finding confirms the findings of Clementi (2004) which suggest that government manipulates the performance of listed firms to make the accounting number more attractive. Moreover, high-tech IPOs also significantly

underperformed the IPOs in the traditional industry. In the research of Coakley *et al*. (2007), the high-tech IPOs are also found to exhibit significantly lower operating performance than the traditional IPOs, but only during the "bubble years"/ hot markets. The reason is that small-size firms tend to seek VC investments during the hot markets and get listed by virtue of VCs' support within a short period. The results reported in this study might be because in the first few years after IPO, high-tech firms have to invest a great deal of capital for the product research and development which would lead to large expenditures.

Lastly, the effects of IPO proceeds are mixed across the regressions. Before the two dummy variables **SOE** and **High-tech** are added, variable **Proceeds** shows a significantly positive slope. However, after adding **SOE** and **High-tech**, the slope becomes negative and insignificant. This is possible due to the variable **SOE** absorbing most of the effects of IPO size, given that many state-owned firms are very large.

(2) Other reputation measurements

Table 4.21 reports the results of the impact of VC reputation on the ROE_1 when using other five alternative measurements of VC reputation. In the regressions, VCs with high reputation are classified as the VCs with the value in the upper quartile of the corresponding measurements, while the rest VCs are classified as VCs with low reputation. The empirical results obtained from the alternative reputation measurements are consistent with the results from the VC Zero2 IPO rankings. VC's IPO market share is calculated in two ways: one is based on IPO proceeds, the other is based on IPO market capitalization. The results show that VC's cumulative IPO market share does not show a significant impact of VC reputation. This contrasts with the studies of Nahata (2008), Kristshan *et al*. (2011), and Shu *et al*. (2011), which report that the market share is the only significant proxy for VC reputation.

The five regressions in Table 4.21 generally demonstrate consistent effects: VC reputation exhibits no significant impact on the profitability or the return level of IPO firms. Similarly, in the regressions based on the five alternative reputation measurements and the ROE_2 as reported in Table 4.22, the coefficients of VC reputation remain insignificant. This further confirms that the level of VC reputation does not significantly affect IPO firms' long-run profitability.

Table 4.21 Alternative Reputation Measurements and ROE$_1$

	ROE$_1$				
	VC IPO MS$_1$	VC IPO MS$_2$	VC Age	VC IPO Number	VC Size
High	-1.633	-1.929	-0.104	-2.649	-0.896
	(0.189)	(0.119)	(0.934)	(0.054)*	(0.479)
Low	-0.573	-0.468	-1.123	-0.461	-0.966
	(0.492)	(0.575)	(0.177)	(0.571)	(0.248)
IPO Age	1.452	1.446	1.468	1.490	1.472
	(0.004)***	(0.004)***	(0.004)***	(0.003)***	(0.004)***
Underpricing	2.586	2.578	2.580	2.523	2.553
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Proceeds	0.086	0.096	0.036	0.046	0.034
	(0.862)	(0.845)	(0.941)	(0.926)	(0.945)
SOE	8.058	8.048	7.953	8.095	8.059
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
High-tech	-3.043	-3.044	-3.101	-2.980	-3.030
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
_cons	-37.05	-37.11	-36.55	-36.87	-36.57
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Adj-R^2	0.1259	0.1265	0.1260	0.1276	0.1256
N.	1,013	1,013	1,013	1,013	1,013

In **Table 4.21**, for each reputation measurement, the High is defined as the first largest 25% of the Lead VC in each fiscal year. Changes in ROE$_1$ is calculated by using the value at year (+3) distract the value at year (-1); Numbers in the brackets are the p-values; *, **, *** denote the significance at 10%, 5%, and 1% levels, respectively.

Table 4.22 Alternative Reputation Measurements and ROE$_2$

	ROE$_2$				
	VC IPO MS$_1$	**VC IPO MS$_2$**	**VC Age**	**VC IPO Number**	**VC Size**
High	-1.379	-1.303	0.617	-1.540	-0.345
	(0.253)	(0.281)	(0.616)	(0.255)	(0.780)
Low	-0.791	-0.818	-1.534	-0.861	-1.289
	(0.334)	(0.317)	(0.059)*	(0.278)	(0.115)
IPO Age	1.589	1.593	1.588	1.608	1.587
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
Underpricing	2.327	2.319	2.343	2.299	2.305
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Proceeds	-0.082	-0.086	-0.136	-0.104	-0.126
	(0.865)	(0.858)	(0.777)	(0.829)	(0.793)
SOE	7.154	7.149	6.937	7.169	7.119
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
High-tech	-2.724	-2.727	-2.862	-2.700	-2.714
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
_cons	-35.16	-35.26	-35.29	-34.55	-34.72
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Adj-R^2	0.1077	0.1079	0.1080	0.1077	0.1080
N.	1,003	1,003	1,003	1,003	1,003

In **Table 4.22**, for each reputation measurement, the High is defined as the first largest 25% of the Lead VC in each fiscal year. Changes in ROE$_2$ is calculated by using the value at year (+3) distract the value at year (-1). Numbers in the brackets are the p-values; *, **, *** denote the significance at 10%, 5%, and 1% levels, respectively.

However, in accordance with Nahata (2008), VC age does not show any significant influence on improving the long-run performance in this study. While in Table 4.22, *VC Age* illustrates some exception: the coefficient of *Low* is negatively and weakly significant (10% level). It is possible that less reputable/younger VCs exert negative impact on IPO long-run operating performance. In order to attain and enhance their reputation and experience, younger VCs have the incentive to grandstand, thus leading to inferior performance of IPO firms. So the results here may be interpreted as providing weak support to the findings of research such as Gompers (1996), Gompers *et al*. (2003), Sørensen (2007), and Krishnan *et al*. (2011), where less reputable VCs are found to be associated with worse performance.

Moreover, the cumulative number of IPOs VC have supported (*VC IPO Number*) does not differentiate the profitability of the VC-backed IPOs from the non-VC-backed IPOs. This contradicts a series of studies which have concluded VCs' past performance is an effective indicator to measure the positive impact of VC reputation (Barry *et al*., 1990; Hsu, 2004; Kaplan and Scholar, 2005; Krishnan *et al*., 2011; Atanasov *et al*., 2012). Additionally, the insignificant impact of VC size (*High* and *Low*) implies that the registered capital of VC firms cannot effectively capture VC reputation, although this study is the first to use this proxy for VC reputation.

The impact of control variables illustrated in Table 4.21 and 4.22 affirms the regression results when using the VC ranking as the reputation measurement. The age of IPO firms, underpricing, and the government shareholders all exhibit significantly positive association with the ROE, while the high-tech IPOs suffer from significantly lower ROE than IPOs in traditional industries.

This series of regressions provides the following insights into the impact of VCs on IPOs' long-term operating performance. First of all, VCs seem to exhibit a positive influence on firms' pre-IPO profitability, given the ROE of VC-backed IPOs are higher and faster growing than the non-VC-backed IPOs. However, this effect is reversed after IPO: VC-backed IPOs exhibit great profitability losses compared with the non-VC-backed IPOs. VC reputation does not significantly affect this fall in the profitability of VC-backed IPOs in the long-run. Such conclusions lead to the rejection of VC's screening, monitoring and value-adding functions. Meanwhile, the lack of significance of measurements of VC reputation also leads to the rejection of studies which suggest significantly negative impact of VCs, i.e., Adverse selection and Grandstanding hypothesis.

The failure to identify a significant relationship between the VC reputation and IPO operating performance can be attributed to several reasons. It is commonly acknowledged that VCs focus mostly in the firms with high growth rates and high risks. In the first few years after IPO, the VC-backed firms require a larger proportion of assets/capital inputs than other IPOs particularly in the stage of the new product development. What is more, the new developed products might need years to be recognized by the public before they truly become successful and bring substantial returns to the company. In this case, the first three years after IPO are not long enough to witness the effective impact of VC reputation. This scenario may induce the VC-backed IPOs to display inferior operating performance to the non-VC-backed IPOs in the first few post-IPO years. However, if the more reputable VCs have more experience to monitor the IPO firms as well as providing value-added service, it is also likely that a proportion of VC-backed IPOs will exhibit superior performance than the non-VC-backed IPOs.

The lack of any positive impact of VC reputation on performance might be because of the measurement problem. Primarily, when using the ROE to evaluate the profitability of a company, the main profit indicator is the net profit. One of the biggest defects of net profit is that it can easily be influenced by factors apart from the profit from principal operations, such as profit/loss from other operations, investment income/loss, subsidy income, and income tax, etc. Any of these additional factors can be used as a channel to inflate profits. This conjuncture is line with the window-dressing hypothesis (Dechow and Douglas, 2000). In the years before IPO, firms' profits might be inflated, and their performance might be improved in an effort to appear to be more attractive.

4.6.3 The Impact of Boards (H_4 and H_5)

From the series of regressions, VC reputation appears to have no significant impact on long-run operating performance, but it may be that the impact varies across different boards. Table 4.23 reports the cross-sectional regressions of VC ranking and the changes in ROE_1 and ROE_2 between the year -1 to +3 carried out by boards. The first group is the IPOs listed on the Main board, and the second group is the IPOs listed on the SME and ChiNext boards. In accordance with the results based on the full sample, Table 4.23 reveals that the level of VC reputation exhibits no significant impact on either board regardless of which metric is used. Table 4.24 and Table 4.25 report the regression results of using alternative

measurements of VC reputation. Again, they suggest that the level of VC reputation exhibits no significant impact on operating performance, with one exception.

The age of VC is found to show weakly significant impact. In Table 4.24, on the Main board, IPOs backed by older VCs are found to exhibit 8.033 percentage point lower ROE_1 than the non-VC-backed IPOs, although it is only significant at 10% level. While VCs exert no significant impact on the ChiNext and SME boards. When replacing ROE_1 with ROE_2, the VC age again appears to have negative effects on the operating performance of IPOs on the main board and positive effects on the operating performance of IPOs on the SME and ChiNext boards (at the 10% level).

The results are reported here as a matter of record but are not sufficiently enough to generate any firm conclusions, particularly when being taken together with the results from the other reputation metrics.

Table 4.23 VC Ranking and Operating Performance by Boards

	ROE$_1$				ROE$_2$			
	Main	**Other**	**Main**	**Other**	**Main**	**Other**	**Main**	**Other**
Top-20	-2.709	-0.368			-2.807	-0.140		
	(0.399)	(0.744)			(0.394)	(0.898)		
Non-Top-20	1.789	-0.093			0.807	-0.354		
	(0.574)	(0.917)			(0.805)	(0.680)		
Top-50			-2.709	-0.620			-2.807	-0.092
			(0.399)	(0.556)			(0.394)	(0.928)
Non-Top-50			1.789	0.109			0.807	-0.254
			(0.574)	(0.906)			(0.805)	(0.775)
IPO Age	2.298	1.574	2.298	1.561	2.801	1.720	2.801	1.715
	(0.12)	(0.003)***	(0.12)	(0.003)***	(0.057)*	(0.001)***	(0.057)*	(0.001)***
Underpricing	4.465	1.595	4.465	1.587	3.816	1.371	3.816	1.368
	(0.088)*	(0.004)***	(0.088)*	(0.004)***	(0.154)	(0.011)**	(0.154)	(0.011)**
Proceeds	1.046	-3.393	1.046	-3.39	0.757	-3.473	0.757	-3.464
	(0.391)	(0.000)***	(0.391)	(0.000)***	(0.544)	(0.000)***	(0.544)	(0.000)***
SOE	14.75	5.333	14.75	5.370	15.87	4.150	15.87	4.147
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
High-tech	0.366	-2.849	0.366	-2.828	2.345	-2.691	2.345	-2.682
	(0.916)	(0.000)***	(0.916)	(0.000)***	(0.509)	(0.000)***	(0.509)	(0.000)***
_cons	-56.94	0.42	-56.94	0.475	-57.89	1.234	-57.89	1.165
	(0.010)***	(0.963)	(0.010)***	(0.959)	(0.010)***	(0.889)	(0.010)***	(0.895)
Adj-R^2	0.2863	0.1108	0.2863	0.1112	0.2479	0.0997	0.2749	0.0995
N.	108	905	108	905	109	894	109	894

In Table 4.23, Top 20 is based on Lead VC's ranking in each fiscal year. Changes in ROE1/ROE2 are the difference between year (+3) and year (-1); 'Other' refers to IPOs listed on SME and ChiNext boards; Numbers in the brackets are the p-values; *, **, *** denote the significance at 10%, 5%, and 1% levels, respectively.

Table 4.24 Alternative Reputation Measurements and ROE$_1$ by Boards

	VC IPO MS$_1$		VC IPO MS$_2$		VC Age		VC IPO Number		VC Size	
	Main	**Other**	**Main**	**Other**	**Main**	**Other**	**Main**	**Other**	**Main**	**Other**
High	-2.445	-0.897	-2.933	-1.138	-8.033	1.567	-2.654	-1.525	-2.073	0.242
	(0.479)	(0.496)	(0.392)	(0.386)	(0.096)*	(0.220)	(0.596)	(0.276)	(0.578)	(0.854)
Low	0.974	0.026	1.357	0.100	1.991	-0.825	-0.043	0.067	2.101	-0.374
	(0.749)	(0.975)	(0.656)	(0.906)	(0.479)	(0.333)	(0.987)	(0.936)	(0.506)	(0.660)
IPO Age	2.429	1.541	2.451	1.532	2.434	1.561	2.182	1.590	2.149	1.572
	(0.106)	(0.004)***	(0.101)	(0.004)***	(0.096)*	(0.003)***	(0.142)	(0.003)***	(0.144)	(0.003)***
Underpricing	4.278	1.610	4.168	1.601	5.144	1.629	4.163	1.578	4.393	1.597
	(0.103)	(0.004)***	(0.112)	(0.004)***	(0.050)**	(0.003)***	(0.119)	(0.005)***	(0.098)*	(0.004)***
Proceeds	1.057	-3.385	1.129	-3.386	1.490	-3.486	0.788	-3.376	0.807	-3.407
	(0.390)	(0.000)***	(0.359)	(0.000)***	(0.230)	(0.000)***	(0.522)	(0.000)***	(0.510)	(0.000)***
SOE	14.88	5.349	14.63	5.350	15.51	5.083	14.75	5.388	15.27	5.319
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
High-tech	0.620	-2.855	0.477	-2.852	0.961	-2.997	0.635	-2.811	0.360	-2.851
	(0.858)	(0.000)***	(0.890)	(0.000)***	(0.778)	(0.000)***	(0.855)	(0.000)***	(0.917)	(0.000)***
_cons	-58.09	0.574	-58.94	0.662	-64.63	1.638	-52.66	0.114	-53.39	0.606
	(0.010)***	(0.950)	(0.008)***	(0.942)	(0.004)***	(0.858)	(0.018)**	(0.990)	(0.016)**	(0.947)
Adj-R²	0.2816	0.1112	0.2849	0.1116	0.3015	0.1140	0.2778	0.1120	0.2832	0.1110
N.	108	905	108	905	108	905	108	905	108	905

In **Table 4.24**, for each reputation measurement, the High is defined as the first largest 25% of the Lead VC in each fiscal year. Changes in ROE$_1$ the difference between year (+3) and year (-1); 'Other' refers to IPOs listed on SME and ChiNext boards; Numbers in the brackets are the p-values; *, **, *** denote the significance at 10%, 5%, and 1% levels, respectively.

Table 4.25 Alternative Reputation Measurements and ROE_2 by Boards

	VC IPO MS$_1$		VC IPO MS$_2$		VC Age		VC IPO Number		VC Size	
	Main	**Other**	**Main**	**Other**	**Main**	**Other**	**Main**	**Other**	**Main**	**Other**
High	-2.283	-0.556	-2.368	-0.426	-8.921	2.088	-1.024	-0.544	-2.403	0.873
	(0.519)	(0.661)	(0.507)	(0.738)	(0.071)*	(0.093)*	(0.842)	(0.690)	(0.530)	(0.493)
Low	-0.067	-0.078	-0.042	-0.118	1.050	-0.986	-0.970	-0.184	0.893	-0.544
	(0.983)	(0.924)	(0.989)	(0.885)	(0.716)	(0.230)	(0.727)	(0.820)	(0.783)	(0.509)
IPO Age	2.867	1.692	2.851	1.699	2.990	1.676	2.729	1.713	2.668	1.700
	(0.055)*	(0.001)***	(0.055)*	(0.001)***	(0.040)**	(0.001)***	(0.065)*	(0.001)***	(0.068)*	(0.001)***
Underpricing	3.684	1.371	3.650	1.364	4.450	1.434	3.763	1.357	3.695	1.370
	(0.171)	(0.011)**	(0.175)	(0.012)**	(0.096)*	(0.008)***	(0.168)	(0.012)**	(-0.174)	(0.011)**
Proceeds	0.740	-3.456	0.752	-3.462	1.222	-3.554	0.626	-3.457	0.526	-3.474
	(0.557)	(0.000)***	(0.551)	(0.000)***	(0.336)	(0.000)***	(0.619)	(0.000)***	(-0.675)	(0.000)***
SOE	15.94	4.181	15.81	4.172	16.60	3.760	15.83	4.184	16.28	4.079
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
High-tech	2.551	-2.672	2.347	-2.676	2.916	-2.835	2.569	-2.661	2.316	-2.668
	(0.472)	(0.000)***	(0.511)	(0.000)***	(0.405)	(0.000)***	(0.470)	(0.000)***	(-0.515)	(0.000)***
_cons	-58.17	1.250	-58.07	1.262	-66.06	2.562	-55.65	1.121	-54.38	1.411
	(0.011)**	(0.888)	(0.011)**	(0.887)	(0.004)***	(0.772)	(0.014)**	(0.899)	(0.016)**	(0.873)
Adj-R^2	0.2708	0.0996	0.2718	0.0995	0.2933	0.1075	0.2685	0.0996	0.2720	0.1008
N.	109	894	109	894	109	894	109	894	109	894

In **Table 4.25**, for each reputation measurement, the High is defined as the first largest 25% of the Lead VC in each fiscal year. Changes in ROE_2 is the difference between year (+3) and year (-1); 'Other' refers to IPOs listed on SME and ChiNext boards; Numbers in the brackets are the p-values; *, **, *** denote the significance at 10%, 5%, and 1% levels, respectively.

4.7 Conclusions

According to the analysis in the sub-sections 4.5 and 4.6, VC reputation is found to exert no significant impact on long-run operating performance of China A share IPO firms. The results presented in sub-sections 4.2 and 4.3 show that VC reputation does exert a significant positive impact on the stock market performance (measured by BHARs). Such mixed findings about VC's function may be explained in several ways.

Firstly, the stock market performance reflects the value of the listed firms in the expectations of investors about the prospects of the IPO firm in the future. According to the Certification function, the presence of a VC can efficiently reduce the information asymmetry between IPO firms and the outsiders. VCs are able to select more qualified firms. Table 4.4 appears consistent with these two theories. The comparisons between characteristics of IPO firms demonstrate that VC-backed IPOs have significantly larger size and are older than the non-VC-backed IPOs. Moreover, they benefit from significantly less uncertainty during the process of IPO as they exhibit lower gaps and underpricing levels. Therefore, IPOs funded by VCs have been labelled as high quality and high potential firms which have large growth possibilities in the future to investors. As investors build up confidence and positive expectations, the VC-backed IPOs are more likely to show favourable stock price performance in the post-IPO period.

Secondly, IPO operating performance is measured here using ROE, a ratio based on accounting numbers. These data reflect recent past performance (e.g. earnings over the last 12 months) and so have limited ability to reflect forward-looking expectations. This is a particular issue for recent IPOs since some, particularly in the high-tech sector, may not currently be making notable profits. However, these IPOs may still be viewed positively by investors if it is believed that their long-term prospects are healthy. As a result, a discrepancy appears when company share price performance and earnings performance over one, two or three years following the IPO date.

Thirdly, there is the possibility that net profit used in ROE may be problematic as a measure of operating performance. VC reputation appears to play a mixed role on China A share IPO firms. It exerts a significant and positive role in improving the post-IPO stock market returns. However, VC reputation seems to have no influencing power on the post-IPO ROE after three years of issuing.

Chapter 5

Robustness Checks and Measurements of

VC reputation

This chapter begins by examining the robustness of the findings in the prior chapter, taking into account the selection bias of VCs. The results of the Heckman two-step model reiterate the prior findings on the impact of both VC-backing and VC reputation on the long-run post-IPO stock market performance. Next, this chapter further explores how the various proxies for VC reputation are related to each other and which characteristics affect the Zero2IPO ranking of VCs. VCs with higher IPO market shares, more IPOs, and larger capital size are more likely to have higher rankings whereas age is not an influential factor. Furthermore, occupying more seats on the board and engaging in more syndication investments also contribute to higher rankings. In contrast, VCs' pre-IPO shareholdings and serving durations in the IPO firms do not seem to influence their rankings. Additionally, VCs with foreign ownership tend to rank more highly while state-owned VCs do not.

5.1 Robustness Checks

From the analysis in Chapter 4, VCs are found to have a significant positive impact on IPO firms' long-run stock market performance, and there is some limited evidence that the impact is stronger if VCs are more reputable, based on the size of the slope coefficients[28].

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[28] Un-tabulated statistic tests reveal no significant difference between high and low reputation VCs at the 0.10 level, however.

In this section, supplementary tests are conducted to check the robustness of the earlier results and the consistency of the VC reputation measurements.

5.1.1 Models

The results from the previous analysis will be re-examined taking account of the selection bias problem. To be more specific, VC investments are not randomly assigned. On the one hand, prior to an investment, VCs conduct elaborate due diligence and analyses among dozens of applicants, and only a few private firms will be chosen (Sahlman, 1990; Kaplan and Stromberg, 2003; Lee and Wahal, 2004). What is more, the amount of cash flow allocated in each chosen firm depends greatly on the VC's expectations regarding the method of exit, i.e. IPO or M&A. VCs may choose more qualified firms as investees ex ante, which then means that VC-backed IPOs are highly likely to have a better performance during the post investment period.

On the other hand, only firms that are capable of taking advantage of VCs are willing to seek funding opportunities from VCs. Generally, as reputable VCs have more experienced in nurturing venture firms, very promising venture firms with great growth potential also prefer to choose reputable VCs to achieve their development goals. Meanwhile, higher quality private venture firms are more able to balance the trade-off between receiving benefits and giving up part of their control rights to VCs. This is because more reputable VCs are more likely to ask for seats on the board of directors in addition to equity stakes.

Consequently, it is possible that an endogeneity problem may exist here. For example, as shown in Table 3.3, 89% of VC-backed IPOs choose to list on the ChiNext and SME boards, and both are described as smaller scale boards. Given the potential endogeneity choice between VCs and IPO firms, it may be that the parameters obtained earlier when estimating the impact of VCs on the IPO performance are biased. To address such concerns, the Heckman Two-step selection procedure will be applied here.

Heckman two-step selection model

As proposed by Heckman (1979), this model is built to address the concerns of the selection bias. The first step is to estimate the probability of VCs making investments in the private venture firms. This step uses a Probit model where the dependent variable is a binary variable, i.e. the dummy variable, ***VC-backed***, denoting whether the IPO firms are VC-backed. This step reflects the characteristics of IPO firms that are likely to influence the

choice of VC investments. The second-step regression includes the Inverse Mill's Ratio (**IMR**) calculated from the first-step model as an additional explanatory variable to correct the selection bias when estimating the effects of VC reputation on the IPO long-run stock market performance. In summary, the models are:

First Step (Probit regression):

$$Pr\ (\textbf{VC backed}_i = 1) = \alpha_0 + \alpha_1\ Province_i + \alpha\ X_i + \varepsilon_i \qquad (5.1)$$

Second step (OLS regression):

$$\textbf{LR Perf}_i = \beta_0 + \beta_1\ VC\ backed_i + \beta_2\ IMR_i + \beta X_i + \mu_i \qquad (5.2)$$

$$\textbf{LR Perf}_i = \beta_0 + \beta_1\ VC\ Rep_i + \beta_2\ IMR_i + \beta X_i + \mu_i \qquad (5.3)$$

$$\textbf{LR Perf}_i = \beta_0 + \beta_1\ High_i + \beta_2\ Low_i + \beta_3\ IMR_i + \beta X_i + \mu_i \qquad (5.4)$$

$\textbf{VC backed}_i$ is a dummy variable. It is equal to one if the IPO i is backed by VC and equal to zero if it is not. $Province_i$ denotes the the cumulative number of IPO firms in the province where the IPO i is located one year prior to the firm being listed. X_i is a set of control variables which are used in previous models, including the age of the IPO firm, underpricing, IPO proceeds, IPO firm's state ownership, and whether it is a high-tech firm..

The logic of including $Province_i$ is as follows. Firstly, it not only reveals the supply and demand of VC investments but is also independent of IPO firms' post-issue performance. Under a special transition economy where the legal system is not well-established, local governments are responsible for screening and selecting qualified firms to go public in their region/province, as well as regulating the quota of IPOs (Du and Xu, 2009; Guo, *et al.*, 2015). Usually the quota of IPOs in the coming year is predictable by referring to the numbers in the past years. VCs are more likely to place extra emphasis on firms located in the area with high IPO quotas in the recent years, which will enhance the chance of getting portfolio firms listed.

In addition, the number of listed firms is highly related to the development of economic innovation and high-tech industries in each area. As is conductive to the development of innovative enterprises, a large proportion of IPO firms assemble in the regions that have followed progressive economic transition policies. VCs by virtue of their preference for

high-tech deals are more willing to expand the investments in such regions because of higher expected valuations.

In the second step regressions, IMR_i refers to the inverse Mill's ratio of IPO i. The control variables remain the same as in the first step. Equation 5.2 pertains to Model 3.1, which estimates how the IPO firms' performance differs by the inclusion of VC investments. Equation 5.3 pertains to Model 3.2, aiming at estimating whether the VC reputation exerts any significant impact on IPO firms' long-run performance. Equation 5.4 pertains to Model 3.3, and examine whether the impact of VCs differs with the level of VC's reputation.

Modified Heckman two-step Model

An alternative method is also employed to control for selection bias as proposed by Heckman and Robb (1985) and Wooldridge (2002). First of all, the same first step regression (Probit) is regressed as discussed above. However, instead of calculating the inverse Mill's ratio, the predicted value of the dependent variable (the **VC backed** is a binary variable) of the first step regression is calculated, which is expressed as $\widehat{VCbacked}$. This variable is used to predict the probability of VC's selection: the likelihood that a VC would invest the firm. Then, similar to the inverse Mill's ratio, predicted value $\widehat{VCbacked}$ is applied in the second-step regression. In this way, the relationship between VC reputation and IPOs' long-run performance are estimated with the correction of the selection-bias problem. The regression models of the second step are then expressed as:

Second step (OLS regression):

$$LR\ Perf_i = \beta_0 + \beta_1\ VC\ backed_i + \beta_2\ \widehat{VCbacked}_i + \beta X_i + \mu_i \tag{5.5}$$

$$LR\ Perf_i = \beta_0 + \beta_1\ VC\ Rep_i + \beta_2\ \widehat{VCbacked}_i + \beta X_i + \mu_i \tag{5.6}$$

$$LR\ Perf_i = \beta_0 + \beta_1\ High_i + \beta_2\ Low_i + \beta_3\ \widehat{VCbacked}_i + \beta X_i + \mu_i \tag{5.7}$$

5.1.2 Results

VC and IPO Performance

Table 5.1 reports the results of using the Heckman Selection model to estimate the impact of VCs on IPO firms' long-run performance. Column (1) reports the results of the first-step regression of Model 5.1, where the cumulative number of IPO firms in the province where the IPO firm (in our sample) is located one year prior to the IPO year is introduced as one of the variables that could impact VC's choice. A positive significant slope for this variable indicates that VC investors are indeed sensitive to cumulative numbers of listed firms in an area/province. They are more likely to invest in firms located in an area with a high frequency of listed firms. Furthermore, all other control variables are statistically significant, indicating that VC-backed IPOs are older, can raise more capital at the time of IPO, and have lower underpricing. Whether firms are high-tech and state-owned also has a significant impact on the investment behaviour of VCs. The specification of the selection step is important since all the control variables in the predictive model of VC-backing are significant.

According to the results of the selection equation, the IMR is calculated and $\widehat{VCbacked}$ is estimated. Columns (2) and (3) report the results of Models 5.2 and 5.5, estimating the impact of VCs in the OLS framework. In both regressions, VC-backed IPOs continue to exhibit significantly superior long-run market returns. On average, VC-backed IPOs appear to enjoy around 13.8 percent higher $BHAR_{36}$ than the non-VC-backed IPOs. Such results are very close to the results obtained in Table 4.3 where the selection bias has not been controlled[29]. However, the IMR and $\widehat{VCbacked}$ are not significant at all, suggesting the selection bias may not be a big issue in the estimations here. In other words, the regression results specify that VC's choice of their portfolio firms displays little selection bias.

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[29] VC-backed are found to show 14 percent higher $BHAR_{36}$ relative to the non-VC-backed IPOs.

Table 5.1 Heckman 2-step on Impact of VC (Table 4.3)

	1st Step	2nd Step	
	VC-backed	BHAR$_{36}$	
	(1)	(2)	(3)
Province$_\#$	0.001		
	(0.029)**		
IMR		-0.236	
		(0.600)	
$\widehat{VCbacked}$			0.679
			(0.397)
VC-backed		0.137	0.138
		(0.011)**	(0.010)***
Ln (IPO Age)	0.150	0.018	0.032
	(0.005)***	(0.758)	(0.584)
Underpricing	-0.108	-0.053	-0.060
	(0.063)*	(0.276)	(0.243)
Ln(Proceeds)	0.118	0.019	0.030
	(0.017)**	(0.706)	(0.529)
SOE	0.194	-0.205	-0.190
	(0.034)**	(0.008)***	(0.015)**
High-tech	0.203	0.169	0.190
	(0.011)**	(0.046)**	(0.026)**
_cons	-2.910	-0.695	-0.438
	(0.000)***	(0.285)	(0.733)
Pseudo R^2	0.0242		
Adj-R^2		0.042	0.042
N	1,086	1,086	1,086

In **Table 5.1**, the ***Province$_\#$*** is the cumulative numbers of IPO firms in the province where the IPO firm is located one year prior to the firms get listed; ***IMR*** is the inverse Mill's ratio; $\widehat{VCbacked}$ is the estimated value of VC-backed variable from the first-step regression; values in the brackets are the p-values; *, **, *** denote significance at 10%, 5%, and 1% levels, respectively.

VC Reputation and IPO Performance

The above analysis shows that the positive impact of VC-backing on IPO firms' long-run performance remains statistically unaltered. The next step is to re-examine whether the results for VC reputation, reported in Chapter 5, also remain robust after correcting for selection bias. The logic of using Models 5.3 and 5.6 is as follows. For this re-examination, it will be assumed that the selection of VCs with high and low reputation is based on the same factors. Therefore, it is rational to use the inverse Mills ratio or predicted VC investment probabilities derived from first-step (Model 5.1) to control for selection bias in the estimation of impact of VC reputation.

The regression results of Models 5.3 and 5.6 are presented together in Table 5.2. Similar to Table 4.4, the models are applied on the sub-sample of VC-backed IPOs. The two methods yield consistent results: VC reputation seems to play no significant role in distinguishing differences in long-run returns among VC-backed IPOs as none of the reputation proxies is significant. Furthermore, the IMR and $\widehat{VCbacked}$ also exhibit no significant slopes, and this further verifies that selection bias is not a big issue in the estimations here. The coefficients of the control variables are not listed in this table as they remain qualitatively unchanged relative to those reported in Table 4.4.

The same models are then replicated on the full sample of IPOs (i.e., including IPOs not backed by VCs) and the results are reported in Table 5.3. Again, the two models yield similar results to the earlier results shown in Table 4.5. All but two of the VC reputation measurements (*VC Age* and *VC Size*) exhibit a positive relation with the long-run performance. This means that compared to non-VC-backed IPOs, older VCs and larger-size VCs are more likely to be associated with better superior IPO performance. The coefficients of the control variables are not listed as their sign and significance are unchanged. The statistically insignificant results of inverse Mills ratio and estimated VC-backed variables again reveal that selection bias is not a big concern for this study.

Table 5.2 Heckman 2-step on the Impact of VC Reputation on VC-backed IPOs (Table 4.4)

	Inverse Mill's Ratio							VCbacked						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Top-20	0.038							0.035						
	(0.658)							(0.683)						
Top-50		0.011							0.008					
		(0.892)							(0.928)					
VC Age			-0.028							-0.027				
			(0.632)							(0.638)				
VC IPO#				0.003							0.003			
				(0.641)							(0.653)			
VC MS$_1$					-0.831							-0.846		
					(0.204)							(0.196)		
VC MS$_2$						-0.857							-0.870	
						(0.164)							(0.158)	
VC Size							-0.010							-0.010
							(0.451)							(0.453)
IMR	-0.770	-0.802	-0.797	-0.785	-0.887	-0.893	-0.693							
	(0.270)	(0.252)	(0.252)	(0.257)	(0.201)	(0.198)	(0.325)							
VCbacked								1.574	1.633	1.607	1.599	1.778	1.785	1.384
								(0.193)	(0.178)	(0.183)	(0.183)	(0.139)	(0.137)	(0.258)
Control Var.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	450	450	446	450	449	449	434	450	450	446	450	449	449	434
Adj-R²	0.023	0.022	0.023	0.023	0.026	0.027	0.019	0.024	0.023	0.024	0.024	0.027	0.028	0.019

In **Table 5.2**, Models 5.3 and 5.6 are examined based on the 450 VC-backed IPOs sub-sample. The **IMR** is the inverse Mill's ratio; **VCbacked** is the estimated value of VC-backed variable from the first-step regression; values in the brackets are the p-values; *, **, *** denote significance at 10%, 5%, and 1% levels, respectively.

Table 5.3 Heckman 2-step on the Impact of VC Reputation on the Full sample IPOs (Table 4.5)

	Inverse Mill's Ratio					VCbacked				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
VC Age	0.018					0.018				
	(0.012)**					(0.013)**				
VC IPO#		0.008					0.008			
		(0.119)					(0.127)			
VC MS$_1$			-0.188					-0.209		
			(0.763)					(0.738)		
VC MS$_2$				-0.370					-0.389	
				(0.532)					(0.511)	
VC Size					0.012					0.012
					(0.025)**					(0.026)**
IMR	-0.223	-0.251	-0.315	-0.327	-0.195					
	(0.622)	(0.580)	(0.487)	(0.471)	(0.668)					
VCbacked						0.653	0.707	0.830	0.851	0.594
						(0.418)	(0.380)	(0.304)	(0.292)	(0.464)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1,082	1,086	1,085	1,085	1,070	1,082	1,086	1,085	1,085	1,070
Adj-R^2	0.042	0.038	0.036	0.036	0.040	0.042	0.039	0.037	0.037	0.040

In **Table 5.3**, Models 5.3 and 5.6 are examined based on the full sample IPOs. The **IMR** is the inverse Mill's ratio; **VCbacked** is the estimated value of VC-backed variable from the first-step regression; values in the brackets are the p-values of coefficients. The control variables included are Age of IPO firm, underpricing, IPO proceeds, a dummy for state ownership, and a dummy for high-tech. *, **, *** denote significance at 10%, 5%, and 1% levels, respectively.

High & Low Reputation and IPO Performance

This section examines the impact of VC reputation (i.e. high and low) after the correction for selection bias. The same selection equation is still used to model the likelihood of VCs making investments in private firms. As listed in Models 5.4 and 5.7, the ***IMR*** and the $\widehat{VCbacked}$ calculated from the first-step probit regression will be added in the second-step regression as an extra regressor to estimate the impact of the level of VC reputation on IPO firms' long-run performance, respectively.

In these two models, VCs are separated into two groups - high and low reputation. These two second-step regressions pertain to Model 4.3 estimated in Tables 4.6 and 4.7. Table 5.4 shows the results of the regressions, where VC reputation is measured by the annual Zero2IPO rankings: the ranking of Top 20/50 VCs is defined as VCs with high reputation and the rest are defined as VCs with low reputation. Column (1) uses the ***IMR*** to correct the VC selection bias. The results remain statistically consistent with Table 4.6[30]. Relative to non-VC-backed IPOs, IPOs funded by Top 20 VCs outperform the IPOs funded by lower ranking VCs, albeit the difference is slight. More specifically, IPOs funded by Top 20 VCs enjoy 14.5 percentage points higher $BHAR_{36}$ values, while the IPOs by remaining VCs with low reputation exhibit $BHAR_{36}$ that are 13.7 percent higher than the non-VC-backed IPOs. However, un-tabulated tests reveal this difference between VC-backed IPOs to be insignificant at the 10% level.

In Column (2) where Top 50 VCs are classified as VCs with high reputation, the impact of VC reputation is generally consistent with Column (1). Although the coefficient of ***Non-Top-50*** (0.141) is slightly higher than for ***Top-50*** (0.138), this difference is not significant (un-tabulated). Compared to the results prior to the control of selection bias (in Table 4.7), the results here are still quite consistent.

Uniform results are obtained from Columns (3) and (4) where $\widehat{VCbacked}$ is used as the variable to control VC selection. Overall, such results indicate that getting rid of the selection bias, VCs exert a positive impact on post-IPO long-run performance, regardless of the level of VC reputation. The model is re-examined in regressions where VC reputation is measured by alternative proxies and the results are reported in Appendix A.4.

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[30] In Column (8) of Table 4.6, the coefficient of Top-20 is 0.149 which is significant at 10% level; the coefficient of non-Top-20 is 0.137 which is significant at 5% level.

Table 5.4 VC Ranking and BHAR$_{36}$

	Inverse Mill's Ratio		VCbacked	
	(1)	(2)	(3)	(4)
Top-20	0.145		0.141	
	(0.063)*		(0.070)*	
Non-Top-20	0.137		0.136	
	(0.025)**		(0.025)**	
Top-50		0.138		0.134
		(0.057)*		(0.064)*
Non-Top-50		0.141		0.141
		(0.027)**		(0.026)**
IMR	-0.229	-0.235		
	(0.612)	(0.605)		
VCbacked			0.668	0.681
			(0.407)	(0.400)
Control Variables	Yes	Yes	Yes	Yes
_cons	-0.452	-0.442	-0.698	-0.696
	(0.725)	(0.731)	(0.283)	(0.285)
Adj-R^2	0.041	0.041	0.042	0.042
N	1,086	1,086	1,086	1,086

In **Table 5.4**, the second step OLS regression is based on the full sample IPOs. The ***IMR*** is the inverse Mill's ratio*; **VCbacked** is the estimated value of VC-backed variable from the first-step regression; Values on the brackets are p-values; *, **, *** denote significance at 10%, 5%, and 1% levels, respectively.

VC reputation on different Boards

From the previous analysis, the significant positive impact of VC-backing/VC reputation is found to be driven by the impact on the IPOs in the non-Main Board. This section estimates the robustness of such results controlling for selection bias. Models 5.4 and 5.7 will be re-examined on the sub-samples, i.e. IPOs listed on the main board, and IPOs listed on the SME and ChiNext boards. Again the Zero2IPO ranking is used as the reputation measurement and the Top 20/50 VCs are classed as reputable VCs. Table 5.5 reports the results, which are highly consistent with early studies, while the results of control variables are statistically unchanged from Table 4.11.

VC-backed IPOs on the ChiNext and SME boards still exhibit significantly superior performance. The coefficients suggest that more reputable VCs appear to produce greater performance improvements to the IPOs than the less reputable VCs, when compared to the non-VC-backed IPOs. Again, this difference is not statistically significant at the 10% level (un-tabulated). In contrast, on the main board, neither the higher reputation VCs nor the lower reputation VCs have any significant impact on the long-run performance (compared to non-VC-backed IPOs).

In addition, Models 5.4 and 5.7 are also re-examined by using the alternative reputation measurements. However, none of the five proxies reveal any significant impact of VC reputation. The coefficients of IMR and $\widehat{VCbacked}$ remain insignificant[31], suggesting that the selection bias is not a big issue in this research.[32]

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[31] These results are shown in Appendix A.5.
[32] Sorenson (2007) and Nahata (2008) claim that VC's choices of investment projects are associated with selection bias and that it is necessary to correct this when estimating the impact of VC on IPOs.

Table 5.5 VC Ranking and BHAR$_{36}$ by Boards (Table 4.11)

	Inverse Mill's Ratio				VCbacked			
	Ranking 20		Ranking 50		Ranking 20		Ranking 50	
	Main	Other	Main	Other	Main	Other	Main	Other
Top-20	-0.120	0.188			-0.116	0.186		
	(0.556)	(0.027)**			(0.569)	(0.029)**		
Non-Top-20	0.015	0.144			0.015	0.144		
	(0.939)	(0.028)**			(0.938)	(0.028)**		
Top-50			-0.120	0.171			-0.116	0.169
			(0.556)	(0.030)**			(0.569)	(0.032)**
Non-Top-50			0.015	0.150			0.015	0.150
			(0.939)	(0.028)**			(0.938)	(0.028)**
IMR	1.057	-0.227	1.057	-0.237				
	(0.464)	(0.637)	(0.464)	(0.623)				
VCbacked					-1.388	0.569	-1.388	0.588
					(0.578)	(0.508)	(0.578)	(0.495)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	155	931	155	931	155	931	155	931
Adj-R^2	0.050	0.038	0.050	0.038	0.049	0.038	0.049	0.038

Table 5.5 reports the results of Models 5.4 and 5.7. VC reputation is measured by the Top 20/50 ranking of VC. The ***IMR*** is the inverse Mill's ratio; ***VCbacked*** is the estimated value of VC-backed variable from the first-step regression; values in the brackets are the p-values of coefficients; The control variables included are Age of IPO firm, underpricing, IPO proceeds, dummy variable for SOE, and dummy variable for high-tech; *, **, *** denote significance at 10%, 5%, and 1% levels, respectively.

5.2 Measurements of VC Reputation

Chapter 5 has examined the effects of VC reputation on IPO firms' long-term stock market performance and operating performance, using a variety of proxies for VC reputation. In general, these yield consistent results across the various regressions. However, the proxy measurements of reputation are far from being perfectly correlated.

Among the five types of proxies for reputation, *VC ranking* is the most multi-faceted metric. Released by the Zero2IPO research group, it evaluates VC's performance every fiscal year on the basis of a variety of aspects, including the Capital under Management, the Amount of Capital Raised, Investment, Exits, and the Comprehensive Returns[33]. This measure is used in Chapter 5 to construct the dummy variables ***Top-20*** and ***Top-50***. An advantage of using this metric as a proxy for reputation is that it captures the time-varying performance VCs on a year-by-year basis. Secondly, it is constructed from a range of individual indicators and thereby reflects a 'composite' of quality signals, which is likely to be more reliable than using any single-item indicator. The alternative proxies for VC reputation are:

(1) ***VC's IPO market share*** is calculated based on IPO proceeds and IPO market capitalization, respectively. The cumulative market share of a VC may reveal the VC's control of the market, and whether it has a defensible competitive position in a certain period.

(2) ***VC's IPO number*** primarily illustrates a VC's activity in the capital market and its popularity among entrepreneurial start-up firms. This variable differs from the current year's IPO number (used in the Zero2IPO VC Ranking) as it counts the cumulative number of IPOs through the sample period.

(3) ***VC Age*** reflects a VC's survivorship across years of fierce competition and ever-changing financial market conditions.

(4) ***Registered capital*** measures a VC's size in terms of the capital recorded at its starting point. A VC company with a substantial capital backing may be viewed as reliable

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[33] Table 4.5 lists the weights of each component that are involved to assess the ranking in each year across 2004 to 2012. The detailed explanation about this table and how the ranking is constructed has been explicitly shown in Section 4.1.3, Chapter 4.

and attractive in the market. As with the Zero2IPO metric, this measure too is unique to this study.

Many prior studies have based their conclusions about VC reputation on using single-item proxies. This thesis includes these for comparative purposes but prefers to focus on a market-based, real-world ranking system (Zero2IPO). Consequently, an intriguing question is whether these individual measurements are associated with the Zero2IPO ranking of VCs. Another issue is whether these single-item measurements are correlated to each other.

5.2.1 Variables and Models

In order to address the questions, a Probit model is applied separately to the two dummy variables Top 20 and Top 50. The explanatory variables are the other four measurements, along with a series of characteristics that are also suggested to be decisive to the evaluation of VC reputation.

(1) ***Pre-IPO shareholdings.*** The VC's pre-IPO equity holdings in the IPO firms could reveal the extent of a VC's involvement with the firm, and its ability to provide capital to IPO firms (Barry *et al*., 1990). A VC that invests more is likely to be more engaged in the funded firms and provide more screening and monitoring functions. The variable is constructed by summing up each VC's total pre-IPO equity holdings in all the IPO firms it has funded in each year.

(2) ***Board Member.*** This variable measures the total number of seats that the VC occupies on the board of directors of the IPO firm. It has been commonly acknowledged that VC's most significant specialty as an equity investor is to add value, in addition to providing money to the invested companies (Bygrave and Timmons 1992). Rosenstein et al. (1993) propose that probably the most distinctive capability to discriminate a VC from the rivals is the quality of its value-adding ability, since being able to provide money is not a conclusive advantage among VCs. This variable is calculated by summing up all the board seats a VC occupies in all the funded IPO firms every year.

(3) ***VC Syndication.*** This variable refers to the VC's ability to conduct syndication investment with other VCs. Specifically, this variable is calculated by summing up the frequency of syndication investments a VC undergoes in each fiscal year. Syndication investment is commonplace since VCs can share information on the funded entrepreneurial companies with each other. It is also an ideal approach to

improve the efficiency of risk sharing, and increase portfolio diversification, thereby improving the quality of project selections. It further guarantees VC's investment scale and augments the successful exit possibility of the project investment (Casamatta and Haritchabalet, 2007). In fact, through syndication investment VCs ensure their share-holdings in the portfolio companies (Lerner, 1994). Tian (2012) states that VC syndication plays an essential role in value creation for the invested firms. It improves IPO firms' innovation productivity (measured by the number of patents) as syndication investments allow VCs to invest more capital in younger firms, in earlier rounds, and at earlier stages. Besides, the syndicated VC-backed IPOs also enjoy better operating performance, as measured by ROA, EBITDA/assets[34], and profit margin.

Reputable VCs rarely syndicate with less experienced VCs in the first round of investment (Manigart *et al*., 2002). Also, because of their better assessment skills, more reputable VCs prefer to rely on their own judgement, rather than that of the lower level VCs (Tykvová, 2007). This would suggest that more reputable VCs are associated with low syndication frequencies, relative to the less reputable VCs.

However, alternative arguments exist. Start-up companies are keen for more funds and the value-added benefits brought by the VC investors (Walz and Cumming, 2004). Less reputable VCs may also join the reputable VCs in the same project. The reputable VCs prefer to involve other VCs (usually less reputable VCs) to ensure the amount of equities at hand at the start-up stage, when not fearing the sharing of information with less reputable VCs (Lerner, 1994). From this perspective, more reputable VCs would be linked with more syndication investments.

New and less reputable VCs are keen to build relationships with the established VCs. According to Podolny (2001), participation in syndicated investments is crucial if they want to access more valuable information and investment opportunities. It has been widely suggested that through syndication, VCs gradually form their networks, along with improving their performance (Hochberg *et al*., 2007; Sorensen, 2007; Pollock *et al*., 2015). Thus, less reputable VCs could be associated with more syndication investments. The ***VC Syndication*** variable will be used here to examine the potential

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[34] EBITDA is short for Earnings before interests, taxes, depreciation and amortization.

impact of syndication investment on the level of VC reputation, i.e., the VC Ranking of Top 20/50 in this case.

(4) ***VC Ownership.*** Two dummy variables are used here to differentiate the ownership structures of VCs: (1) ***VC-SS***, which equals 1 if the VC is funded by government, and equals 0 otherwise; and (2) ***VC-Foreign***, which equals 1 for the foreign VCs or VCs that have been funded by an overseas investment body, and equals 0 otherwise.

In order to encourage the development of high-tech and emerging industries, governments worldwide have supported the development of the VC industry through various policies. Although state-owned VC-backed projects may benefit in certain ways (e.g. better in moderating the information asymmetry), their initial incentives can be negatively affected by the government's political targets (Lerner, 1999). Numerous studies have documented a negative association between government ownership and VCs' performance[35].

China's IPO market is known to be dominated by the government, and this also applies to the VC industry. VCs who have close connections with governments may enjoy certain advantages and benefits. Francis *et al*. (2009) and Du (2011) suggest that IPO companies backed by state-owned VCs exhibit shorter approval processes since they are much easier to be endorsed by security regulation institutions. However, the state-owned VCs may also suffer from excessive administrative controls from government. By intervening in VC's activities, equities, and operational decisions, the political controls imposed could undermine VC investors' efficiency and performance significantly. As a result, the governmental background might also be detrimental to VC's reputation.

An increasing number of foreign VCs have expanded their business and conducted many IPOs in China. Given that many foreign VCs are very experienced, their reputation might be higher than that for domestic VCs in China.

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35 For instance, VC's successful exit rate, patents number applied and the value-added to enterprises.

(5) ***VC Investment Durations.*** The length of VCs' involvement is a potential indicator of reputation. Barry *et al*. (1990), Espenlaub *et al*. (1999), and Arthurs and Busenitz (2006) all adopt this variable to proxy for VCs' experience. It is possible that more experienced and reputable VCs are more likely to serve in a company for longer periods. Gompers (1996) finds that less reputable VCs tend to serve in the firm for a shorter period than reputable VCs.

In addition, given that VCs provide value-added services via involvement in corporate management and governance in the invested firms, the longer the VCs serve, the greater the effort that VCs will likely devote to the project (Fitza *et al*., 2009). Hence, the duration of VC investments measures VCs' capability of management and corporate governance. Many well-known VCs are famous for their management experience.

Thirdly, VCs usually provide multiple-rounds of investments in the invested firms. The longer the VCs' investment duration is, the more subsequent funding they will invest. This could reflect that the VCs are able to raise sufficient capital to support their investments, which is proposed to be a significant predictor for reputation (Gompers and Lerner, 1999; Atanasov *et al*., 2012). It is therefore reasonable to suggest that reputable VCs are associated with longer investment durations. This variable is calculated by summing up the years each VC serves in the IPO firms before the IPO date.

Table 5.6 reports the summary of the characteristics of 800 VCs that have funded A share IPO firms during 2004 and 2012. A VC that has more than one IPO in year *t* will only be listed one time, but it will be listed again in different years. The maximum value of the five variables listed above for VCs will then be recorded if they have multiple IPOs in year *t*. Table 5.6 demonstrates that the average age of VCs at the invested firms' IPO date is 5.7 years, with the youngest age being 10 months and the oldest being around 51 years. On average, VCs conduct two IPOs in each year, and the maximum number of IPOs a VC conducts is 48 across the sample years[36]. No VC occupies more than three board seats in an invested IPO firm. It may be noted that on average each VC has one syndication IPO investment in each year, and the largest being 16 IPOs (un-tabulated).

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[36] This is the Shenzhen Capital Group (SCGC).

Table 5.7 illustrates the same characteristics as in Table 4.7, relating to Top 20 VCs. The table shows that higher ranked VCs are older and control more capital. Both their IPO numbers and IPO market shares are around three times greater than the lower ranked VCs. Moreover, Top 20 VCs are more likely to hold more equity stakes and occupy more board seats in the invested IPO firms. Likewise, the frequency of syndication investments of the Top 20 VCs is also higher. Table 5.8 reports the characteristics of Top 50 VCs and the non-Top-50 VCs and it shows very similar results to Table 5.7. Data from these two tables indicates that higher ranked VCs are more active in the IPO market, and they are also more involved in the invested IPO firms.

Table 5.6 Characteristics of VCs

	N.	Mean	Std. Dev.	Min	Max
Top 20	800	0.23	0.42	0	1
Top 50	800	0.30	0.46	0	1
VC Age	790	2,066	1,849	319	18,497
VC IPO#	801	2.05	3.02	1	48
VC MS$_1$, %	800	1.75	4.92	0.05	65.48
VC MS$_2$, %	800	1.84	6.14	0.02	82.11
VC Size	774	429.29	1,579.23	0	35,000
VC Ownership	782	0.34	0.64	0	2
Max VC Shareholding (Pre-IPO), %	800	7.33	6.69	0.07	46.87
Max VC Shareholding (After-IPO), %	800	5.43	5.01	0	35.11
Max VC Board Members	800	0.74	0.90	0	3
Max VC Syndications	800	0.82	0.39	0	1
Max VC Duration	800	3.84	1.99	1	13

Table 5.6 is the summary of characteristics of 801 VCs. VC Age is measured by days; VC size is measured by Million yuan; The VC Ownership is used to illustrate the ownerships of VC investors, and VCs are separated to three groups: the privately-owned VC, state-owned VC, and foreign VC, which equals to 0, 1, and 2, respectively; VC duration is measured by years.

Table 5.7 Characteristics of Top-20 and Non-Top-20 VCs

	Top-20					Non-Top-20				
	N.	Mean	S.D.	Min	Max	N.	Mean	S.D.	Min	Max
VC Age	181	2,285	2,492	367	18,497	609	2,001	1,606	319	9,995
VC IPO#	183	3.44	5.64	1	48	617	1.63	1.31	1	12
VC MS$_1$, %	183	3.09	7.49	0.08	65.48	617	1.35	3.76	0.05	51.63
VC MS$_2$, %	183	3.45	9.88	0.04	82.11	617	1.37	4.37	0.02	59.56
VC Size	171	945.62	3,006.68	0	35,000	603	282.87	743.18	0	10,000
Max VC Shareholding (Pre-IPO),%	183	8.23	6.71	0.45	46.87	617	7.06	6.67	0.07	36.06
Max VC Shareholding (Post-IPO),%	183	6.24	5.15	0.34	35.11	617	5.20	4.94	0	27.05
Max VC Board Members	183	0.98	1.01	0	3	617	0.66	0.85	0	3
Max VC Syndications	183	0.85	0.36	0	1	617	0.81	0.39	0	1
Max VC Duration	184	3.91	2.17	1	12	616	3.82	1.94	1	13

Table 5.7 is the summary of characteristics of the 801 VCs. Each VC will only be shown once in each year even if it has funded more than one IPOs, but it can be shown repeatedly if it has funded IPOs in different years. For VCs have multiple IPOs in a single year, we list the maximum data of VC's shareholdings before IPO and after IPO, number of VC on boards, and the frequency of VC syndication. VC Age is measured by days; VC size is measured by Million yuan.

Table 5.8 Characteristics of Top-20 and Non-Top-20 VCs

	Top-50					Non-Top-50				
	N.	Mean	S.D.	Min	Max	N.	Mean	S.D.	Min	Max
VC Age	238	2,437	2,420	367	18,497	552	1,907	1,514	319	9,995
VC IPO #	241	3.19	5	1	48	559	1.56	1.23	1	12
VC MS$_1$, %	241	2.85	6.70	0.08	65.48	559	1.28	3.82	0.05	51.63
VC MS$_2$, %	241	3.10	8.75	0.05	82.11	559	1.30	4.48	0.01	59.56
VC Size	228	812.19	2,625.46	0	35,000	546	269.40	761.12	0	10,000
Max VC Shareholding (Pre-IPO),%	241	8.25	6.91	0.34	46.87	559	6.93	6.57	0.07	36.06
Max VC Shareholding (Post-IPO),%	241	6.21	5.26	0.26	35.11	559	5.10	4.86	0	27.05
Max VC Board Members	241	0.95	1.02	0	3	559	0.64	0.83	0	3
Max VC Syndications	241	0.85	0.36	0	1	559	0.80	0.40	0	1
Max VC Duration	242	3.96	2.18	1	12	558	3.79	1.90	1	13

Table 5.8 is the summary of characteristics of all the 801 VCs: each VC will only be shown once in each year even if it has funded more than one IPOs, but it can be shown repeatedly if it has funded IPOs in different years. For VCs have multiple IPOs in a single year, there are two ways to compute VC's shareholdings before IPO and after IPO, number of VC on boards, and the frequency of VC syndication. We sum them up or take the maximum value. Besides, VC Age is measured by days; VC size is measured by Million yuan.

5.2.2 Results

(1) Correlations

Table 5.9 presents the Spearman correlation matrix among the proxies for VC reputation and the potential decisive variables. In general, there are significant positive relationships between the seven reputation measurements. Firstly, the correlation between the ***Top 20/50*** and the other measurements ranges between 0.2 and 0.3. The only exception is ***VC's IPO quantity*** which is correlated with the ***VC's IPO market share*** at a relatively higher level (0.506/0.443). This is very plausible since the number of IPOs is one of the two components to calculate VC's IPO market share. ***VC age*** is not significantly correlated with VC rankings. More surprisingly, it is negatively associated with Top 20 (-0.019). Given that VC age has been used as a proxy for reputation in earlier studies, this result demonstrates that different choice of reputation measure may potentially generate mixed findings across different studies. The correlation between reputation proxies and the variables are generally positive, though the values of the correlation are low.

(2) Regression Results

In this sub-section, Probit regressions are used to examine whether the traditional reputation proxies can predict the Zero2IPO VC ranking. For the sake of reliability of the regression, the VC sample is chosen from 2007 to 2012 as the number of VC-backed IPOs is too few in the years 2004, 2005 and 2006. Therefore, the sample includes all the VCs that have implemented IPOs every year from 2007 to 2012. In order to obtain reliable conclusions, Top 20 and Top 50 are used separately as dependent variables.

Table 5.10 reports the results of the Probit regression on the ranking of Top 20 VCs, where the year fixed effect is controlled. The regressions generate expected results for *VC's IPO market share*, *VC's IPO quantity*, and *VC size* and they all display significant and positive associations with the VC Ranking, while *VC Age* is not significantly correlated with the VC ranking when regressed individually. However, when all the reputation proxies are involved in the regression (shown in the last two columns) *VC Age* generates a strong and significant negative impact on the VC Ranking.

Table 5.9 Correlation matrix of VC Reputation Measurements

	Top20	Top50	Age	IPO#	MS$_1$	MS$_2$	VC Size	Ownership	Shares	Seats	Syn.	Dur.
Top20	1											
Top50	0.830*	1										
VC Age	-0.019	0.048	1									
VC IPO#	0.222*	0.266*	0.277*	1								
VC MS$_1$	0.233*	0.295*	0.184*	0.506*	1							
VC MS$_2$	0.231*	0.285*	0.150*	0.443*	0.967*	1						
VC Size	0.217*	0.266*	0.066	0.330*	0.216*	0.190*	1					
Ownership	0.070*	0.096*	0.246*	-0.084*	0.056	0.057	-0.008	1				
Pre-IPO, %	0.187*	0.187*	0.215*	0.268*	0.092*	0.051	0.256*	0.230*	1			
Board Seats	0.152*	0.153*	0.242*	0.246*	0.094*	0.067	0.162*	0.140*	0.468*	1		
Syndication	0.175*	0.189*	-0.044	0.434*	0.158*	0.144*	0.176*	-0.157*	0.086*	0.100*	1	
Duration	0.091*	0.104*	0.398*	0.458*	0.276*	0.255*	0.184*	0.039	0.469*	0.365*	0.319*	1

In **Table 5.9,** for VCs have multiple IPOs in a single year, we sum up each VC's shareholdings before IPO and after IPO, number of VC on boards, and the frequency of VC syndication. Besides, VC Age is measured by days; VC size is measured by Million yuan.* denotes the significance of at least 5% level.

While the majority of the single-item variables exhibit a positive association with Top 20 and Top 50, *VC age* exhibits a negative association with VC ranking. Around half of the Top 20 VCs are relatively old, having operated for more than 15 years and some for more than 50 years. However, the majority of lower ranked VCs were established the same year as, or one year prior to, their invested firms' IPO date. Given that VC Age fails to generate a significant correlation with the Zero2IPO ranking when tested individually, it appears that the advantage/impact cumulated by age seems to be neglected in Zero2IPO's process of ranking VCs.

Another reason for the confusing empirical impact of VC age might be due to the VC sample used here. In fact, hundreds of VC firms are involved when composing the rankings, but this study only selects those VCs who had accomplished A share IPOs during the test period. These VCs may already be the outstanding VCs who are able to support firms to IPO. Hence, it is possible that the chosen VCs' age happens to present a reversed, or non-significant association with ranking.

Aside from the relationships between reputation proxies, there are also some interesting findings from other variables. To begin with, across the seven regressions, the number of board seats that VCs occupy is positively correlated with the VCs' ranking. This implies that it may be easier for more reputable VCs to become a board member in the IPO firms and to be more engaged in the operational and management activities. Meanwhile, VCs' syndication investment frequency is also significantly and positively related to their rankings. The more reputable VCs are able to initiate or attract many other VCs to jointly invest in a project.

Next, the foreign ownership of VCs is also found to be favourable to their rankings. This might be because those foreign VCs who are active in China's capital market are already highly respected and have built up a widespread reputation. It is understood that those foreign VCs have more experience in managing IPO firms. In contrast to foreign ownership, state ownership is found to exert no significant influence on VC's ranking. Such a finding may indicate that state-owned VCs neither get back-door benefits from their connection with government, nor are they damaged by the interference from government (or that these two effects cancel out). Similarly, the length of time that the VC serves in IPO firms (***Duration***) is also not a significant determinant of VC's ranking, and neither are the VC's shareholdings prior to IPO.

Table 5.11 reports the results of Probit regressions on the ranking of Top 50 VCs, where the year fixed effect is also controlled. These results show consistent impacts from *VC's IPO market share, VC's IPO quantity*, and *VC Size*, which are positively and significantly associated with the Zero2IPO ranking of VCs. *VC age* exhibits no significant association with the ranking, whether examined individually or jointly with other reputation measurements. This verifies that the age is not a crucial factor when the performance-based VC's ranking is composed by Zero2IPO.

5.3 Conclusions

This chapter has examined some robustness checks on the selection bias of VC. Two methods are applied. The first one is that Heck-man two step, where in the first step the number of IPO firms in the province the IPO is located is include as a variable to explain the probability of VC-backing. Then the inverse mill's ratio is included in the second stage to control the selection bias. The second method is to include the predicted the probability of VC backing as in the second stage. All results are robust. This chapter also examines whether there are any correlations between the traditional VC reputation measurements and the Zero2IPO ranking which is exclusive to China. Overall, the market share of the VC, the total IPO quantities of VC, and the size of the VC are all significant factors that could influence the Zero2IPO ranking of the VC. The more IPOs a VC accomplishes, the larger is the VC's market share, and the more capital it controls, the more likely it is ranked as Top 20/50 VCs. However, mixed results are found for the age of VC, i.e., it is more likely for younger VCs to be ranked in the Top 20 VCs, while it seems to be independent of the ranking of Top 50. Some young VCs may be able to achieve excellent performance because they are actually managed by their parent VCs.

Table 5.10 Association between Top-20 and the Other Reputation Measurements

| | Top 20 | | | | | | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VC MS$_1$	26.94					19.94	
	(0.000)***					(0.002)***	
VC MS$_2$		23.10					17.95
		(0.000)***					(0.001)***
VC IPO#			0.175			0.104	0.120
			(0.000)***			(0.036)**	(0.010)***
VC Age				-0.108		-0.348	-0.352
				(0.197)		(0.000)***	(0.000)***
VC Size					0.068	0.065	0.068
					(0.002)***	(0.005)***	(0.003)***
Pre-IPO, %	1.990	1.986	0.955	0.844	0.988	1.365	1.344
	(0.037)**	(0.037)**	(0.293)	(0.352)	(0.297)	(0.170)	(0.177)
Board Seats	0.104	0.102	0.100	0.111	0.102	0.113	0.109
	(0.063)*	(0.066)*	(0.071)*	(0.043)**	(0.064)*	(0.049)**	(0.057)*
Syndication	0.410	0.432	0.295	0.395	0.412	0.259	0.256
	(0.000)***	(0.000)***	(0.004)***	(0.000)***	(0.000)***	(0.021)**	(0.022)**
VC-SS	-0.178	-0.191	-0.230	-0.153	-0.232	-0.042	-0.058
	(0.318)	(0.282)	(0.194)	(0.394)	(0.195)	(0.828)	(0.766)
VC-Foreign	0.530	0.540	0.856	0.849	0.983	0.948	0.974
	(0.004)***	(0.003)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Duration	-0.043	-0.037	-0.032	0.018	-0.060	-0.014	-0.011
	(0.103)	(0.158)	(0.212)	(0.478)	(0.809)	(0.627)	(0.712)
D Years.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.
_cons	-1.195	-1.216	-1.148	-0.320	-1.666	0.635	0.610
	(0.000)***	(0.000)***	(0.000)***	(0.592)	(0.000)***	(0.372)	(0.388)
Pseudo-R^2	0.1735	0.1690	0.1496	0.1275	0.1373	0.1922	0.1927
N.	754	754	754	744	728	727	727

Table 5.10 reports the results of logit regression of Top 20 VC ranking on the other reputation measurements and a series of control variables based on a sample of 800 VCs; *D Years.* refers to the control of years' effect using a series of dummy variables. Values in the brackets are p-values of coefficients; ***, **,* denote the significance at 1%, 5%, and 10% levels, respectively.

Table 5.11 Association between Top-50 and the other Reputation Measurements

	Top 50						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
VC MS$_1$	15.25					7.479	
	(0.000)***					(0.054)*	
VC MS$_2$		13.29					7.215
		(0.000)***					(0.047)*
VC IPO#			0.208			0.167	0.171
			(0.000)***			(0.000)***	(0.000)***
VC Age				0.045		-0.137	-0.135
				(0.562)		(0.116)	(0.120)
VC Size					0.084	0.077	0.079
					(0.000)***	(0.001)***	(0.000)***
Pre-IPO, %	1.443	1.392	0.657	0.828	0.739	0.783	0.769
	(0.097)*	(0.108)	(0.442)	(0.328)	(0.404)	(0.389)	(0.398)
Board Seats	0.109	0.111	0.107	0.118	0.114	0.108	0.108
	(0.044)**	(0.040)**	(0.050)*	(0.028)**	(0.034)**	(0.052)*	(0.053)*
Syndication	0.475	0.479	0.351	0.497	0.480	0.335	0.332
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.001)***	(0.002)***
VC-SS	0.115	0.110	0.060	0.055	0.055	0.129	0.124
	(0.450)	(0.471)	(0.698)	(0.724)	(0.726)	(0.437)	(0.455)
VC-Foreign	0.526	0.542	0.807	0.707	0.996	1.000	1.013
	(0.003)***	(0.002)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Duration	-0.028	-0.024	-0.038	-0.007	-0.004	-0.032	-0.031
	(0.239)	(0.311)	(0.117)	(0.779)	(0.855)	(0.225)	(0.239)
D Years.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.
_cons	-3.348	-3.161	-1.772	-2.194	-2.646	-2.224	-2.223
	(0.000)***	(0.000)***	(0.001)***	(0.004)***	(0.000)***	(0.017)**	(0.015)**
Pseudo-R^2	0.1406	0.1367	0.1440	0.1118	0.1294	0.1627	0.1631
N.	777	777	777	767	751	750	750

Table 5.11 reports the results of logit regression of Top 50 VC ranking on the conventional reputation measurements and a series of control variables based on a sample of 800 VCs; *D Years.* refers to the control of years' effect using a series of dummy variables. Values in the brackets are p-values of coefficients; ***, **,* denote the significance at 1%, 5%, and 10% levels, respectively.

Chapter 6

Conclusion

This is the final chapter of this thesis and the main aim of this chapter is to summarise the findings obtained from earlier chapters, regarding the role of Venture Capital (VC) and VC Reputation in the long-run post-issue performance of China IPOs. This chapter will then discuss how the findings contribute to policies for the improvement of long-term IPO performance, and the development of the VC industry in China. The final section points out some limitations to this thesis and provides suggestions for further research.

6.1 Summary of findings

This thesis examines whether the long-run performance of China IPOs is impacted by VC-backing and VC reputation. This study also examines a much wider range of reputation metrics than is commonly employed in prior studies, including a real-world, market driven metric devised by Zero2IPO. Furthermore, this study also examines whether the impact of VC-backing and VC reputation varies across the different trading boards in China. For the implementation of the research questions, in this thesis two types of long-run post-IPO performance are examined - the stock market performance and the operating performance. In general, China IPOs are found to exhibit significant underperformance in the long-run. VCs are found to have a significant and positive impact on the long-run post-issue stock market performance, but make no significant difference to the operating performance.

6.1.1 VC and Long-run Post-IPO Performance

This research examines 1095 China A share IPOs from 2004 to 2012. The long-run performance is investigated for a period up to 36 months after the issuing, where the first month starts from the month following the issue. The BHARs are adopted to measure the post-IPO stock market performance, and each IPO in the sample is matched with a specific benchmark portfolio according to the size and/or M/B ratio. China IPOs are found to exhibit significant underperformance during the long-run post-issue period regardless of which benchmark is used.

In addition, the VC-backed IPOs are found to significantly outperform non-VC-backed IPOs. In particular, the 36-month returns of VC-backed IPOs outperform the benchmark by 7.04%, while the non-VC-backed IPOs underperform the benchmark by -10.59% (see Table 4.2). This indicates that the long-run underperformance of China IPOs is dominated by the non-VC-backed IPOs. Multivariate regressions reaffirm that VC-backed IPOs significantly outperform the non-VC-backed IPOs. Such findings add evidence to VC's Certification and Monitoring functions as proposed in a number of prior studies (e.g. Kaplan and Stromberg, 2003; Doukas and Gonenc, 2005; Hochberg, 2011; Lahr and Mina, 2012).

This thesis also finds that China IPOs experience serious long-run profit deterioration, where ROE is used as the main measure for operating performance. However, VCs exert no significant impact on the long-run operating performance of IPOs, which is consistent with Mikkelson *et al*. (1997) and Rosa (2003).

6.1.2 VC reputation and Long-Run performance

This thesis focuses on the examination of the impact of VC reputation on IPOs' long-run performance and further examines whether the impact of VC reputation varies with the level of reputation. In particular, a series of metrics are created to measure the reputation of VCs, including the VC Zero2IPO Ranking, VC's IPO market share, VC's IPO quantity, VC age, and VC size.

Compared to the non-VC-backed IPOs, both more reputable VC-backed IPOs and less reputable VC-backed IPOs exhibit significantly superior stock market performance, and this pattern is mainly driven by IPOs listed on the SME and ChiNext Boards, which are

mainly smaller-sized firms. However, this study also finds that the reputation of VCs appears to have no significant impact on the long-run stock market performance of VC-backed IPOs, which is consistent with Wang and Wang (2011), and Otchere and Vong (2016).

One explanation for this finding is that several different effects may be operating in different directions, resulting in an insignificant difference between high and low reputation VCs. Firstly, for more reputable VCs, the Value-adding hypothesis would suggest a positive influence on post-IPO long-run stock market performance, since higher reputation VCs can provide better screening, monitoring and value-added services.

Less reputable VCs also exhibit a positive impact on IPO long-run stock market performance would suggest that the Grandstanding hypothesis could not be supported. Such results would also suggest that less experienced VCs may have better understanding of the invested firms (Butler and Goktan, 2013) as they get more involved with the firms (closer distance and longer interaction period). Therefore, if both effects are operating together this might explain why VC reputation exhibits no significant impact on the VC-backed IPOs' long-run stock market performance at the aggregate level.

The analysis of long-run operating performance exhibits different results for VC-backing, and VC reputation remains insignificant. In addition, neither the more reputable VC-backed nor the less reputable VC-backed IPOs exhibit significantly different long-run operating performance from that of non-VC-backed IPOs. What is more, the analysis by boards also fails to capture any significant impact of VC reputation on the long-run operating performance.

The mixed findings regarding the impact of VC-backing on share price performance and operating performance may be explained in several ways. Firstly, the stock market performance reflects the expectations of investors about the prospects of the IPO firms in the future. IPO operating performance is measured here using ROE, a ratio based on accounting numbers. These data reflect recent past performance (e.g. earnings over the last 12 months) and thereby have limited ability to reflect forward-looking expectations. This is a particular issue for recent IPOs since some, particularly in the high-tech sector, may not immediately be making notable profits after IPO. However, these IPOs may still be viewed positively by investors if it is believed that their long-term prospects are healthy. As a result, a discrepancy appears when measuring stock market performance and earnings

performance over one, two or three years following the IPO date. There is also the possibility that net profit used in ROE may be problematic as a measure of operating performance.

6.1.3 Additional Findings

In addition to the above findings, this thesis also finds that the effects of VC-backing/VC reputation are robust after correcting for the potential self-selection bias between VC and IPO firms with the Heckman two-step model.

In particular, this thesis further assesses whether the traditional single-item measures for VC reputation have any association with the market-based and multi-item reputation measure published by Zero2IPO. The empirical analyses suggest that higher IPO market share, more IPO numbers, and larger size are contributing factors to obtaining higher VC rankings, but VC age appears to be less important. More reputable VCs tend to occupy more board seats, but their shareholdings and investment durations appear to have no influence on the ranking. Furthermore, higher ranked VCs appear to get involved in more syndication investments, indicating that networks are another important factor to VC reputation. However, compared to the state-owned VCs, foreign VCs are more likely to be ranked highly in China. This may be because most of the foreign VCs who have business in China are the world's leading VCs, and they are more experienced and famous than almost all of the domestic VCs.

6.2 Policy Implications

VCs are identified as risk-based investments which concentrate on unestablished firms with high risk and high growth potential. A number of studies based on the US market have documented that VCs have a significant impact on the IPOs' long-run performance (although findings are often mixed). This thesis finds that VCs in China do not play the exact same role as in the US market. This sub-section sheds light on the differences and then tries to bring forward some China-specific suggestions to the market participants.

(1) **Broaden the Sources of Funding**

Unlike the VCs in western markets, the source of funds in China is still quite limited[37]. Currently, state-owned VCs are still the leading capital providers for VC investments. Pension funds and most investment banks/financial institutions are prohibited from investing in VC-related businesses. However, state-owned VCs can suffer from serious problems, such as limitations on capital scales, less effective incentive-constraint mechanisms, and imperfect risk control systems. This thesis finds that state-owned IPOs significantly underperform privately-owned IPOs. Although VCs have no significant impact on IPO long-run operating performance, they exert a significantly negative impact on the state-owned IPOs' long-run operating performance (un-tabulated). Nevertheless, promoting the diversification of capital sources might help to mitigate this problem.

To encourage diversification, support from government is crucial. However, the support should focus on offering a positive policy orientation. With positive guidance from government, VC investments can be made more appealing to other capital sources, thereby weakening the leading role of government capital. For example, China could formulate and implement policies that could encourage the private capital to enter the business of venture capital. The government could also work on raising the citizens' awareness of venture investment, thereby encouraging individuals, institutions, and public investors to invest in venture firms through VC institutions.

(2) Provide More Favourable Tax Policies

The serious profitability deterioration of VC-backed IPO firms might be improved by promoting preferential tax policies towards the VC investments. For example, although a few preferential tax policies exist for venture firms, there are no specific policies for the investors in VCs or VC firms. Meanwhile, existing set of policies for venture firms can also be improved. For instance, one of the most important preferential tax policies for high-tech firms is that the new-established high-tech firms can be exempted from income tax for two years from the year of production. This policy has very limited effect because many venture firms report little (or no) profit in the early years. Since VCs usually serve in the invested firms for several years before exit, the two year exemption is very likely to expire before the VC-backed firm conducts an IPO.

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[37] In the developed markets, pension funds, charities, and various financial institutions are the main capital providers of VCs.

Therefore, to promote the development of VC investments and IPO performance, China should focus on making more effective tax policies. For example, policies can be made to increase the tax allowance of VC firms and VC capital providers, thereby cutting down VC investors' transaction costs and investment risks, increasing their investment returns, and raising their willingness to invest money in VC firms. Meanwhile, more preferential tax policies for high-tech firms, if possible for VC-backed IPOs, could be made through reducing the tax rates, extending the tax relief ranges, and formulating more flexible and diverse tax incentives.

(3) **Encourage more Involvements from VCs**

In western markets, VCs prefer to invest at the early stage, and then nurture the funded firms for a number of years before they exit. However, VCs in China appear to place more weight on late stage investments, especially in the expansion projects. Generally, the average investment duration of a VC before IPO is 3.8 years, and a large number of VCs starts the investment only one year before IPO. Indeed the late-stage investment reduces risks and improves the likelihood of successful exits for VCs. However, it also generates less rewards. For IPO firms, short duration of VC investment means that VCs' cultivation of IPO firms is lessened, and their impact on the operational structure and corporate governance is reduced. This might be a possible reason for the lack of a long-lasting impact of VCs in China.

To ensure venture firms make the best use of VC investments and exhibit better long-run performance, this thesis proposes that the government could promulgate some preferential policies to encourage VCs to select early-stage projects. Building a complete system of risk evaluation for the venture investments will also be beneficial to the reduction of uncertainty in the early-stage investments. Moreover, for early stage investments, more syndications between VCs should be encouraged because this is effective for the sharing of risk and information. In addition, the government could also provide some supports to the newly-established VCs, thereby enhancing the performance of IPOs backed by these VCs.

(4) **Seek for the Most Suitable VC**

This thesis finds that the effects of VCs are more applicable to small- and medium-sized enterprises which are more likely to in need of VCs' advanced management skills and value-added services, in addition to money. In contrast, in the large-scale and established

firms which have already built a well-organized operational structure, the additional benefits VCs provide appear to be less effective. For example, the reputable VCs usually request more control rights from the IPO firms. This might lead to more severe conflicts of interests when the IPO firm is established, which might end up with lower performance. Hence, it is suggested that firms should take their ownership into consideration when seeking for funding.

In addition, the analysis indicates that less reputable VCs also exert a positive impact on IPO performance relative to non-VC-backed IPOs. Even though VCs with higher reputation are older, more experienced, and have stronger financial backgrounds, their intensity of involvement in IPO firms is equivalent to that of less reputable VCs, e.g. shareholdings, number of board seats, and investment durations. This thesis proposes that venture firms should select the most suitable VCs which can provide the most appropriate value-added services to optimize the firms' value, rather than chasing VC's reputation blindly. For many small-scale start-ups which are not that attractive to these very prestigious VCs, a less reputable VC may perform at a similar level to the top VCs. Therefore, this thesis further advocates that it is not necessary to aim at the most reputable VCs when entrepreneurs are selecting VC firms.

6.3 Limitations and Future Research

6.3.1 Limitations

This section addresses several limitations which remain to be addressed in future studies. First of all, since this thesis fails to identify any significant effects from VC-backing/VC reputation on post-IPO operating performance, additional measurements for the operating performance can be employed to examine the robustness of these results. Alternatively, like the stock market performance, future studies may also construct a portfolio as a benchmark for each IPO when calculating the operating performance (e.g. the difference between the ROE of sample IPO and the average ROE of the benchmark portfolio).

Secondly, this study examines the impact of VCs on the long-run post-IPO performance over three-years. However, the analysis does not control for the time that VCs completely exit IPO firms. In fact, the post-IPO duration of VCs may be far less than three years[38].

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[38] Since 2009, the lock-up period has been shortened from 36 months to 12 months for a large number of VC and PE shareholders.

Consequently, the impact of VCs found in this thesis cannot distinguish between the impact when VCs are serving in the IPO firms, and the ex-post long-term impact after VCs leave. Therefore, to have a further understanding of the impact of VCs, studies could be designed with the information on when the VCs exit the IPO.

Thirdly, owing to the lack of data availability, this thesis confronts several weaknesses in the measurement of VC reputation. The capital under management should be the most appropriate proxy for VC size, however it is replaced here by VCs' registered capital. In fact, the capital managed by a VC firm could be far more than the registered capital, and it is a time-varying variable. Nonetheless, the registered capital only reflects the assets in the accounts when the firm was established, and thereby may generate misleading results regarding the impact of VCs' financial strength on IPO long-run performance. Moreover, variables that could reflect VCs' investment performance and profitability should also be employed as reputation measurements in future studies of VC reputation, e.g., the total amount of money VCs invested in IPO firms, VCs' total investment rounds, the number of projects VCs invested, and VCs' returns on investments. Additionally, two of the measures used here (VCs' IPO market share and IPO quantity) are based only on the A share markets. Therefore, as the accessibility to richer data grows, future studies about VC reputation could be enriched by including data from the B share market as well.

6.3.2 Future Research

This thesis also leads to several recommendations to future academic researchers on the issue of VC reputation. To begin with, it may be better to use a multi-indicator variable to proxy for VC reputation as it could capture a more comprehensive impact of VC reputation. However, how many indicators and which particular indicators should be included still remain to be ascertained in future studies. Moreover, the impact of VCs might vary by the level of reputation. It is a potential are for future research. Another crucial question here is: what the boundary between high and low reputation is. That is, different cut-off points to differentiate high and low reputation may generate different results. In the future, a more solid method to define high and low reputation is an interesting question. Furthermore, neural networks are an econometric tool that is powerful to address bias and may be worthy investigating in the future.

Appendix

A.1 The background of China Stock Market

The stock market of China was established in the beginning of 1990s. The Shanghai Stock Exchange (SHSE) was established on 19 Dec 1990 and followed by the establishment of Shenzhen Stock Exchange (SZSE) on 4 July 1991. There are three main types of trading markets in the mainland China Stock market:

(1) Main Board market. The Main Board is located on both the SHSE and SZSE. This board is designed for the IPO of medium and large mature enterprises who have large-scale capital and strong profitability. It imposes very strict listing requirements to issuers, such as the term of operation, equity size, profitability and minimum market values. The majority of the large-scale issuing IPOs are conducted on the Main Board.

(2) Small and Medium Sized Board market (SME). Launched in 2004 on the SZSE, it was initiated to prepare for the establishment of the Second Board. It is one of the components of (but independent from) the Main Board. Listing requirements of SME are identical to the Main Board, whereas the distinct difference is that the IPO issue scales are usually smaller. Hence, the SME is dominated by the medium-scale IPO issuing from the fast-growing medium-sized mature enterprises.

(3) ChiNext Board. This Nasdaq-type board was established on Oct 30 2009 on the SZSE, and it is also called the Second Board. It is framed for the IPO for high-tech enterprises and fast-growing small- and medium-sized enterprises. Listing requirements of this board are much looser than the Main Board. It is suitable for enterprises who demonstrate outstanding growth characteristics and are particularly strong in technology innovation activities. Nevertheless, these firms also exhibit high uncertainty in operating performance due to their relatively immature business patterns at the IPO time.

Shares traded on China stock exchanges (SHSE and SZSE) are categorised in two major types: A-shares and B-shares. A-shares are the common shares of mainland China-based companies which are nominated and quoted in Chinese RMB. They constitute the majority of shares circulating on China stock market. The face value of B-shares is also nominated in RMB, but they are quoted in foreign currencies, i.e. B-shares on SHSE and SZSE are quoted in US dollars and HK dollars, respectively.

Table A1.1 describes the cumulated number of listed companies and market capitalization of A shares across 1995 to 2012. The SHSE takes the leading role in China stock market in terms of market capitalization since the Main board is primarily based here and consists of large size firms. On average, SHSE contributes 70% of the entire A share market capitalization throughout the sample years which has always been at least two times more than the SZSE. Figure 3.1 demonstrates that numbers of listed companies on SHSE and SZSE, both of which exhibit an increasing tendency. In a long period from 1995 to 2009, more companies were listed on the SHSE than on the SZSE. However, from 2010 the number of listed companies on SZSE exceeded the SHSE, and the gap becomes wider in the next 3 years. In 2009, it was 860 vs. 783, while in 2012 the number became 1,156 vs. 945.

In 1995, there were 311 A share listed companies, with a market capitalization of 333.783 billion yuan. 40% of the companies were listed on the SZSE but they only contributed to 26.71% of the total market capitalization. In 2000, the number of listed companies was increased by three times to 1,060, while the market capitalization illustrated a dramatic increase by 13 times to 4,780 billion yuan. After that, the Chinese stock market developed at a slow pace in the next few years. In 2005, the total number of listed companies slightly increased to 1,365, but the market capitalization reduced notably to 3,184 billion yuan. This retrogressive phenomenon was mainly because of the share-split restructure reformation carried out by the China Securities Regulation Commission in 2005. This period is more likely to be the preparation stage for this reform[1] (Hou *et al*., 2012).

From 2006, the number of listed firms experienced great growth. By the end of 2012, there were 2,101 listed companies in the entire market. The establishment of ChiNext board in 2009 was a key reason for the enormous growth of listed companies. The overall

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[1] A description of the reform process can be found from Appendix 1.3.

market capitalization peaked in 2007 (32,560.43 billion yuan) with 1,516 listed companies. As the market recover from the financial crisis occurred in 2008, the total market capitalization rebounded to above 25 billion in 2010. After a slight fluctuation, the total market capitalization turned out to be around 22 billion yuan at the end of 2012. Figure A1.1 demonstrates the cumulative distribution of the number of A share listed companies and the distribution of market capitalization of SHSE and SZSE across 1995 to 2012.

Table A1.1 Total Number and Market Capitalization of A share listed Firms

	SHSE			SZSE			Total	
	N.	Mkt Cap	%	N.	Mkt Cap	%	N.	Mkt Cap
1995	184	244.645	73.29	127	89.138	26.71	311	333.783
2000	559	2,674.725	55.96	501	2,105.293	44.04	1,060	4,780.018
2005	829	2,287.703	71.83	536	896.975	28.17	1,365	3,184.678
2006	835	7,135.887	80.25	582	1,756.455	19.75	1,417	8,892.341
2007	852	26,931.556	82.71	664	5,628.874	17.29	1,516	32,560.430
2008	851	9,757.032	80.43	725	2,373.506	19.57	1,576	12,130.539
2009	860	18,444.196	76.37	783	5,706.174	23.63	1,643	24,150.370
2010	881	17,923.954	69.76	985	7,769.488	30.24	1,866	25,693.442
2011	919	14,851.884	71.64	1,101	5,878.413	28.36	2,020	20,730.297
2012	945	15,829.442	71.86	1,156	6,199.969	28.14	2,101	22,029.411

Table A1.1 shows the cumulative number and market capitalization of all A share firms listed on SHSE and SZSE in each year from 1995-2012. The market capitalization is in the unit of Billion Yuan.
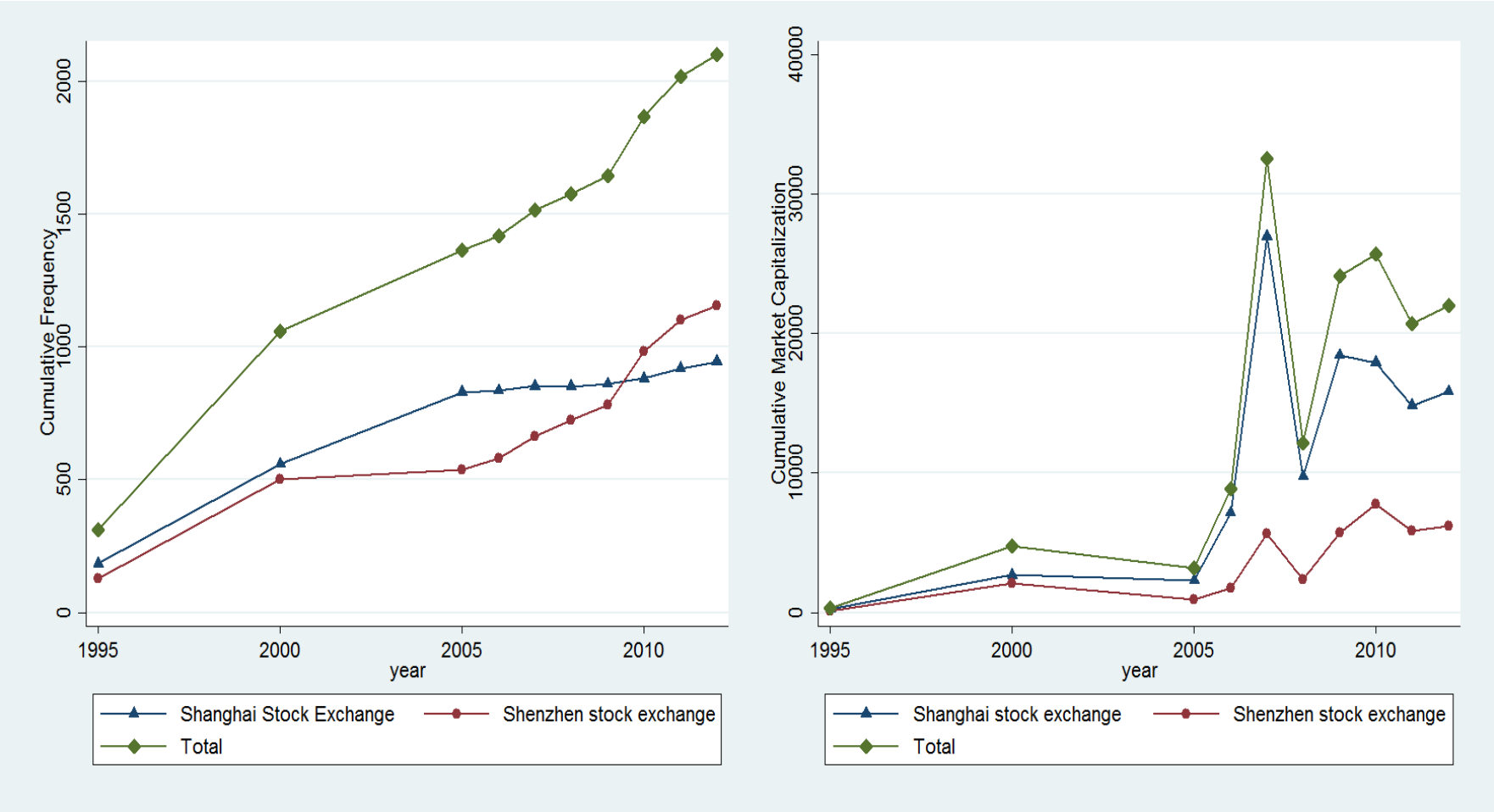
Figure A1.1 Frequency of China A share Stocks and the Total Market Capitalization from 1995-2012.

Table A1.2 Frequency of China A share IPOs

Year	SHSE	SZSE	Full
1990	7	1	8
1991	0	5	5
1992	22	18	40
1993	77	52	129
1994	65	42	107
1995	16	12	28
1996	104	102	206
1997	86	123	209
1998	54	50	104
1999	45	52	97
2000	87	46	133
2001	75	0	75
2002	70	1	71
2003	67	0	67
2004	61	39	100
2005	3	12	15
2006	14	52	66
2007	25	101	126
2008	6	71	77
2009	9	90	99
2010	28	321	349
2011	39	243	282
2012	26	129	155
Total	986	1,562	2,548

Table A1.2 reports the number of A share IPOs listed on the China stock market from 1990 to 2012. The SHSE means the Shanghai stock exchange and the SZSE means the Shenzhen stock exchange. (Figure 1.2)

A.2 VC Industry in China

A.2.1 Capital Resource

In China, the development of VCs is closely related to the support from government. In the US market, capital resources for VCs are quite diversified, e.g., the pension funds, donated funds from charity, financial institutions, industrial companies, wealthy family of individual, and etc. Unlike the US, the government serves as the dominating source of capital in China, especially in the early stage. Initially (1994-1998), government and financial institutions are the two main capital sources for VC firms in China. As illustrated in Table A2.1, government held more than half share of the total VC capital before 1996, since the majority of VCs were state-owned[2]. For instance, some of the outstanding government-backed VCs are: BVCC, East-Lake VC, and Shenzhen Capital Group[3].

As the VC industry developed, its capital resources become more and more diversified. More private capital was invested into the VC firms, as lots of large-scale enterprises had launched for VC investments, such as the CICC[4]. In 1999, the private capital sector surpassed the financial institutions to the second largest capital source for VCs. Moreover, such growing trend continued and since 2007 the private capital sector had replaced the government and been the largest source, despite of another fall back in 2009 and 2010. Besides, capital from individuals increased from barely any to as high as 18.9% from 1994 to 2012, which had been the third largest capital source for VCs since 2008.

The capital invested by financial institutions fell sharply from 21.9% to only 4% in 2002, and then fluctuated around this level in the following years. Meanwhile, in the past 20 years a number of foreign VCs, such as the Softbank, Goldman Sachs, and IDG[5], were attracted to expand businesses in China. The proportion of foreign capital had once reached up to 35% (in 2002). However, with the increasing diversity of capital resources, the proportion decreased to around 5% since 2006. Figure A2.1 illustrates the distribution of capital resources in China for VCs during the years 1994 to 2012.

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[2] Those VCs were owned by the independent state-owned companies, universities, or directly owned by the governments.
[3] BVCC: Beijing Venture Capital Co., Ltd. Founded in 1998 and is jointly owned by Beijing Stated-owned Assets Management Corporation and other institutions; East-lake VC: Wuhan East-lake Innovation and Technology Investment Co., Ltd. Founded in 1999 by the governments of Hubei province and Wuhan City; Shenzhen Capital Group, founded in 1998 by the Shenzhen government. Now it has become the biggest and most famous VC in China.
[4] CICC: China International Capital Corporation Limited. In 1998, they announced to set-up seed capitals to provide VC funds to domestic high-tech industry in China.
[5] IDG: International Data Group (US), world's biggest IT publication, research, development and VC company, established the "Pacific technology VC Funds" in 1998 and invested 20 million yuan to the "Jindie Software Company".

Table A2.1 Capital Resources of VCs in China

Panel A: Capital Resources of VCs from 1994 to 2003

%	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
State-owned	58.7	56.5	55.7	48.9	49.1	45.7	34.6	34.3	35	39
Private	4.7	8.2	9.4	8.9	16.2	24.1	35.6	37.0	23	35
FIs	36.2	34.9	34.4	29.9	23.6	22.0	23.0	21.9	4	6
Foreign	0.4	0.4	0.5	11.7	10.2	6.4	4.3	4.1	35	17
Others	0	0	0	0.6	0.9	1.8	2.5	2.7	3	3
Total	100	100	100	100	100	100	100	100	100	100

Panel B: Capital Resources of VCs from 2004 to 2012

%	2004	2005	2006	2007	2008	2009	2010	2011	2012
State-owned	39	36	39	36	37	41.9	38.8	33.2	30.6
Private	28	33	34	46	46.8	36.3	35.7	42.9	38.6
FI	7	8	9	6	1.3	3.3	4.1	1.9	2.1
Foreign	21	11	4	3	3.6	5.4	3.9	2.8	5.1
Individual	3	3	5	6	6.9	10.1	14.9	13.7	18.9
Others	3	9	9	3	4.3	2.9	2.5	5.5	4.7
Total	100	100	100	100	100	100	100	100	100

In **Table A2.1,** the State-owned includes the government and government institutions; Private capital includes the money from privately-held companies and listed companies; The FIs refer to financial institutions, including both bank and non-bank financial institutions; Foreign capital refers to the capital from overseas, including wholly foreign-owned enterprises and/or partnerships that have registered and operated in China, and the foreign institutions.
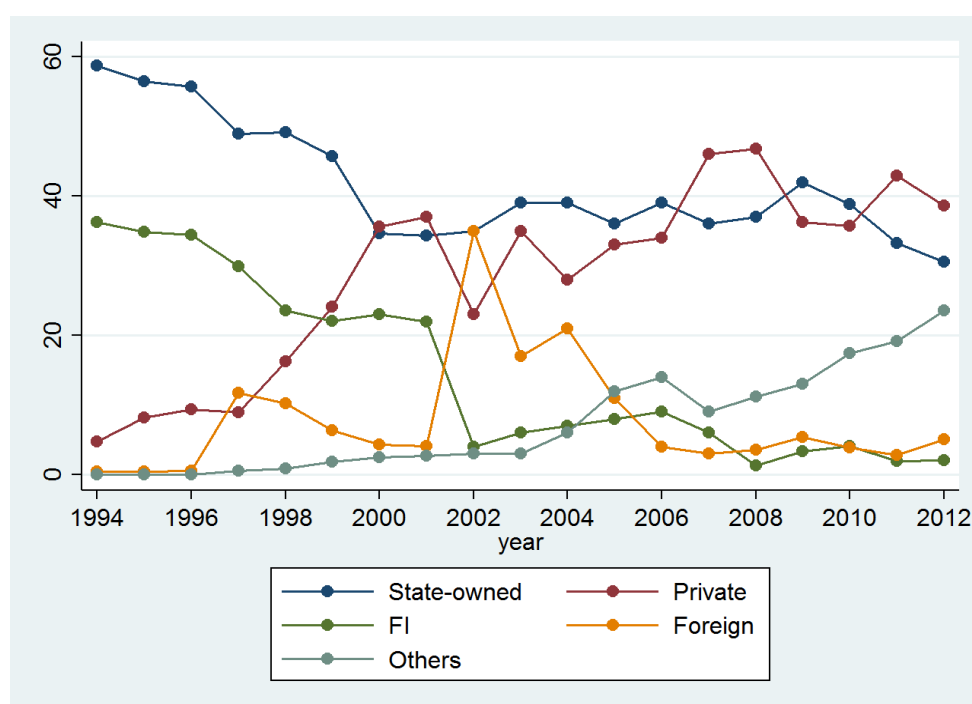
Figure A2.1 Allocation of Capital Resources of VCs in China from 1994 to 2012.

A.2.2 Industry

Industry distribution of China VC investments is dispersed. VCs tend to investigate a range of criteria when choosing new projects, e.g. innovation capability, market prospect, growth possibility and the quality of firm's management team. Usually, the small- and medium-sized technological enterprises are the most preferred choice for VC investors. This is mainly because these firms have more efficient technology innovation process, which are more adaptive to the market fluctuations, thereby exhibiting higher growth rates. However, in recent years, VCs in China seemed to have dispensed their conventional investment preferences and have shifted their eyes to all the high-growth projects regardless of industry.

Table A2.2 demonstrates the industry distribution between high-tech industries and non-high-tech industries of China VC investments from 2001 to 2012. Investments into high-tech projects declined steadily, whether measured in terms of projects numbers or the capital amount. Meanwhile, non-high-tech projects show a steady increase over time (see Figure A2.2). VCs shifted their investment preference mainly because numerous emerging industries started to show tremendous development potential, such as the industry in New Material, New Resources, Medicine and Healthcare.

Table A2.2 Industry distributions of China VC Investments

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Panel A: Investment Projects (%)												
High-tech	87.4	85.8	73.1	76.7	78.3	67.9	65.5	63.2	67.7	67.0	53.4	55.3
Non-High-tech	12.6	14.2	26.9	23.3	21.7	32.1	34.5	36.8	32.3	33.0	46.6	44.7
Panel B: Investment Amount (%)												
High-tech	-	-	79.8	67.7	79.5	62.2	51.1	55.2	52.3	52.4	44.9	47.6
Non-High-tech	-	-	20.2	32.3	20.5	37.8	48.9	44.8	47.7	47.6	55.1	52.4
Total	100	100	100	100	100	100	100	100	100	100	100	100

Table A2.2 reports the allocation of China VC investments into the high-tech and non-high-tech industries from 2001 to 2012, in terms of quantities of projects and investment amounts. Information from the table are extracted from the "China VC Annual Report" from the year 2002 to 2013.
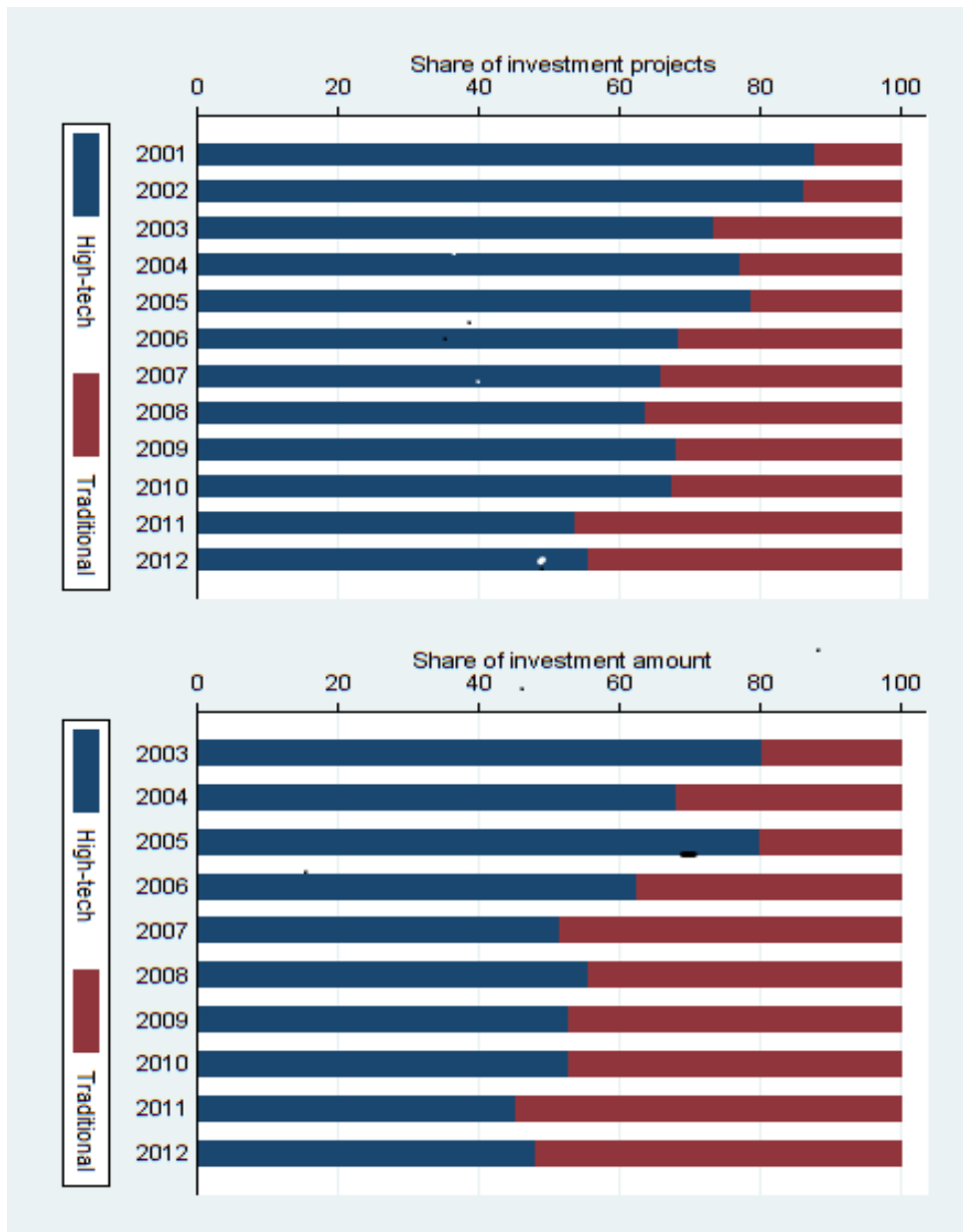
Figure A2.2 Industry distributions of China VC Investments. The figure illustrates the distributions of China VC Investments in the high-tech and non-high-tech industries from 2001 to 2012.

A.2.3 Stage

The life cycle of venture firms can roughly be divided into five stages: the seed, start-up, expansion, mature and reconstruction. Demands for capital differ according to the stage. The earlier the stage is, the higher the risk is, but the higher the returns VC investors will obtain. Correspondingly, risks associated with expansion or mature projects are much

lower but are less likely to generate high returns. In fact, the returns of late stage projects are very close to the returns generated by traditional financing (Gompers, 1995).

However, VCs' investment timing in China venture firms differs notably when compared to the VC investments in western markets: VCs are more biased towards the late stage IPOs. Table A2.3 exhibits the percentage of VC investments stages in terms of both quantity and capital scale from 2001 to 2012. Unlike the US market, VCs in China focus more on late stage investment. Across these years, generally more than half of the VC-backed projects occurred in expansion and mature stages, which had occupied around 70% of the total amount of money invested by VCs. Besides, the seed stage investments experienced a large increase from 2006 but fell back to the original level in 2011. The proportion of start-up stage projects fluctuated in a range between 20% and 30%, while the investment amounts had decreased from up to 30% to less than 20%. Figure A2.3 shows the stages of VC investments in China by two bar charts.

Table A2.3 Investment stages of VCs

%	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Panel A: Project Quantity of Investment												
Seed	11.6	16.0	13	15.8	15.4	37.4	26.6	19.3	32.2	19.9	9.7	12.3
Start-up	30.5	28.1	19.3	20.6	30.1	21.3	18.9	30.2	20.3	27.1	22.7	28.7
Expansion	49.7	44.1	49.5	47.9	41.0	30.0	36.6	34	35.2	40.9	48.3	45.0
Mature	8.2	11.8	18.2	15.5	11.9	7.7	12.4	12.1	9.0	10.0	16.7	13.2
Recon.	-	-	-	0.3	1.6	3.6	5.4	4.4	3.4	2.2	2.6	0.8
Panel B: Investment Amount												
Seed	14.5	9.2	5.3	5.0	5.2	30.2	12.7	9.4	19.9	10.2	4.3	6.6
Start-up	28.5	30.3	16.9	13.5	20.0	11.5	8.9	19.0	12.8	17.4	14.8	19.3
Expansion	48.8	46.3	37.5	49.3	46.8	39.4	38.2	38.5	45.0	49.2	55.0	52.0
Mature	8.2	14.2	40.4	32.2	26.3	14.6	35.2	26.5	18.5	20.2	22.3	21.6
Recon.	-	-	-	0.0	1.7	4.3	5.0	6.6	3.7	3.0	3.6	0.6
Total	100	100	100	100	100	100	100	100	100	100	100	100

Table A2.3 reports the investment stages of VC in China during 2001 and 2012. The Recon. Refers to the reconstruction stage**.** Information from the table asre extracted from the "China VC Annual Report" from the year 2002 to 2013.
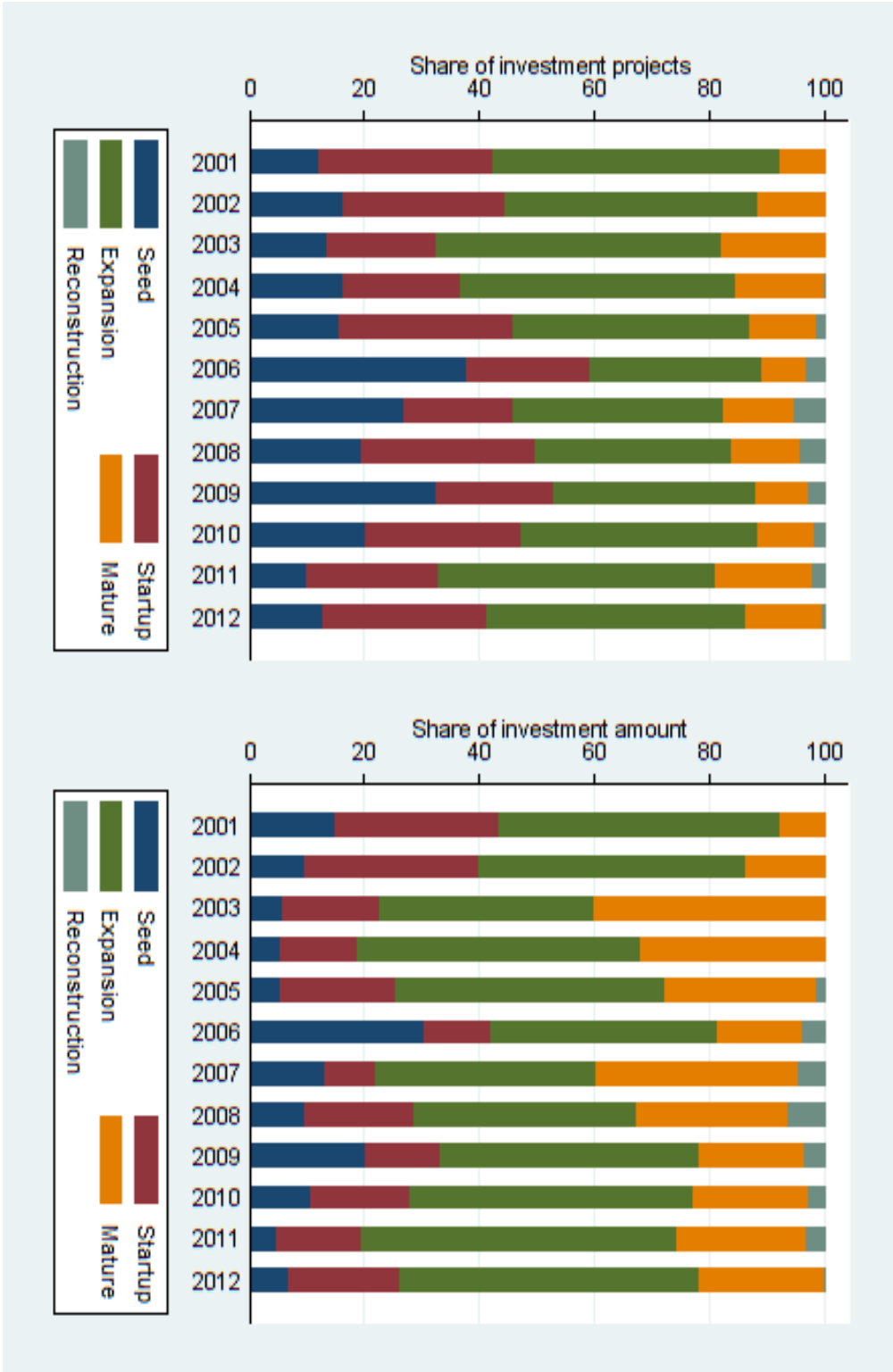
Figure A2.3 Investment stages of VCs. This figure illustrates the distribution of VC Investment in different stages in China from 2001 to 2012, in terms of number of the projects and investment amount.

A.2.4 Exit

The exit mechanism is an extremely important step within the VC investment system, since this is the time VCs transfer their investments from equities into capital/cash. Given the importance of this step, it is necessary to build and optimize an efficient exit mechanism for VCs.

A VC firm usually establishes a fund with the money raised from investors. Each fund has a certain duration which could further be split into two periods: investment period and exit period. During the investment period, VCs invest in and cultivate promising projects in the name of the fund. However, VCs have to exit any investment during the exit period to cash out because they have to return the principal (as well as the agreed profits) to investors before the fund expires.

There are 4 major channels for VCs to exit: IPO, Mergers and Acquisitions (M&A), Share repurchase agreement (Repo) and Clearance. Among them, IPO is the most ideal channel. VCs sell the shares they owned in the portfolio firms when the market value goes up drastically, therefore to gain huge returns. M&A is the second preferred choice for an exit. Although the rewards are not as huge as an IPO, it shortens the exit cycle and reduces the transaction costs a lot. What is more, the M&A allows the use of equity shares as a form of payment. Conventionally, for VCs, Repo is always considered as a plan-B, as it only can help VCs to guarantee the investment principal. The last option is Clearance, which is used when the investment fails: this option minimizes losses.

Due to the variations of institutional background, VC's patterns of exit channels vary across different countries. Table A2.4 and Figure A2.4 illustrate the distributions of exit channels of VCs in China from 2003 to 2012. In 2003 and before, M&A and Repo were the most prevailing ways to exit, and each of them accounted for around 40% of the exits. However, the IPO exit rate at that time was rather low: only 5.4%. In fact, before 2004, main board was the only available market for the trading of listed firms, and it required very strict and high standards for IPO, which could explain these figures.

Once China had established the SME board in 2004, the IPO exit rate started to increase and in 2008 it reached 22.7%. With the establishment of the ChiNext board in 2009, the IPO exit rate further peaked at nearly 30% in 2010 and held steady in 2011 and 2012. In comparison, the M&A exit rate decreased sustainably from over 50% in 2004 to 28.6% in 2010, and further declined to less than 20% in 2012. The trends of Repo exit

option have been less volatile, wavering around 30% throughout 2003 to 2011. Lastly, since 2004, the Clearance exit option had fallen in popularity by around half.

Table A2.4 Weights of VC Exit Channels

%	Pre-2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
IPO	5.4	12.4	11.9	12.7	24.2	22.7	25.3	29.8	29.4	29.4
M & A	40.4	55.3	44.4	28.4	29.0	23.2	33.0	28.6	30.0	18.9
Repo	36.3	27.6	33.3	30.4	27.4	34.8	35.3	32.8	32.3	45.0
Clearance	14.9	4.8	10.4	7.8	5.6	9.2	6.3	6.9	3.2	6.7
Others	3.0	0.0	0.0	20.6	13.7	10.1	0.0	1.9	5.1	0.0
Total	100	100	100	100	100	100	100	100	100	100

In **Table A2.4**, the M&A refers to Merge and Acquisitions; Repo refers to share repurchase/repurchase agreement. Resources of the table are from the: China VC Annual Report in the year of 2004 and 2013.
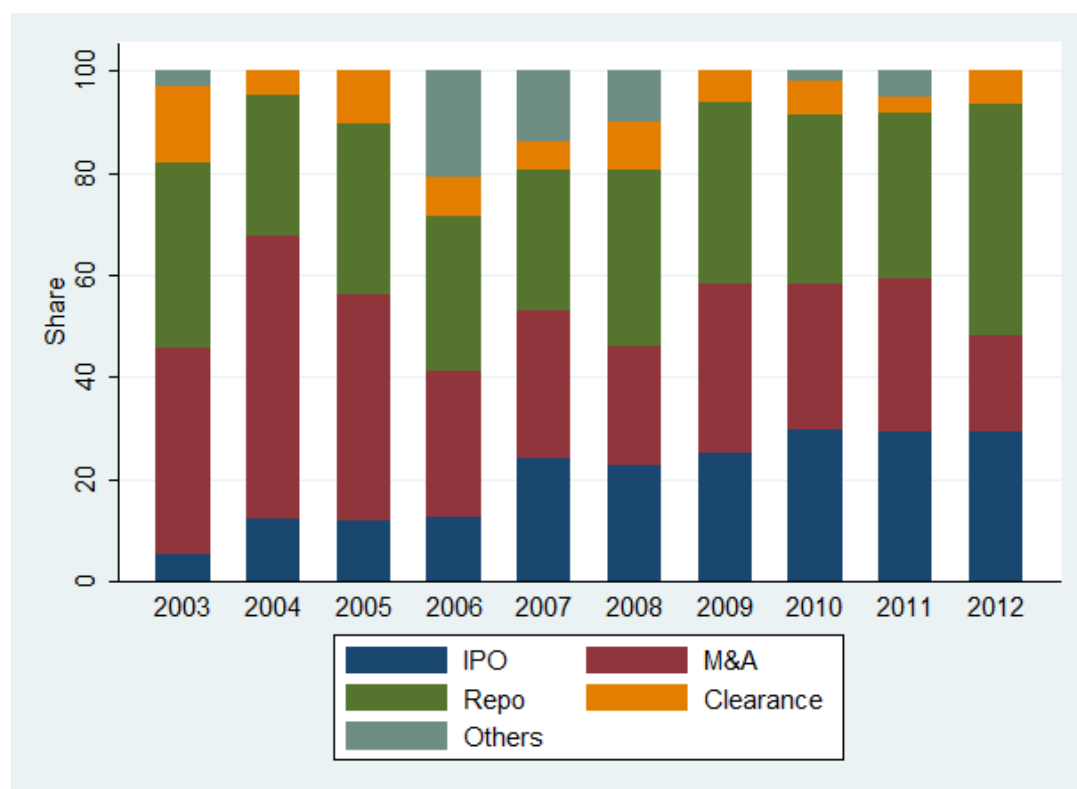
Figure A2.4 Exit Channels of VCs from 2003 to 2012.

Table A2.5 VC Quantity, Gross Capital Raised and Investment Amount

	Quantity	Capital under management	Investment Amount	Cumulative investment projects	Investment Intensity
1985-1994	26	4.17	0.70	202	3.47
1995	27	5.13	0.20	36	5.57
1996	32	5.52	0.16	30	5.23
1997	51	10.12	0.22	32	6.82
1998	76	16.88	0.33	62	5.37
1999	118	30.62	0.98	165	5.96
2000	249	51.20	2.92	514	5.69
2001	323	61.93	4.14	662	6.25
2002	366	68.85	5.59	641	8.72
2003	315	61.65	-	-	9.2
2004	304	61.75	21.99	3,172	9.72
2005	319	63.16	32.61	3,916	9.01
2006	345	66.38	41.08	4,592	8.03
2007	383	111.29	49.55	5,585	9.73
2008	464	145.57	76.97	6,796	10.41
2009	576	160.51	90.62	7,432	10.6
2010	720	240.66	149.13	8,693	13.57
2011	860	319.80	203.66	9,978	15.51
2012	942	331.29	235.51	11,112	13.23

In **Table A2.5**, the gross capital, investment amount is counted by Billion yuan, the investment intensity is counted by Million yuan/project. The numbers listed in the first row shows the cumulative numbers for the first four indicators and the average investment intensity from 1985 to 1994. (Figure 1.2)

A.3 The split-share reformation

At the early stage of the development period, the most exclusive pattern of the mainland China security market is the separation of shareholder structure. Shares held by shareholders are separated into tradable shares and non-tradable shares, i.e. only a small proportion of listed companies' shares are allowed to be circulated in the secondary market, while the rest of shares are forbidden to be traded. The tradable shares are mainly composed of the public shares, whereas non-tradable shares are mainly composed of state-owned shares and legal person shares. Due to the institutional reasons, a large volume of, nearly two thirds of, shares are non-tradable shares which are held by the large shareholders. This means that only one-third of shares in China stock market are tradable, and the majority are held by the medium and small investors. Such differences in shares' circulation system had generated acute unbalance in the cost of stock ownerships, interests and rights between large shareholders and the medium and small investors, which have seriously put a brake on the economic growth and development of China capital market. The split-share problem had used to be allegorized as the Sword of Damocles of China stock market, therefore it is necessary to solve it.

From the state-owned stock reduction onward, the split-share reform aimed at gradually converting all the non-tradable shares to tradable ones. In this way can the reform protect the legitimate interests of public investors and enhance the adaptability of stock market. China attempted to confront the problem several times in 1998 and 2001 but were all forced to be suspended as the effects are unsatisfactory. However, in 2004, it was officially carried out with the issue of a relevant regulation, and the pilot work of the reform was launched in April 29th, 2005. Later in September, this institutional and structural reformation had reached a full-scale stage. Till now, this reform is still recognized as the most profound and far reaching action since the establishment of China security market.

A.4 VC Reputation and Initial market performance

The impact of VC reputation on the initial performance is examined to examine whether VC reputation has the certification function on China IPOs. Table A4.1 reports the results of regressions of the ranking of lead VCs and IPO underpricing on a sample of 1,205 IPOs listed from 2004 to 2012. Ranking of Top 20/50 are treated as high reputation VCs, respectively. Two specific variables that are suggested to be related to the underpricing are controlled in the regression together with three control variables. They are time gap between offering date and listing date and the first day P/E ratio.

Four regressions are illustrated in Table A4.1, and they exhibit very consistent results. In each regression, the coefficients of *Top-20* and *Non-Top-20* are all significantly and negatively associated with the underpricing, indicating that both the IPOs backed by more reputable and less reputable VCs enjoy lower underpricing than the non-VC-backed IPOs. Moreover, as all the coefficients of *Top-20* are more negative than the *Non-Top-20*, it further means that IPOs funded by more reputable VCs are experiencing even less underpricing than the IPOs funded by less reputable VCs. Such finding is consistent with Barry et al. (1990), Megginson and Weiss (1991), Lerner (1994) and Coakley et al. (2009), where VCs are found to play Certification function on IPO firms. In order to maintain and enhance their reputation, VCs would rather to set the offering price close to the true value of IPO firms and avoid the falsely certificate. Hence VC-backed IPOs are displaying lower initial returns than the non-VC-backed IPOs.

The empirical results of the control variables across the regressions are also very consistent. On the one hand, the age and the proceeds of IPO firms are significantly and negatively related to underpricing, implying that the older the IPO firms and the larger size the IPO firms, the lower the underpricing. Meanwhile, high-tech IPOs exhibit significantly less initial returns than the traditional industry IPOs. On the other hand, the time gap between offering date and listing date, and the first-day P/E ratio are both positively related with underpricing. At the same time, state-owned IPOs seem to bear higher underpricing than the privately-owned IPOs, meaning that the government might interfere the decision of price setting and set the offering price at a low level in order to extract substantial initial returns.

Table A4.1 VC Ranking and the Underpricing

	Underpricing		Underpricing	
	(1)	**(2)**	**(3)**	**(4)**
Top-20	-0.155	-0.142		
	(0.000)***	(0.001)***		
Non-Top-20	-0.146	-0.141		
	(0.000)***	(0.000)***		
Top-50			-0.161	-0.157
			(0.000)***	(0.000)***
Non-Top-50			-0.141	-0.130
			(0.000)***	(0.000)***
IPO Age	-0.087	-0.076	-0.087	-0.076
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Gap	0.013	0.010	0.013	0.010
	(0.000)***	(0.005)***	(0.000)***	(0.006)***
P/E	0.008	0.008	0.008	0.008
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Proceeds	-0.213	-0.245	-0.213	-0.244
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
SOE		0.226		0.227
		(0.000)***		(0.000)***
High-tech		-0.097		-0.096
		(0.001)***		(0.001)***
_cons	3.017	3.284	3.019	3.283
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
N.	1,205	1,201	1,205	1,201

In **Table A4.1**, Ranking of Top 20/50 is based on Lead VC's ranking in each fiscal year from 2004 to 2012. Values in the brackets are p-values; *, **, *** denote the coefficients of the variables are significant at 10%, 5%, and 1%, respectively.

Table A4.2 reports the regression results using the alternative reputation measurements on the IPO underpricing. VC's IPO market share, calculating both by proceeds and market capitalization, exhibit different impact with the other three reputation measurements. The underpricing of IPOs backed by VCs with higher market share exhibit no significant difference with the non-VC-backed IPOs; on the contrary, IPOs backed by VCs with lower market share exhibit significantly lower underpricing than the non VC-backed IPOs. Such results are inconsistent with the reputation effects by using the ranking of VC.

However, results of the other reputation measurements are consistent with the ranking of VCs, confirming that higher VC reputation can effectively reduce the underpricing level of IPO firms. From Columns (3) to (5), it is found that coefficients of all the High and Low are significantly negative. The results also manifest that the underpricing of IPOs backed by more reputable VCs are even lower than the IPOs backed by less reputable VCs.

Additionally, effects of control variables are robust to the all the VC reputation measurements. They are also robust to the effects shown in the table by using ranking of Top 20 and 50 as reputation measurements. Older and larger scale firms, high-tech firms are more apt to set their offering price closer to the true value. Conversely, firms have more uncertainty before listing (longer gaps) are likely to suffer from higher underpricing level. Besides, IPO underpricing is found to have positive association with the first day P/E ratio. Last but not least, the more the equities held by government shareholders, the higher the underpricing will be.

Table A4.2 Alternative Reputation Measurements and Underpricing

	VC IPO MS$_1$	VC IPO MS$_2$	VC Age	VC IPO Number	VC Size
	(1)	(2)	(3)	(4)	(5)
High	-0.040	-0.046	-0.197	-0.233	-0.182
	(0.389)	(0.322)	(0.000)***	(0.000)***	(0.000)***
Low	-0.176	-0.174	-0.125	-0.110	-0.145
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
IPO Age	-0.072	-0.073	-0.075	-0.075	-0.076
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Gap	0.010	0.010	0.010	0.009	0.010
	(0.005)***	(0.000)***	(0.004)***	(0.008)***	(0.005)***
P/E	0.008	0.008	0.008	0.008	0.008
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Proceeds	-0.244	-0.244	-0.243	-0.245	-0.247
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
SOE	0.217	0.218	0.234	0.226	0.227
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
High-tech	-0.096	-0.096	-0.092	-0.097	-0.096
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
_cons	3.242	3.259	3.253	3.283	3.312
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
N.	1,201	1,201	1,201	1,201	1,201

In **Table A4.2.**, measurements of VC reputation are based on Lead VC's value in each fiscal year; For each proxy, High reputation is the first largest 25%, and low is the latter 75%; Values in the brackets are p-values; *, **, *** denote the coefficients of the variables are significant at 10%, 5%, and 1%, respectively.

A.5 VC reputation and the Operating Performance

In this sub-section, Model 4.2 is applied to test the Hypothesis 3. The operating performance is measured by ROE_2 and VC reputation is measured by VC age, VC IPO quantities, VC IPO market share, and VC registered capital. Table A5.1 illustrates the results of regressions based on 1,042 A share IPOs from 2007 to 2012. The results are consistent with Table 5.19 that the reputation of VCs has no significant power in predicting the three-year's post-IPO operating performance.

Table A5.1 VC Reputation and ROE_2

	ROE_2				
	(1)	(2)	(3)	(4)	(5)
VC Age	0.000				
	(0.398)				
VC IPO#		-0.023			
		(0.753)			
VC MS$_1$			-1.632		
			(0.858)		
VC MS$_2$				1.302	
				(0.880)	
VC Size					0.000
					(0.367)
IPO Age	1.543	1.582	1.581	1.582	1.598
	(0.002)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
Underpricing	2.412	2.375	2.401	2.398	2.515
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Proceeds	-0.112	-0.0783	-0.0732	-0.0812	-0.119
	(0.817)	(0.871)	(0.879)	(0.866)	(0.808)
SOE	6.914	7.055	7.030	7.020	6.624
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
High-tech	-2.755	-2.739	-2.729	-2.728	-2.769
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
_cons	-35.20	-35.66	-35.73	-35.67	-35.44
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Adj-R^2	0.1071	0.1067	0.1064	0.1064	0.1074
N.	999	1,003	1,002	1,002	988

Table A5.1 reports the cross-sectional OLS regression of 5 different VC reputation proxies against the changes of ROE_2; Numbers in the brackets are p-values; *, **, *** denote to the coefficients of variables are significant at 10%, 5%, and 1%, respectively.

A.6 Selection Bias Issue

Following the Section 6.2.2, this thesis also applies the Heckman 2-step model on the regressions where VC reputation is measured by alternative proxies on the full sample IPOs. The regression model used are the same as Model 6.4 and Model 6.7.

Table A6.1 reports the results of second-step regression, and the results could compare with Table 5.10. Table 5.10 shows that compare to the non-VC-backed IPOs, IPOs funded by more reputable VCs enjoy higher $BHAR_{36}$ than the IPOs funded by less reputable VCs. Nevertheless, completely different results are obtained here. Table A6.1 reveals that after controlling the selection bias using both methods, neither the more reputable VCs, nor the less reputable VCs exert any significant influence on IPO firms' long-run stock market performance. Nearly none of the coefficients of High or Low is significant[6]. However, as documented in Table 6.10, the Ranking of Top 20/50 VCs exhibit significant impact on the IPO long-run stock market performance even after the control of selection bias. Therefore, it might be concluded that the Ranking of VCs is a more significant measurements for VC reputation, comparing to the traditional reputation measurements. It also reveals that the multi-factor indicator proxy is more effective in capturing the effects of VC reputation than the single-factor indicators.

Moreover, Table A6.2 illustrates the same models by using the alternative five reputation measurements on different boards. Panel A of Table A6.2 shows the results of Model 6.4, and Panel B shows the results of Model 6.7. The results show that after the selection bias is controlled, neither the more reputable VCs nor the less reputable VCs exhibits significant impact on IPO long-run performance. However, Table 5.12 shows that VCs are found to exhibit significantly positive impact on IPOs listed on the SME and ChiNext boards. Impact of more reputable VCs are stronger as before. Consequently, the significant impact of the alternative reputation proxies vanish as the selection bias is controlled. In comparison, the positive impact still exists when using the Ranking as proxy for reputation[7].

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[6] When we use VC's past cumulative IPO numbers as proxy of reputation, more reputable VC-backed IPO exhibit significantly better BHARs than non VC-backed IPOs at 10% level.

[7] See Table 6.11.

Table A6.1 Alternative Reputation and BHAR$_{36}$ – High/Low (Table 5.10)

	Inverse Mill's Ratio					VCbacked				
	VC MS$_1$	VC MS$_2$	VC Age	VC IPO#	VC Size	VC MS$_1$	VC MS$_2$	VC Age	VC IPO#	VC Size
IMR	-0.268	-0.262	-0.281	-0.243	-0.267					
	(0.554)	(0.563)	(0.534)	(0.591)	(0.554)					
VCbacked						0.735	0.718	0.767	0.693	0.742
						(0.361)	(0.372)	(0.340)	(0.389)	(0.357)
High	0.390	0.393	0.243	0.122	0.250	0.375	0.377	0.240	0.120	0.251
	(0.650)	(0.648)	(0.574)	(0.055)*	(0.266)	(0.663)	(0.661)	(0.578)	(0.059)*	(0.263)
Low	0.288	0.287	0.150	-	0.161	0.274	0.273	0.148	-	0.164
	(0.738)	(0.738)	(0.727)	-	(0.466)	(0.750)	(0.750)	(0.731)	-	(0.457)
Con. Var.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj-R^2	0.045	0.045	0.037	0.039	0.038	0.038	0.038	0.038	0.040	0.045
N	1,086	1,086	1,086	1,086	1,086	1,086	1,086	1,086	1,086	1,086

Table A6.1 illustrates the results of Model 6.4 and 6.7 based on the full sample IPOs. The *IMR* is the inverse Mill's ratio; values in the brackets are the p-values of coefficients; The control variables included are Age of IPO firm, underpricing, IPO proceeds, dummy variable for SOE, and dummy variable for high-tech. *, **, *** denote significance at 10%, 5%, and 1% levels, respectively.

Table A6.2 Alternative reputation and BHAR$_{36}$ by boards (Table 5.12)

Panel A: Inverse Mills Ratio

	VC MS$_1$		VC MS$_2$		VC Age		VC IPO #		VC Size	
	Main	**ChiNext**	**Main**	**ChiNext**	**Main**	**ChiNext**	**Main**	**ChiNext**	**Main**	**ChiNext**
IMR	-0.272	1.026	-0.264	1.014	-0.303	1.028	-0.255	0.938	-0.289	1.085
	(0.571)	(0.475)	(0.581)	(0.480)	(0.527)	(0.475)	(0.595)	(0.515)	(0.547)	(0.452)
High	0.449	-0.090	0.449	-0.083	0.390	-0.457	0.149	-0.151	0.221	0.266
	(0.604)	(0.582)	(0.604)	(0.605)	(0.438)	(0.575)	(0.029)**	(0.425)	(0.430)	(0.486)
Low	0.310	-	0.308	-	0.281	-0.360	-	-	0.127	0.291
	(0.720)	-	(0.721)	-	(0.574)	(0.657)	-	-	(0.644)	(0.427)
Control Var.	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	931	155	931	155	931	155	931	155	931	155
Adj-R^2	0.035	0.056	0.035	0.056	0.033	0.051	0.036	0.058	0.032	0.052

Panel B: VC͡backed

	VC MS$_1$		VC MS$_2$		VC Age		VC IPO #		VC Size	
	Main	**ChiNext**	**Main**	**ChiNext**	**Main**	**ChiNext**	**Main**	**ChiNext**	**Main**	**ChiNext**
VC͡backed	0.651	-1.366	0.630	-1.345	0.716	-1.356	0.622	-1.212	0.679	-1.403
	(0.447)	(0.583)	(0.462)	(0.589)	(0.403)	(0.587)	(0.467)	(0.627)	(0.429)	(0.574)
High	0.438	-0.090	0.438	-0.083	0.386	-0.452	0.148	-0.153	0.222	0.257
	(0.613)	(0.585)	(0.613)	(0.607)	(0.442)	(0.580)	(0.030)**	(0.419)	(0.428)	(0.502)
Low	0.299	-	0.298	-	0.277	-0.356	-	-	0.129	0.280
	(0.729)	-	(0.730)	-	(0.579)	(0.661)	-	-	(0.640)	(0.445)
Control Var.	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	931	155	931	155	931	155	931	155	931	155
Adj-R^2	0.035	0.055	0.043	0.055	0.034	0.050	0.036	0.057	0.033	0.050

In **Table A6.2**, the second step OLS regression is based on the full sample IPOs. The *IMR* is the inverse Mill's ratio; **VC͡backed** is the estimated value of VC-backed variable from the first-step regression; The control variables included are Age of IPO firm, underpricing, IPO proceeds, dummy variable for SOE, and dummy variable for high-tech. *, **, *** denote significance at 10%, 5%, and 1% levels, respectively.

A.7 Lists of China A share IPOs and VC companies

Table A7.1 Lists of China A share IPOs listed from 2004-2012.

Local Code	Name	Local Code	Name
002001	ZHEJIANG NHU	002040	NANJING PORT
002002	JIANGSU GOLDEN MRA.TECH.	002041	SHANDONG DENGHAI SEEDS
002003	ZHEJIANG WEIXING INDL. DEV.	002042	HUAFU TOP DYED MELANGE YARN
002004	CHONGQING HUAPONT PHARM.	002043	DEHUA TB NEW DECORATION MATERIAL
002005	ELEC-TECH INTL.	002044	JIANGSU SANYOU GROUP
002006	ZHEJIANG JINGGONG SCI.& TECH.	002045	GUOGUANG ELECTRIC
002007	HUALAN BIOLOGICAL ENGR.	002046	LUOYANG BRG.SCI.& TECH.
002008	HAN'S LASER TECH.	002047	SHENZHEN GLOBE UN.INDL.
002009	JIANGSU MIRACLE LOGIST. SYSTEM	002048	NINGBO HUAXIANG ELT.
002010	ZHEJIANG TRANSFAR	002049	TONGFANG GUOXIN ELTN.
002011	ZHEJIANG DUN'AN ARTIFICIAL ENV.	002050	ZHEJIANG SANHUA
002012	ZHEJIANG KAN SPECIALTIES MATERIAL	002051	CHINA CAMC ENGINEERING
002013	HUBEI AVIATION PRECISION MACHINERY	002052	SHENZHEN COSHIP ELTN.
002014	HUANGSHAN NOVEL	002053	YUNNAN SALT & CHM.IND.
002015	XIAKE COLOR SPINNING	002054	DYMATIC CHEMICALS
002016	GUANGDONG SHIRONGZHAOYE	002055	SHENZHEN DEREN ELT.
002017	EASTCOMPEACE TECHNOLOGY	002056	HENGDIAN GP.DMEGC MGN.
002018	ANHUI HUAXING CHEMICAL INDUSTRY	002057	SINOSTEEL ANHUI TIANYUAN TECH.
002019	ZHEJIANG HANGZHOU XINFU PHARM.	002058	SHANGHAI WELLTECH ATMTN.
002020	ZHEJIANG JINGXIN PHARM.	002059	YUNNAN TOURISM
002021	ZOJE SEWING MACHINE	002060	GUANGDONG NO.2 HYPW. ENGR.
002022	SHANGHAI KEHUA BIO ENGR.	002061	ZHEJIANG JIANGSHAN CHM.
002023	SICHUAN HAITE HIGH TECH.	002062	HONGRUN CON.GP.
002024	SUNING APPLIANCE	002063	YGSOFT
002025	GUIZHOU SPACE APPLIANCE	002064	ZHEJIANG HUAFON SPANDEX
002026	SHANDONG WEIDA MACHINERY	002065	DHC SOFTWARE
002027	HEDY HOLDING	002066	RUITAI MATS.TECH.
002028	SIEYUAN ELECTRIC	002067	ZHEJIANG JINGXING PAPER JOINT STOCK
002029	FUJIAN SEPTWOLVES IND.	002068	JIANGXI BLACK CAT CARBON BLACK
002030	DA AN GENE OF SUN YAT- SEN UVTY.	002069	ZHANGZIDAO GROUP
002031	GUANGDONG GREATOO MOLDS	002070	ZHONGHE
002032	ZHEJIANG SUPOR	002071	JIANGSU HONGBAO HWRE.
002033	LIJIANG YULONG TOURISM	002072	SHANDONG DEMIAN
002034	ZHEJIANG MIZUDA PRINTING & DYEING	002073	MESNAC
002035	ZHONGSHAN VATTI GSA.STK.	002074	JIANGSU DONGYUAN ELECT. GP.
002036	NINGBO YAK TECH.INDL.	002075	JIANGSU SHAGANG
002037	GUIZHOU JIULIAN IND. EXPLOSIVE	002076	CNLIGHT
002038	BEIJING SL PHARMACEUTICAL	002077	JIANGSU DAGANG
002039	GUIZHOU QIANYUAN PWR.	002078	SHANDONG SUN PAPR.IND. JOIST.

Local Code	Name	Local Code	Name
002079	SUZHOU GOOD-ARK ELTN.	002123	RONGXIN POWER ELECTRONIC
002080	SINOMA SCI.& TECH.	002124	NINGBO TECH-BANK
002081	SUZHOU GD.MANTIS CON.	002125	XIANGTAN ELECTROCHEM. SCIEN.
002082	ZHEJIANG DONGLIANG NEW BLMS.	002126	ZHEJIANG YINLUN MCH.
002083	SUNVIM GROUP	002127	JIANGSU XINMIN TEXTILE SCTC.
002084	GUANGZHOU SEAGULL KITCHEN&BATH PRO	002128	HUOLINHE OPENCUT COAL IND.
002085	ZHEJ.WANFENG AUTO WHEEL	002129	TIANJIN ZHONGHUAN SEMICON.
002086	SHANDONG ORNTL.OCE.SCI.- TECH.	002130	SHENZHEN WOER HTSHRIN. MATERIAL
002087	HENAN XINYE TEX.	002131	ZHEJIANG LEO
002088	SHANDONG LUYANG SHRE.	002132	HENAN HENGXING SCTC.
002089	SUZHOU NEW SEA UN.TELC. TECH.	002133	COSMOS GROUP
002090	WISCOM SYSTEM	002134	TIANJIN PRINTRONICS CIRCUIT
002091	JIANGSU GUOTAI INTL.GP.	002135	ZHEJIANG SOUTHEAST SPACE FRAME
002092	XINJIANG ZHONGTAI CHEMICAL	002136	ANHUI ANNADA TTM.IND.
002093	GUOMAI TECHNOLOGIES	002137	SHENZHEN SEA STAR TECH.
002094	QINGDAO KGKG.APPD. CHEMY.	002138	SHENZHEN SUNLORD ELTN.
002095	ZHEJIANG NETSUN	002139	SHENZHEN TOPBAND
002096	HUNAN NANLING IND. EXPLV.MATS.	002140	EAST CHINA ENGR.SCTC.
002097	SUNWARD INTEL.EQU.	002141	GUANGDONG RONSEN SUPER MICROWIRE
002098	FUJIAN SBS ZIPPER SCI. & TECH.	002142	BANK OF NINGBO
002099	ZHEJIANG HISOAR PHARMACEUTICAL	002143	SICHUAN GAOJIN FOOD
002100	XINJIANG TECON ANM.HBDY. BIO-TECH	002144	HONGDA HIGH-TECH HLDG.
002101	GUANGDONG HONGTU TECH.	002145	CNNC HUA YUAN TITANIUM DIOXIDE
002102	FUJIAN GUANFU MOD.HHLD. WARES	002146	RISESUN REAL ESTATE DEV.
002103	GUANGBO GROUP STOCK	002147	MAANSHAN FANGYUAN SLEWING RING
002104	HENGBAO	002148	BEIJING BEWINNER COMMS.
002105	HL (SHENZHEN)	002149	WESTERN METAL MATERIALS
002106	SHENZHEN LAIBAO HI.TECH.	002150	JIANGSU TONGRUN EQU. TECH.
002107	SHANDONG WOHUA PHARM.	002151	BEIJING BDSTAR NAV.
002108	CANGZHOU MINGZHU PLASTIC	002152	GRG BANKING EQUIPMENT
002109	SHAANXI XINGHUA CHEMY.	002153	BEIJING SHIJI INFO.TECH.
002110	SANSTEEL MINGUANG	002154	ZHEJIANG BAOXINIAO GRMT.
002111	WEIHAI GUANGTAI ARPT. EQU.	002155	CHENZHOU MINING GP.
002112	SAN BIAN SCIENCE TECHNOLOGY	002156	NANTONG FUJITSU MICROELS.
002113	HUNAN TIANRUN ENTS.HLDG.	002157	JIANGXI ZHENGBANG TECH.
002114	YUNNAN LUOPING ZINC & ELTY.	002158	SHANGHAI HANBELL PRECISE MACHINERY
002115	SUNWAVE COMMUNICATIONS	002159	WUHAN SANTE CBWS.GP.
002116	CHINA HAISUM ENGINEERING	002160	JIANGSU ALCHA ALUM.
002117	TUNGKONG	002161	INVENGO INFO.TECH.
002118	JILIN ZIXIN PHARM.INDL.	002162	SHANGHAI CIMIC HOLDINGS
002119	NINGBO KANGQIANG ELTN.	002163	AVIC SANXIN
002120	NINGBO XINHAI ELECTRIC	002164	NINGBO DONLY TNSM. EQUIPMENT
002121	SHENZHEN CLOU ELTN.	002165	NANJING HONGBAOLI
002122	TIANMA BEARING GROUP	002166	GUILIN LAYN NATINGDTS.

Local Code	Name	Local Code	Name
002167	GNGD.OR.ZCIND.SCTC.	002210	SHENZHEN FEIMA INTL. SPCH.
002168	SHENZHEN HIFUTURE ELEC.	002211	JIANGSU HONGDA NEW MRA.
002169	GUANGZHOU ZHG.ELEC.	002212	GNGD.NAN YANG CAB.GP. HLDG.
002170	SHN.BATIAN ECOL.TCNQ.	002213	SHENZHEN TERCA TECH.
002171	ANHUI JIC.CPR.SHRE.	002214	ZHEJIANG DALI TECH.
002172	JIANGSU AOYANG TECH.	002215	SHENZHEN NOPOSION AGCHM.
002173	PURE PEARL GROUP	002216	ZHENGZHOU SANQUAN FOODS
002174	SUSINO UMBRELLA	002217	SHANDONG LIAHERD CHM. IND.
002175	GUILIN GUANGLU MG.INSTM.	002218	SHENZHEN TOPRAYSOLAR
002176	JIANGXI SPC.ELEC.MTR.	002219	GNDUWI.BILG.PHARM.
002177	GUANGZHOU KINTCH.	002220	DALIAN TIANBAO GRN.FDS.
002178	SHANGHAI YANSMRT.GP.	002221	ORIENTAL ENERGY
002179	CHINA AVTN.OPTC.ELTG.	002222	CASTECH
002180	ZHUHAI WANLIDA ELEC.	002223	JIANGSU YUYUE MDEQT.& SUPP.
002181	GUANGDONG GZH.DLY.MDA.	002224	ZHEJIANG SANLUX RUB.
002182	NANJING YUNHAI SMTL.	002225	PUYANG REFRAC.GROUP
002183	ETERNAL AI.SPCH.MAN.	002226	ANHUI JIANGNAN CHM.IND.
002184	SHANGHAI HT.CNTL.SY.	002227	SHN.AUTO ELEC.PWR.PLT.
002185	TIANSHUI HUN.TECH.	002228	XIAMEN HXP.PRINTING
002186	CHINA QUANJUDE GP.	002229	FUJIAN HONGBO PRINTING
002187	GUANGZHOU GRANDBUY	002230	ANHUI USTC IFLYTEK
002188	ZHEJIANG NEW JLN.ELTN.	002231	ALLWIN TELECM.
002189	LIDA OPTICAL & ELT.	002232	QIMING INFORMATION TECH.
002190	SIC.CHENGFEI INTG.TECH.	002233	GUANGDONG TAPAI GP.
002191	SHENZHEN JINJIA COPRGP.	002234	SHANDONG MINHE ANM.HBDY.
002192	LUXIANG	002235	XIAMEN ANNE
002193	SHANDONG JINING RUYI WTX.	002236	ZHEJIANG DAHUA TECH.
002194	WUHAN FINGU ELEC.TECH.	002237	SHANDONG HUMON SMELTING
002195	SHANGHAI HYRON SFTW.	002238	SHENZHEN TOPWAY VID. COMM.
002196	ZHEJIANG FOUNDER MTR.	002239	JIANGSU KINGFIELD GARM.
002197	SHENZHEN ZHENGTONG ELTN.	002240	GUANGDONG WEIHUA
002198	GNGD.JIAYING PHARM.	002241	GOERTEK
002199	ZHEJIANG ET.CRYSTAL ELT.	002242	JOYOUNG
002200	YUNNAN GRN.LD.BILG.TECH.	002243	SHENZHEN BEAUTY STAR
002201	JIANGSU JIUDING NEW MRA.	002244	HANGZHOU BJ.RLST.GP.
002202	XINJIANG GOLDWIND SCTC.	002245	JIANGSU AUCKSUN
002203	ZHEJIANG HAILIANG	002246	SICHUAN NITROCELL
002204	DALIAN HUARUI HVY.IND. GP.	002247	ZHEJIANG DILONG NEW MRA.
002205	XINJIANG GUOTONG PIPE.	002248	WEIHAI HUADONG ATMTN.
002206	ZHEJIANG HAILIDE NEW MRA.	002249	ZHONGSHAN BROAD-OCE.MTR.
002207	XINJIANG ZHUDG.PTL.TECH.	002250	LIANHE CHEMICAL TECH.
002208	HEFEI URBAN CON.DEV.	002251	BETTER LF.COML.CHN.SHRE.
002209	GUANGZHOU TECH-LONG PACK.MACH.	002252	SHANGHAI RAAS BLOOD PRDS.

Local Code	Name	Local Code	Name
002253	WISESOFT	002298	ANHUI XINGLONG ELECT.
002254	YANTAI TAYHO ADVD.MATS.	002299	FUJIAN SUNNER DEV.
002255	SUZHOU HAILU HVY.IND.	002300	FUJIAN NANPING SUN CAB.
002256	SHENZHEN RAINBOW FINE CHM.IND.	002301	SHENZHEN COMIX STNERY.
002258	LIER CHEMICAL	002302	XINJIANG WEST CON.GP.
002259	SICHUAN SHENGDA FOREST. IND.	002303	SHENZHEN MYS ENV.PROTC. & TECH.
002260	GUANGDONG ELECPRO ELEC. APPLIANCE HLDG.	002304	JIANGSU YANGHE BREW.JST.
002261	TALKWEB INFO.SY.	002305	WUHAN LANGOLD RLST.
002262	JIANGSU NHWA PHARM.	002306	BEIJING XIANGEQING
002263	ZHEJIANG GT.STHEAST.	002307	XINJIANG BEIXIN ROAD & BDG.GP.
002264	FUJIAN NEW HUA DU SUPERCENTER	002308	VTRON TECHNOLOGIES
002265	YUNNAN XIYI INDUSTRY	002309	ZHONGLI SCTC.GROUP
002266	ZHEJIANG FFJG.HYPR.EQU.	002310	BEIJING OR.LANDSCAPE
002267	SHAANXI PRVL.NATGS.	002311	GUANGDONG HAID GROUP
002268	WESTONE INFO.IND.	002312	CHENGDU SANTAI ELTN.IND.
002269	SHANGHAI MBWE.FASH. & ACCS.	002313	SUNSEA TELECOM.
002270	SHANDONG FIN CNC MACH.	002314	YAHGEE MODULAR HOUSE
002271	BEIJING ORNTL.YUHONG WATERPROOF TECH.	002315	FOCUS TECHNOLOGY
002272	SICHUAN CRUN	002316	SHENZHEN KEYBRIDGE COMMS.
002273	ZHEJIANG CYL.OPTECH	002317	GUANGDONG ZHONGSHENG PHARM.
002274	JIANGSU HUACHANG CHM.	002318	ZHEJIANG JIULI HI-TECH METALS
002275	GUILIN SANJIN PHARM.	002319	LETONG CHEMICAL
002276	ZHEJIANG WANMA CABLE	002320	HAINAN STRAIT SHIPPING
002277	HUNAN FRIENDSHIP & APO. COML.	002321	HENAN HUAYING AGRI.DEV.
002278	SHANGHAI SK PTL. & CHM. EQU.	002322	NINGBO LGG.ONMTG.TECH.
002279	BEIJING JOIN-CHEER SFTW.	002323	JIANGSU ZHONGLIAN ELEC.
002280	HANGZHOU NEW CEN.INFO. TECH.	002324	SHANGHAI PRET CMPS.
002281	ACCELINK TECHS.	002325	SHENZHEN HONGTAO DCRT.
002282	BOSUN TOOLS	002326	ZHEJIANG YONGTAI TECH.
002283	TIANRUN CRANKSHAFT	002327	SHENZHEN FUANNA BEDDING AND FURNISHING
002284	ZHEJIANG ASIA-PACIFIC MECH.& ELECT	002328	SHANGHAI XINPENG IND.
002285	SHENZHEN WORLD UNION PROPS.CONSULTATION	002329	GUANGXI HUANGSHI DAIRY
002286	BAOLINGBAO BIOLOGY	002330	SHANDONG DELISI FOOD
002287	TIBET CHEEZHENG TIBETAN MEDICINE	002331	ANHUI WANTONG TECH.
002288	GUANGDONG CHAOHUA TECH.	002332	ZHEJIANG XIANJU PHARM.
002289	SUCCESS ELECTRONICS	002333	SUZHOU LOPSKING ALMN.
002290	SUZHOU HESHENG SPC.MRA.	002334	SHENZHEN INV.ELEC.
002291	FOSHAN SATURDAY SHO.	002335	XIAMEN KEHUA HENGSHENG
002292	GUANGDONG ALP.ANIM.& CUL.	002336	RENRENLE COML.GP.
002293	LUOLAI HOME TEXTILE	002337	TIANJIN SAIXIANG TECH.
002294	SHENZHEN SALUBRIS PHARMS.	002338	CHANGCHUN UP OPTOTECH
002295	GUANGDONG JINGYI METAL	002339	INTEGRATED ELT.SYS.LAB
002296	HENAN SPLENDOR SCTC.	002340	SHENZHEN GRN.ECO-MANF. HI TECH
002297	HUNAN BOYUN NEW MATS.	002341	SHENZHEN SELEN SCTC.

Local Code	Name	Local Code	Name
002342	JULI SLING	002386	YIBIN TIANYUAN GP.
002343	ZHEJIANG HEXIN IND.GP.	002387	BLACKCOW FOOD
002344	HAINING CHINA LTHR.MKT.	002388	SHENZHEN SUNYES EMF. HLDG.
002345	GUANGDONG CHJ IND.	002389	ZHEJIANG NANYANG TECH.
002346	SHANGHAI ZHEZHONG CON.	002390	GUIZHOU XINBANG PHARM.
002347	ANHUI TAIER HDY.	002391	JIANGSU CHANGQING AGRCL.
002348	GOLDLOK TOYS HDG. (GNGD.)	002392	BEIJING LIER HIGH TEMPERATURE MATS.
002349	NANTONG JINGHUA PHARM.	002393	TIANJIN LISHENG PHARM.
002350	BEIJING CRTV.DS.ATMTN.	002394	JIANGSU LIANFA TEXTILE
002351	EDIFIER TECHNOLOGY	002395	WUXI DBLE.EH.MCR.FBM.
002352	MANNSHAN DINGTAI RARE EARTH NEW MRA.	002396	FUJIAN STAR-NET COMM.
002353	YANTAI JEREH OLSR.GP.	002397	HUNAN MENDALE HMT.
002354	DALIAN KEMIAN WOOD IND.	002398	XIAMEN ACADEMY OF BLDG. RESH.GP.
002355	SHANDONG XINGMIN WHEEL	002399	SHENZHEN HEPALINK PHARM.
002356	SHENZHEN HAONINGDA METERS	002400	GUANGDONG ADVR.
002357	SICHUAN FULIN TRSP.GROUP	002401	CHINA SHIPPING NET.TECH.
002358	HENAN SENYUAN ELEC.	002402	SHENZHEN H & T INTEL. CNTL.
002359	SHANDONG QIXING IO.TWR.	002403	ZHEJIANG AISHIDA ELEC.
002360	SHANXI TOND CHEMICAL	002404	ZHEJIANG JIAXIN SILK
002361	ANHUI SHENJIAN NEW MATS.	002405	NAVINFO
002362	HANWANG TECHNOLOGY	002406	XUCHANG YND.DRIVE SHAFT
002363	SHANDONG LONGJI MCH.	002407	DO-FLUORIDE CHEMS.
002364	HANGZHOU ZHONGHENG ELEC.	002408	ZIBO QIXIANG TENGDA CHM.
002365	QIANJIANG YONGAN PHARM.	002409	JIANGSU YOKE TECH.
002366	SICHUAN DANFU COMPR.	002410	GLODON SOFTWARE
002367	CANNY ELEVATOR	002411	JIANGSU JIUJIUJIU TECH.
002368	TAIJI COMPUTER	002412	HUNAN HANSEN PHARM.
002369	SHENZHEN ZOWEE TECH.	002413	JIANGSU CHANGFA REFRIG.
002370	ZHEJIANG YATAI PHARM.	002414	WUHAN GUIDE INFRARED
002371	BEIJING SEVENSTAR ELTN.	002415	HANGZHOU HIK VIS.DIG. TECH.
002372	ZHEJIANG WEIXING NEW BLDG.MATS.	002416	SHENZHEN AISIDI
002373	SUREKAM	002417	FUJIAN SUNNADA COMM.
002374	SHANDONG LIPENG	002418	ZHEJIANG KANGSHENG
002375	ZHEJIANG YASHA DECORATION	002419	RAINBOW DEPT.STORE
002376	SHANDONG NEW BEIYANG INFO.TECH.	002420	GUANGZHOU ECHOM SCTC.
002377	HUBEI GUOCHUANG HI-TECH. MRA.	002421	SHENZHEN DAS INTELLITECH
002378	CHONGYI ZHANGYUAN TGTN.	002422	SICHUAN KELUN PHARM.
002379	SHDG.LOFTEN ALMN.FOIL	002423	ZHONGYUAN SPC.STEEL
002380	NANJING SCIYON ATMTN.GP.	002424	GUIZHOU BAILING GROUP PHARM.
002381	ZHEJIANG DBLE.ARROW RUB.	002425	KAISER (CHINA) HLDG.
002382	SHANDONG BLU.SAIL PLAST. & RUB.	002426	SUZHOU VTY.PRECN.MANF.
002383	BEIJING UNISTRONG SCTC.	002427	ZHEJIANG UNIFULL INDL. FIBER
002384	SUZHOU DONGSHAN PRECN. MNFG.	002428	YUNNAN LINCANG XINYUAN GERMANIUM INDL.
002385	BEIJING DABEINONG TECH. GP.	002429	SHENZHEN MTC

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002430	HANGZHOU HANGYANG	002474	FUJIAN RONGJI SFTW.
002431	PALM LANDSCAPE ARCHI.	002475	LUXSHARE PRECN.IND.
002432	ANDON HEALTH	002476	SHANDONG PLM.BIOCS.
002433	GUANGDONG TAIANTANG PHARM.	002477	CHUYING AGRO-PAST.GP.
002434	ZHEJIANG WANLIYANG TNSM.	002478	JIANGSU CHANGBAO STEELTUBE
002435	CHANG JIANG RUNFA MCH.	002479	ZHEJIANG FFJG.ENV.TMELC.
002436	SHENZHEN FASTPRINT CCT. TECH.	002480	CHENGDU XINZHU RD. & BDG. MCH.
002437	HARBIN GLORIA PHARMS.	002481	YAN TAI SHUANG TA FOOD
002438	JIANGSU SHENTONG VALVE	002482	SHENZHEN GRANDLAND DCRT. GP.
002439	BEIJING VENUSTECH	002483	JIANGSU RAINBOW HVIND.
002440	ZHEJIANG RUNTU	002484	NANTONG JNH.CAPACIT.
002441	ZHONGYEDA ELECTRIC	002485	SINOER MEN'S WEAR
002442	LONGXING CHEMICAL STOCK	002486	SHANGHAI CHALLENGE TEX.
002443	ZHEJIANG KINGLAND PIPE. & TECHS.	002487	DAJIN HEAVY INDUSTRY
002444	HANGZHOU GT.STAR INDL.	002488	ZHEJIANG JINGU
002445	JIANGYIN ZHONGNAN HVY. INDS.	002489	YOTRIO GROUP
002446	GUANGDONG SHENGLU TELECM.TECH	002490	SHANDONG MOLONG PTL.MCH.
002447	DALIAN YI QIAO MARINE SEEDS	002491	JIANGSU TONGDING OPTIC ELECTRONIC
002448	ZYNP	002492	ZHUHAI WINBASE INTL.CHM. TNK.TERM.
002449	FOSHAN NATIONSTAR OPEL.	002493	RONGSHENG PETRO CHM.
002450	BEIJING KANGDE XIN CPST. MRA.	002494	HUASI AGRI.DEV.
002451	SHANGHAI MORN ELEC.EQU.	002495	GUANGDONG JIALONG FOOD
002452	HUNAN CNGO.HVLG.SWGR.GP.	002496	JIANGSU HUIFENG AGROCHEMICAL
002453	SUZHOU TIANMA SPY.CHEMS.	002497	SICHUAN YAHUA INDL.GP.
002454	SHAI.JIALENG SONGZHI AUTMB.AIRCONDITION	002498	QINGDAO HANHE CABLE
002455	WUXI BAICHUAN CHM.IND.	002499	KELIN ENP.EQUIPMENT
002456	SHENZHEN O-FILM TECH	002500	SHANXI SECURITIES
002457	NINGXIA QINGLONG PIPES IND.	002501	JILIN LIYUAN ALMN.
002458	SHANDONG YISHENG LIVE.& POULTRY BREEDING	002502	HUAWEI TECHNOLOGY
002459	QINHUANGDAO TITO.HDY.	002503	DONGGUAN SOUYUTE FASH.
002460	JIANGXI GANFENG LITHIUM	002504	JIANGSU DONGGUANG MCR. ELTN.
002461	GUANGZHOU ZHUJIANG BREW.	002505	HNN.DAKANG PASTURE FRMG.
002462	CACHET PHARM.	002506	SH CHAORI SOLAR EN.SCTC.
002463	WUS PRINTED CIRCUIT (KUNSHAN)	002507	CHONGQING FULING ZHACAI GP.
002464	KEE EVER BRT.DEC.TECH.	002508	HANGZHOU ROBAM APP.
002465	GUANGZHOU HAIGE COMMS. GP.	002509	TIANGUANG FIRE-FIGHTING
002466	SICHUAN TIANQI LITHIUM INDS.	002510	TIANJIN MOTOR DIES
002467	NET263	002511	C&S PAPER
002468	ZHEJIANG IDC FLUID CNTL.	002512	TATWAH SMARTECH
002469	SHANDONG SUNWAY PETROCH. ENGINEER	002513	JIANGSU LANFENG BIOCH.
002470	SHANDONG KINGENTA ECOL. ENGR.	002514	SUZHOU BOAMAX TECHS.GP.
002471	JIANGSU ZHONGCHAO CABLE	002515	JINZI HAM
002472	ZHEJIANG SGUN.DRIVELINE	002516	JIANGSU KUANGDA AUTMB. TEX.GP.
002473	NINGBO SNLT.ELECT.APPC.	002517	TAIYA SHOES

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002518	SHENZHEN KSTAR SCTC.	002563	ZHEJIANG SEMIR GRMT.
002519	JIANGSU YINHE ELTN.	002564	ZHANGJIAGANG CHM.MCH.
002520	ZHEJIANG RIFA DIG.PRECN. MCH.	002565	SH LUXIN PCKG.MATS.SCTC.
002521	SHANDONG QIFENG SPECIAL PAPER	002566	JILIN JIAN YISHENG PHARM.
002522	ZHEJIANG ZHONGCHENG PCKG.MRA.	002567	TANGRENSHEN GROUP
002523	ZHUZHOU TIANQIAO CRANE	002568	SHANGHAI BAIRUN FLFR.
002524	GUANGZHENG STL.STRUC.	002569	ZHEJIANG BUSEN GARM.
002526	SHANDONG MNG.MCH.GP.	002570	ZHEJIANG BEINGMATE SCIEN.INDS.
002527	SHANGHAI STEP ELECTRIC	002571	ANHUI DELI HHLD.GLASS
002528	SHENZHEN INFINVOA	002572	SUOFEIYA HOME CLLN.
002529	FUJIAN HAIYUAN AUTOMATIC EQPM.	002573	BEIJING SPC ENVM.PROTC. TECH.
002530	JIANGSU FENGDONG THM. TECH.	002574	ZHEJIANG MING JEWELRY
002531	TITAN WIND EN.(SUZHOU)	002575	GUANGDONG QUNXING TOYS JOINT-STOCK
002532	SHIMGE PUMP IND.GP.	002576	JIANGSU TONGDA PWR.TECH.
002533	GOLDCUP ELEC.APPARATUS	002577	SHENZHEN RAPOO TECH.
002534	HANGZHOU BOILER GP.	002578	FUJIAN MINFA ALUM.
002535	LINZHOU HEAVY MCH.GP.	002579	HUIZHOU CHINA EAGLE ELT. TECH.
002536	HENAN PROV.XIXIA AUTMB. WATER PUMP	002580	SHANDONG SACRED SUN PWR. SOURCES
002537	QINGDAO HAILI METAL ONE	002581	ZIBO WANCHANG SCTC.
002538	ANHUI SIERTE FTLZ.IND.	002582	HAOXIANGNI JUJUBE
002539	SHINDOO CHEMICAL IND.	002583	HYTERA COMMS.
002540	JIANGSU ASPAC.LT.ALLOY TECH.	002584	XILONG CHEMICAL
002541	ANHUI HONGLU STL.CON. (GP.)	002585	JIANGSU SHUANGXING COLOR PLAST.NEW MATS.
002542	CHINA ZHONGHUA GTH.ENGR.	002586	ZHEJIANG RECLAIM CON.GP.
002543	GUANGDONG VANWARD NEW ELECTRIC	002587	SHENZHEN AOTO ELTN.
002544	GCI SCTC.	002588	STANLEY FERTILIZER
002545	QINGDAO ET.STL.TWR.STK.	002589	SHANDONG REALCAN PHARM.
002546	NANJING XINLIAN ELTN.	002590	ZHEJIANG VIE SCTC.
002547	SUZHOU CHUNXING PRECN. MECH.	002591	JIANGXI HENGDA HI-TECH
002548	SHENZHEN JINXINNONG FEED	002592	NANNING BALING TECH.
002549	HUNAN KAIMEITE GASES	002593	XIAMEN SUNRISE WHEEL GP.
002550	CHANGZHOU QIANHONG BIOPHARMA	002594	BYD
002551	SHENZHEN GLORY MED.	002595	SHANDONG HIMILE MECH. SCTC.
002552	BAODING HEAVY IND.	002596	HAINAN RUIZE NEW BLDG. MRA.
002553	JIANGSU NANFANG BEARING	002597	ANHUI JINHE INDL.
002554	CHINA OIL HBP SCTC.	002598	SHANDONG ZHANGQIU BLOWER
002555	WUHU SHUNRONG AUTO PARTS	002599	BEIJING SHENGTONG PRINT.
002556	ANHUI HUILONG AGRI.MPD.	002600	JPMF GUANGDONG
002557	CHACHA FOOD	002601	HENAN BILLIONS CHEMS.
002558	CHONGQING NEW CEN.CRUISE	002602	ZHEJIANG CEN.HUATONG AUTV.PART
002559	JIANGSU YAWEI MACH.TOOL	002603	SHIJIAZHUANG YILING PHARM.
002560	HENAN TONG-DA CABLE	002604	SHANDONG LONGLIVE BIO TECH.
002561	SHANGHAI XUJIAHUI COML.	002605	SHANGHAI YAOJI PLAYING CARD
002562	BROTHER ENTS.HLDG.	002606	DALIAN INSULATOR GP.

Local Code	Name	Local Code	Name
002607	WUHU YAXIA AUTOMOBILE	002650	JIAJIA FOODSTUFF GP.
002608	SAINTY MARINE	002651	CHENGDU LEEJUN INDL.
002609	SHENZHEN JIESHUN SCTC. IND.	002652	SUZHOU YANGTZE NMTS.
002610	JIANGSU AKCOME SLR.SCTC.	002653	XIZANG HAISCO PHARM.GP.
002611	GUANGDONG DONGFANG PRECN.SCTC.	002654	SHENZHEN MASON TECHS.
002612	LANCY	002655	SHANDONG GETTOP ACOUSTIC
002613	LUOYANG NORTH GLSS.TECH.	002656	GUANGZHOU CANUDILO F&A.
002614	XIAMEN COMFORT SCTC.GP.	002657	SINODATA
002615	ZHEJIANG HAERS VACUUM CTRS.	002658	BEIJING SDL TECH.
002616	GUANGDONG CHANT GP.	002659	JIANGSU ZHONGTAI BDG. STL.STRUCD.
002617	ROSHOW TECHNOLOGY	002660	MOSO PWR.SUPP.TECH.
002618	SHENZHEN DANBOND TECH.	002661	KEMEN NOODLE MNFG.
002619	ZHEJIANG DGN.PI.MNFG.	002662	BEIJING WKW AUTV.PAS.
002620	SHENZHEN RUIHE CON.DCRT.	002663	PUBANG LND.ARCHI.
002621	DALIAN SUNLIGHT MCH.	002664	XIN ZHI MOTOR
002622	JILIN YONGDA GROUP	002665	BEIJING SHOUHANG RES. SVN.
002623	CHANGZHOU ALMADEN STK.	002666	GUANGDONG DELIAN GROUP
002624	ZHEJIANG JINLEI REFRAC.	002667	ANSHAN HEAVY DUTY MINING MACHINERY
002625	ZHEJIANG LSH.AUTO PARTS	002668	GUANGDONG HOMA APP.
002626	XIAMEN KINGDOMWAY GP.	002669	SHANGHAI KANGDA NMTS.
002627	HUBEI YICHANG TRSP.GP.	002670	GUANGDONG HUASHENG ELECT.APP.
002628	CHENGDU R&BR.ENGR.	002671	SHANDONG LONGQUAN PIPE. ENGR.
002629	SICHUAN RENZHI OILFIELD TECH.SVS.	002672	DONGJIANG ENVIRONMENTAL
002630	CHINA WSTN.PWR.INDL.	002673	WESTERN SECURITIES
002631	DER INTL.HM.FURNISHING	002674	XINGYE LEATHER TECH.
002632	ZHEJIANG DAOMING OP.& CHM.	002675	YANTAI DONGCHENG BIOCHEMICALS
002633	SHENKE SLIDE BEARING	002676	GUANGDONG SUNWILL PRECISING PLASTIC
002634	ZHEJIANG BANGJIE DIG. KNTG.SHRE.	002677	ZHEJIANG MEIDA INDUSTRIAL
002635	SUZHOU ANJIE TECH.	002678	GUANGZHOU PER.RVR.PIANO GP.
002636	GOLDENMAX INTL.TECH.	002679	FUJIAN JINSEN FORESTRY
002637	ZHEJIANG ZANYU TECH.	002680	LIANYUNGANG HUANGHAI MACHINERY
002638	DONGGUAN KINGSUN OT.	002681	SHENZHEN FENDA TECHNOLOGY
002639	FUJIAN SNOWMAN	002682	FUJIAN LONGZHOU TRSP.
002640	SHANXI BAIYUAN TROUSERS CHAIN MAN.	002683	GUANGDONG HONGDA BLASTING
002641	YONGGAO	002684	GUANGDONG DYNAVOLT POWER TECHNOLOGY
002642	UNITED ELECTRONICS	002685	WUXI HUADONG HEAVY MCH.
002643	YANTAI VALIANT FINE CHEMS.	002686	ZHEJIANG YILIDA VENTILATOR
002644	LANZHOU FOCI PHARM.	002687	ZHEJIANG GIUSEPPE GRMT.
002645	JIANGSU HUAHONG TECH. STK.	002688	JINHE BIOTECHNOLOGY
002646	QINGHAI HUZHU BARLEY WINE	002689	SHENYANG BRILLIANT ELEV.
002647	ZHEJIANG HONGLEI COPPER	002690	HEFEI MEIYA OT.TECH.
002648	ZHEJIANG SAT.PETROCH.	002691	SHIJIAZHUANG ZHONGMEI COAL MINE EQU.MANF.
002649	BEYONDSOFT	002692	JIANGSU NEW YUANCHENG CABLE

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002693	HAINAN SHUANGCHENG PHARMACEUTICALS	300033	HEXIN FLUSH INFO.NET.
002694	GOODY SCIENCE & TECH.	300034	BEIJING CISRI GAONA MATS.& TECH.
002695	JIANGXI HUANG SHANG HUANG FOOD	300035	HUNAN ZHONGKE ELECTRIC
002696	BAIYANG AQUATIC GP.	300036	BEIJING SUPERMAP SFTW.
002697	CHENGDU HONGQI CHAIN	300037	SHENZHEN CAPCHEM TECH.
002698	HARBIN BOSHI ATMTN.	300038	BEIJING METENO COMM. TECH.
002699	MEISHENG CULTR. & CRTV.	300039	SHANGHAI KAIBAO PHARM.
002700	XINJIANG HAOYUAN NATURAL GAS	300040	HARBIN JIUZHOU ELECTRIC
002701	ORG PACKAGING	300041	HUBEI HUITIAN ADHESIVE ENTER.
002702	FUJIAN TENGXIN FOOD STK.	300042	NETAC TECHNOLOGY
002703	ZHEJIANG SHIBAO	300043	XINGHUI AUTO MODEL
300001	QINGDAO TGOOD ELEC.	300044	SHENZHEN SUNWIN INTEL.
300002	BEIJING ULTRAPOWER SFTW.	300045	HWA CREATE
300003	LEPU MED.TECH. (BEJ.)	300046	HUBEI TECH SEMICS.
300004	NANFENG VENTILATOR	300047	SHENZHEN TIANYUAN DIC INFO.
300005	BEIJING TOREAD OUTDR. PRDS.	300048	HICONICS DRIVE TECH.
300006	CHONGQING LUMMY PHARM.	300049	INNER MOI.FURUI MED.SCI.
300007	HENAN HANWEI ELTN.	300050	DINGLI COMMS.
300008	SHANGHAI BESTWAY MAR. ENGR.DSGN.	300051	XIAMEN 35 COM TECH.
300009	ANHUI ANKE BIOTECH. (GP.)	300052	SHENZHEN ZHONGQING BAOWANG NET.TECH.
300010	BEIJING LANXUM TECH.	300053	ZHUHAI ORBITA CNTL.ENGR.
300011	BEIJING DINGHAN TECH.	300054	HUBEI DINGLONG CHM.
300012	CENTRE TESTING INTL. (SHN.)	300055	BEIJING WATER BUS.DR.
300013	JIANGSU XINNING MOD. LOGIST.	300056	XIAMEN SAVINGS ENV.
300014	EVE ENERGY	300057	SHANTOU WANSHUN PACKAGE MATERIAL
300015	AIER EYE HOSPITAL GP.	300058	BLUEFOCUS COMM.GP.
300016	BEIJING BEILU PHARM.	300059	EAST MONEY INFO.
300017	SHANGHAI WANGSU SCTC.	300061	SHANGHAI CONANT OPTICS
300018	WUHAN ZHONGYUAN HUADIAN SCTC.	300062	FUJIAN CEE INSTALLATIONS
300019	CHENGDU GUIBAO SCTC.	300063	GUANGDONG SKY DRAGON PRINTING INK GP.
300020	ZHEJIANG ENJOYOR ELTN.	300064	ZHENGZHOU SINO-CRYSTAL DIAMOND
300021	GANSU DA YU WATER-SAVING	300065	BEIJING HIGHLANDER DIGITAL TECH.
300022	GIFORE AGRI.MCH.CHAIN	300066	JIANGXI SANCHUAN WATER METER
300023	BODE ENERGY EQU.	300067	SHANGHAI ANOKY TEX.CHM.
300024	SIASUN ROBOT & ATMTN.	300068	ZHEJIANG NARADA PWR.SCE.
300025	HANGZHOU HUAXING CHUANGYE COMM.	300069	ZHEJIANG JINLIHUA ELEC.
300026	TIANJIN CHASE SUN PHARM.	300070	BEIJING ORIGINWATER TECH.
300027	HUAYI BROTHERS MDA.	300071	SPEARHEAD INTMKG.COMM. GP.
300028	CHENGDU GEEYA TECH.	300072	BEIJING SJ ENP. & NMT.
300029	JIG.HUASHENG TIANLONG PHOTOELECTRIC	300073	BEIJING EASPRING MRA. TECH.CL.A
300030	GUANGZHOU IMPROVE MED. INSTRUMENTS	300074	AVCON INFO.TECH.CL.A
300031	WUXI BOTON BELT	300075	BEIJING EGOVA CL.A
300032	JINLONG MCH. & ELT.	300076	NINGBO GQY VID. & TELC. JST.

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300077	NATIONZ TECHNOLOGIES	300120	TIANJIN JINGWEI ELECTRIC WIRE
300078	HANGZHOU CENTURY	300121	SHANDONG YANGGU HUATAI CHM.
300079	SUMAVISION TECHS.	300122	CHONGQING ZHIFEI BILG. PRDS.
300080	HENAN XINDAXIN MATS.	300123	SUNBIRD YACHT
300081	HEBEI HENGXIN MOBL.BUS.	300124	SHENZHEN INOVANCE TECH.
300082	LIAO NING OXIRANCHEM	300125	DALIAN EAST NEW ENERGY DEVELOPMENT
300083	JN. (DGA.)PRECN.COMPNS.	300126	SHANGHAI KEN TOOLS
300084	LANZHOU HAIMO TECHS.	300127	CHENGDU GALAXY MAGNETS
300085	SHENZHEN INFOTECH TECHS.	300128	SUZHOU JINFU NEW MRA.
300086	HAINAN HONZ PHARM.	300129	SHANGHAI TAISHENG WIND POWER EQU.
300087	WINALL HI-TECH SEED	300130	SHENZHEN XINGUODU TECH.
300088	WUHU TOKEN SCIENCE	300131	SHENZHEN YITOA INTEL. CNTL.
300089	GREAT WALL GROUP	300132	FUJIAN GREEN PINE
300090	ANHUI SHENGYUN MCH.	300133	ZHEJIANG HUACE FILM & TV
300091	JIANGSU JIN TONG LING FLUID MCH.TECH.	300134	SHENZHEN TAT FOOK TECH.
300092	SICHUAN KEXIN MECH. & ELECT.EQU.	300135	JIANGSU BAOLI ASPHALT
300093	GUANGDONG GOLDEN GLSS. TECHS.	300136	SHENZHEN SUNWAY COMM.
300094	ZHANJIANG GLA.ATC.PRDS.	300137	HEBEI SAILHERO ENP. HIGH-TECH
300095	JIANGXI HUAWU BRAKE	300138	CHENGUANG BIOTECH GP.
300096	YLZ INFO.TECH.	300139	BEIJING FUXING XIAOCHENG ELTECH.STK.
300097	DALIAN ZHIYUN ATMTN.	300140	XI'AN QIYUAN MECH.AND ECEQ.
300098	GOSUNCN TECH.GROUP	300141	SUZHOU INDL.PARK HESHUN ELEC.
300099	UROICA MNG.STY.ENGR.	300142	WALVAX BIOTECHNOLOGY
300100	NINGBO SNGN.AUTO PARTS	300144	HANGZHOU SONGCHENG TSM. DEV.
300101	CHENGDU GDL.ELCT.TECH.	300145	NANFANG PUMP IND.
300102	XIAMEN CHANGELIGHT	300146	BY-HEALTH
300103	XI'AN DAGANG RD.MCH.	300147	XIANGXUE PHARM.
300104	LESHI INET.INFO.& TECH.	300148	HUNAN TANGEL PBL.
300105	YANTAI LGU.PWR.TECH.	300149	JIANGMEN QUANTUM HI-TECH BIOLOGICAL
300106	XINJIANG WSTN.ANIMAL HUSBANDRY	300150	BEIJING CEN.RL.TECH.
300107	HEBEI JIANXIN CHM.	300151	SHENZHEN CHANGHONG MOLD TECHNOLOGY
300108	TONGHUA SHUANGLONG CHM.	300152	XUZHOU COMBUSTION CNTL. TECH.
300109	BOAI NKY PHARMS.	300153	SHANGHAI COOLTECH POWER
300110	QINGDAO HUAREN PHARM.	300154	SHENZHEN RILAND IND.
300111	ZHEJIANG SUNFLOWER LT. EN.SCTC.	300155	GUANGDONG ANJUBAO DIG. TECH.
300112	SHENZHEN MAXONIC ATMTN. CNTL.	300156	TIANLI ENV.ENGR.
300113	HANGZHOU ICAFE TECH.	300157	LANDOCEAN ENERGY SVS.
300114	ZHONGHANG ELT.MG.INSTS.	300158	SHANXI ZHENDONG PHARM.
300115	SHENZHEN EVERWIN PRECN. TECH.	300159	XINJIANG MCH.RESH.INST.
300116	SHAANXI J&R FIRE PROTC.	300160	JIANGSU XIUQIANG GLASSWORK
300117	BEJ.JIAYU DOOR WINDOW & CUI.WALL JST.	300161	WUHAN HUAZHONG NMC.CNTL.
300118	RISEN ENERGY	300162	LEDMAN OPTOELECTRONIC
300119	TIANJIN RINGPU BIO-TECH.	300163	NINGBO XIANFENG NMT.

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300164	TONG OIL TOOLS	300208	QINGDAO EVERCONTAINING ELEC.
300165	JIANGSU SKYRAY INSTM.	300209	TIANZE INFO.IND.
300166	BEJ.OR.NAT.COMM.SCTC.	300210	ANSHAN SENYUAN R&B.
300167	SHENZHEN DVISION VID. COMMS.	300211	JIANGSU YITONG HT.
300168	WONDERS INFORMATION	300212	BEIJING E-HUALU INFO TECH.
300169	CHANGZHOU TIANSHENG NEW MATS.	300213	BEJ.JX.FEIHONG ELECT.
300170	HAND ENTERPRISE SLTN.	300214	SHANDONG RIKE CHM.
300171	SHANGHAI TOFFLON SCTC.	300215	SUZHOU ELEC.APT.SCIENCE ACADEM.
300172	NANJING CEC ENV.PROTC.	300216	HUNAN CHINA SUN PHARM. MCH.
300173	SOTECH MACHINERY	300217	ZHENJIANG DONGFANG ELEC. HEATING TECH.
300174	FUJIAN YUANLI ACV.CARBON	300218	ANHUI ANLI ARTIFICIAL LTHR.
300175	LONTRUE	300219	GUANGZHOU HONGLI OPTO ELT.
300176	GUANGDONG HONGTEO ACCURATE TECH.	300220	WUHAN GOLDEN LASER
300177	GUANGZHOU HI TARGET NAV. TECH.	300221	GUANGDONG SILV.AGE SCTC.
300178	SHENZHEN TEMPUS GLB. TRVL.HDG.	300222	SHANGHAI CSG SMRT.SCTC.
300179	SF DIAMOND	300223	INGENIC SEMICON.
300181	ZHEJIANG JOLLY PHARM.	300224	YANTAI ZHENGHAI MAGNETIC MRA.
300182	BEIJING JETSEN TECH.	300225	SHANGHAI KINLITA CHM.
300183	QINGDAO EASTSOFT COMM. TECH.	300226	SHANGHAI GANGLIAN E-COM. HDG.
300184	WUHAN P&S INFO.TECH.	300227	SHENZHEN SUN.LSR. & ELTN. TECH.
300185	TONGYU HEAVY INDUSTY	300228	ZHANGJIAGANG FURUI SPC. EQU.
300186	GUANGDONG DAHUANONG ANM. HLPR.	300229	BEIJING TRS INFO.TECH.
300187	HUNAN YONKER ENP.	300230	SHANGHAI YONGLI BELTING
300188	XIAMEN MEIYA PICO INFO.	300231	BEIJING TRUST & FAR TECH.
300189	GRAND AGRISEEDS TECH.	300232	UNILUMIN GROUP
300190	JIANGSU WELLE ENV.	300233	SHANDONG JINCHENG PHARM. AND CHM.
300191	SINO GEOPHYSICAL	300234	ZHEJIANG KAIER NEW MATS.
300192	SUZHOU KINGSWOOD PRINT. INK	300235	SHENZHEN KINGSUN SCTC.
300193	SHENZHEN JASIC TECH.	300236	SHANGHAI SINYANG SEMICON.MATS.
300194	CHONGQING FUAN PHARM. (GP.)	300237	SHANDONG MEICHEN SCTC.
300195	MASTERWORK MACHINERY	300238	GRANDHOPE BIOTECH
300196	JIANGSU CHANGHAI CPST. MATS.	300239	BAOTOU DONGBAO BIO TECH
300197	SHENZHEN TECHAND ELG.& ENVM.	300240	JIANGSU FEILIKS INTL. LOGIST.
300198	FUJIAN SUPERPIPE	300241	SHENZHEN REFOND OPEL.
300199	HYBIO PHARMACEUTICAL	300242	MIG TECHNOLOGY
300200	BEIJING COMENS NEW MATS.	300243	SHANDONG RUIFENG CHM.
300201	XUZHOU HANDLER SPC.VEH.	300244	ZHEJIANG DA DIAGNOSTICS
300202	LIAONING JULONG FINL. EQU.	300245	SHANGHAI DRAGONNET TECH.
300203	FOCUSED PHT. (HGZO.)	300246	GUANGDONG BIOLIGHT MEDITECH
300204	STAIDSON (BEJ.)BIOPH.	300247	ANHUI SAUNAKING
300205	WUHAN TIANYU INFO.IND.	300248	ZHENGZHOU BRAND-NEW CAP ELTN.
300206	EDAN INSTRUMENTS	300249	SICHUAN YIMIKANG ENV. TECH
300207	SUNWODA ELECTRONIC	300250	HANGZHOU CNCR-IT

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300251	BEIJING ENLIGHT MDA.	300294	JIANGXI BOYA BIOPHM.
300252	KINGSIGNAL TECH.	300295	EVERYDAY NETWORK
300253	SHANGHAI KINGSTAR WINNING SFTW.	300296	LEYARD OPTOELECTRONIC
300254	SHANXI C&Y PHARM.	300297	BLUEDON INFO.SCTY.TECHS.
300255	HEBEI CHANGSHAN BIOCH. PHARM.	300298	SINOCARE
300256	ZHEJIANG FIRSTAR PANEL TECH.	300299	FUCHUN COMMUNICATIONS
300257	ZHEJIANG KAISHAN COMPR.	300300	HAKIM INFO.TECH.
300258	JIANGSU PAC.PRECN.FRGG.	300301	SHENZHEN CHANGFANG LIGHT EMITTING DIODE LTG.
300259	HENAN SUNTRONT TECH.	300302	TOYOU FEIJI ELECTRONICS
300260	KUNSHAN KINGLAI HYGIENIC MATS.	300303	SHENZHEN JUFEI OPTOELECTRONICS
300261	ABA CHEMICALS	300304	JIANGSU YUNYI ELECTRIC
300262	SHANGHAI SAFBON WT.SER.	300305	JIANGSU YUXING FILM TECH.
300263	LUOYANG LONGHUA HEAT TFER.TECH.	300306	HANGZHOU EVERFINE PHOTO- E-INFO
300264	AVIT	300307	NINGBO CIXING
300265	JIANGSU TONGGUANG ELT. W&C.	300308	SHANDONG ZHONGJI ECEQ.
300266	HANGZHOU XINGYUAN FILTER TECH.	300309	GI TECHS.(BEJ.)
300267	HUNAN ER-KANG PHARM.	300310	GUANGDONG EASTONE CEN. TECH.
300268	WANFU BIOTECH. (HUNAN) AGRI.DEV.	300311	SURFILTER NETWORK TECH.
300269	SHENZHEN LIANTRONICS	300312	BOOMSENSE TECHNOLOGY
300270	OB TELECOM ELTN.	300313	XINJIANG TIANSHAN AHBY. BIO-ENGINEERING
300271	BEIJING THUNISOFT	300314	NINGBO DAVID MED.DVC.
300272	SHANGHAI CANATURE ENV. PRDS.	300315	BEIJING OURPALM TECHNOLOGY
300273	ZHUHAI HOKAI MED.INSTS.	300316	ZHEJIANG JINGSHENG MCL&ECL.
300274	SUNGROW POWER SUPPLY	300317	SHENZHEN JIAWEI PHOTOVOLTAIC LTG.
300275	CHONGQING MAS SCI & TECH	300318	BEIJING BOHUI INNOVATION TECHNOLOGY
300276	HUBEI SNE.INTEL.CNEQ.	300319	SHENZHEN MICROGATE TECHNOLOGY
300277	SHENZHEN HIRISUN TECH.	300320	JIANGYIN HAIDA RUBBER AND PLASTIC
300278	HUBEI HUACHANGDA INTEL. EQUP.	300321	SHANDONG TONGDA NEW MATERIALS
300279	WUXI HODGEN TECH.	300322	HUIZHOU SPEED WIRELESS TECHNOLOGY
300280	NANTONG METALFORMING EQU.	300323	HC SEMITEK
300281	GUANGDONG JINMING MCH.	300324	BEIJING WATERTEK ITECH.
300282	BEIJING IRTOUCH SYS.	300325	JIANGSU DEWEI ADVANCED MATERIALS
300283	WENZHOU HONGFENG ELECT. ALLOY	300326	SHANGHAI KINETIC MEDICAL
300284	JIANGSU TRSP.RESH.INST.	300327	SINO WEALTH ELECTRONIC
300285	SHANDONG SINOCERA FUNCTIONAL MRA.	300328	DONGGUAN EONTEC
300286	SHANGHAI ACREL	300329	HAILUN PIANO
300287	BEIJING PHILISENSE TECH.	300330	SHANGHAI HUAHONGJT SMART SYSTEM
300288	GUIYANG LONGMASTER INFO. & TECH.	300331	SVG OPTRONICS
300289	BEIJING LEADMAN BCM.	300332	TOP RSO.CVT.ENGR.
300290	BRINGSPRING SCTC.	300333	SINOSUN TECHNOLOGY
300291	BEIJING HUALUBAINA FILM & TV	300334	TIANJIN MOTIMO MEMBRANE TECHNOLOGY
300292	JIANGSU WUTONG COMMS.	300335	GUANGZHOU DEVOTION THM. TECH.
300293	SHENYANG BLUE SILV.IND. AUTO.EQU.	300336	SHANGHAI NEW CUL.MDA.GP.

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300337	YINBANG CLAD MRA.	600479	ZHUZHOU QIANJIN PHARM.
300338	CHANGSHA KAIYUAN INSTS.	600482	FENGFAN STOCK
300339	JIANGSU HOPERUN SFTW.	600483	FUJIAN NANFANG TEX.
300340	JIANGMEN KANHOO IND.	600491	LONG YUAN CONSTRUCTION GP.
300341	MOTIC (XIAMEN) ELEC.GP.	600493	FUJIAN FYNEX TEX.SCTC.
300342	CHANGSHU TIANYIN ELECTROMECHANICAL	600495	JINXI AXLE
300343	LECRON ENERGY SAVING MATERIALS	600497	YUNNAN CHIHONG ZINC & GERMANIUM
300344	BEIJING TAIKONG PANEL INDUSTRY	600540	XINJIANG SAYRAM MOD. AGRIC.
300345	HONYU WEAR RESISTANT NEW MATERIALS	600543	GANSU MOGAO INDL.DEV.
300346	JIANGSU NATA OPTO-ELECTRONIC MRA.	600572	ZHEJIANG CONBA PHARM.
300347	HANGZHOU TIGERMED CNSL.	600960	SHANDONG BINZHOU BOHAI PISTON CO.
300348	SHENZHEN SUNLINE TECH.	600961	ZHUZHOU SMELTER GROUP
300349	ZHEJIANG GOLDCARD HIGH-TECH	600962	SDIC ZHONGLU FRUIT JUICE
300350	SHENZHEN HUAPENGFEI MODERN LOGISTICS	600963	YUEYANG FOR. & PAPR.
300351	ZHEJIANG YONGGUI ELEC. EQU.	600966	SHANDONG BOHUI PAPER INDL.
300352	BEIJING VRV SOFTWARE	600967	BAOTOU BEIFANG CHUANGYE
300353	KYLAND TECHNOLOGY	600969	HUNAN CHENDIAN INTL.DEV.
300354	DONGHUA TESTING TECH.	600970	SINOMA INTL.ENGR.
300355	INNER MOI.HTMS.DGRT. GRIG.	600971	ANHUI HENGYUAN COAL IND. & ELEC.
300356	ELEFIRST SCTC.	600973	BAOSHENG SCI. AND TECH. INNOVATION
600017	RIZHAO PORT	600975	HUNAN NEW WELLFUL
600022	SHANDONG IRON & STL.	600976	WUHAN JIANMIN PHARM. GROUPS
600035	HUBEI CHUTIAN EXPRESSWAY	600978	GUANGDONG YIHUA TIMBER INDUSTRY
600048	POLY REAL ESTATE GP.	600979	SICHUAN GUANGAN AAA PUBLIC
600114	NBTM NEW MATS.GROUP	600981	JIANGSU HIGH HOPE
600143	KINGFA SCI.& TECH.	600982	NINGBO THERMAL POWER
600249	LIUZHOU LIANGMIANZHEN	600983	HEFEI RONGSHIDA SANYO ELECTRIC
600284	SHAI.PUDONG RD.AND BDG. CON.	600984	SHANXI CON.MCH.
600325	HUAFA INDUSTRIAL ZHUHAI	600985	ANHUI LEIMINGKEHUA
600354	GANSU DUNHUANG SEEDS	600986	KEDA GROUP
600387	ZHEJIANG HAIYUE	600987	ZHEJIANG HANGMIN
600405	BEIJING DYNAMIC POWER CO.	600988	CHIFENG JILONG GDMNG.
600410	BEIJING TEAMSUN TECH.	600990	ANHUI SUN-CREATE ELTN.
600420	SHANGHAI MODERN PHARM.	600991	GAC CHANGFENG MOTOR
600421	WUHAN NATIONAL PHARMS.	600992	GUIZHOU WIRE ROPE
600438	TONGWEI	600993	MAYINGLONG PHARM.GP.
600444	ANHUI GROTONG HI-TECH PIPES INDUSTRY	600995	YUNNAN WENSHAN ELECTRIC PWR.
600452	CHONGQING FULING ELEC. PWR.INDL.	600998	JOINTOWN PHARM.GP.
600455	BUT'ONE INFORMATION	600999	CHINA MERCHANTS SECS.
600461	JIANGXI HONGCHENG WTW.	601000	TANGSHAN PORT GROUP
600463	BEIJING AIRPORT HIGH-TEC PARK CO.	601001	DATONG COAL INDUSTRY
600467	SHANDONG HOMEY AQUATIC DEV. CO.	601002	GEM-YEAR INDUSTRIAL
600470	ANHUI LIUGUO CHM.	601003	LIUZHOU IRON & STEEL

Local Code	Name	Local Code	Name
601006	DAQIN RAILWAY	601101	BEIJING HAOHUA EN.RSO.
601007	JINLING HOTEL	601106	CHINA FIRST HVY.IND.
601009	BANK OF NANJING	601111	AIR CHINA LIMITED
601010	WENFENG GT.WLD.CHN.DEV.	601113	YIWU HUADING NYLON
601011	QITAIHE BAOTAILONG COAL & COAL CHEMS.	601116	SANJIANG SHOPPING CLUB
601012	XI'AN LONGI SCN.MATS.	601117	CHINA NAT.CHM.ENGR.
601018	NINGBO PORT	601118	CHINA HAINAN RUBBER IND. GP.
601028	JIANGSU YULONG STL.PIPE	601126	BEIJING SIFANG ATMTN.
601058	SAILUN	601137	NINGBO POWERWAY ALLOY MATERIAL
601088	CHINA SHENHUA EN.	601139	SHENZHEN GAS
601098	CHINA SOUTH PBL. & MDA. GP.	601158	CHONGQING WATER GP.
601099	PACIFIC SECURITIES	601166	INDUSTRIAL BANK
601100	JIANGSU HENGLI HIP.OIL CYLD.	601168	WESTERN MINING

In **Table A7.1**, all the A share IPOs from 2004 to 2012 are listed by following the ascending order of the local stock market code on the China stock market.

Table A7.2 Lists of VC Companies

Name	Name	Name
ABC Capital	CCI Investment	China-Belgium Equity Investment Fund
ABC VC Management	CDB Capital	China Link Asia Holdings
Actmax Investment	CDF Capital, Hua Cheng	Changzhou Hi-tech Capital
Alex Investment	CDF Capital, Suzhou	Chinese Innovation Group
Alfa Investment Management	CDing Hui Venture	Chongqing VC
Anhui Technology Investment	Century Fang Zhou VC	Chuang Dong Fang Capital
Asian Allied International Ltd	Century Tianfu VC	CICC Alternative Investment Limited
Bai Na Investment	Century VC	CITIC Investment
Bai Rui Innovation VC	Chang An Innovation Investment	CITIC PE
Bai Shun Investment	Chang Jang VC	CITIC Union
Bao Li Jia	Chang Run Investment	CMS Zhi Yuan Capital
Bao Sheng S&T Investment	Changsha Gui Gu VC	CMTECH
Beijing Capital Investment	Chang Sha Xing Ye VC	Co Bridge Capital
Beijing Cyber Globe	Chang Ting VC LP	Comway VC
Beijing Hua Yun Equity Investment	Chang Yuan Ying Jia	Costone VC Guangzhou
Beijing Tain Tu Xing Ye Investment	Chang Yun Xin An	China Ever Bright Inter. Joint Venture
Beijing Yiyun Clean Techonology VC LP	China-Singapore Suzhou Industrial Park	Cowin Capital
Beijing Zhong Fan Hua Ruan Investment	Changzhou Jin Ling Hua Ruan VC Partnership	Cowin Capital LP
Bejing VC	Changzhou Xin Hui VC	Cowin Capital Venture Technology LP
Bing Yuan An Investment	Cheer Yard Investment	CRCI
Bing Yuan Investment	Cheng Ming Da Investment	Crown Team International Investment
Bing Yuan VC	Cheng Dang VC	CVC
Binzhou VC	Cheng Xin VC	CVVC
BOC Investment	Chen Neng Hi tech investment	CXC Capital
Boho Investment	China Capital Management	Da Hua S&T Investment
Bo Xin Capital	China Crane	Dalian Hai Rong Hi-tech VC
Bridge Capital	China Gao Xin Investment	De Bang Rui Jing Investment Management
Bridge Fu Ka Capital	China Science Bai Yun VC	De Dao Investment
Bright Stone	China Science Chun Sheng No.1 LP	De Rui Heng Feng VC
Broad Resource Investment Ningbo	China Science Danxia VC LP	De Tong Yin Ke VC LP
CAC Capital	China Science Hong Yi HK VC	Ding Hong VC
Caep VC	China Science Hong Yi VC	Ding Yuan Investment
Cai Hong VC	China Science Huang Hai	Ding Yun Jia Hui Investment Management
Cai Xin VC	China Science Hui Shang VC	Dongguan Ke Chuang Investment
Care All Capital	China Science Hui Tong VC	Dong Jin VC
Carlyle	China Science Hui Xing VC LP	Dong Sheng VC
CAS Investment Management	China Science Merchants VC	East Sky Investment
CAS Rui Hua VC	China Science Merchants VC, Guangdong	East-lake VC
CCB International Asset Management	China Science Song Shan Lake VC Fund	Ever Bright Capital
CCB International Capital	China Science Yuan Dong	Ever Yong VC
CCG	China VC	Fang Xiang Investment

Name	Name	Name
Fen Hui VC	Greenwoods Asset VC	Heng Sheng Investment
FFH	GS Pharma	Heng Tian Tech Investment
First Solution ltd	Guangdong Technology VC	He Tai Growth VC
Fortune Synergy	Guangdong Xin Da VC	HFT Capital
Fortune VC	Guangzhou Technology VC	Hida Investment
Fosun Industry Investment	Gui Shi VC LP	Hong De Long Sheng Investment
Fosun Medical Investment	Guo Fu Fund	Hong Jing VC
Gold Stone	Guo Jia Venture Capita	Hong Ling VC LP
Fosun Purun Investment	Guo Ke New Economy Investment	Hong Ma VC
Fosun VC	Guo Lian Zhuo Cheng VC	Hong Qiao VC
Franchise Investment	Guo Run VC	Hong Rui VC
Fu Hai Yin Tao	Guosen Hong Sheng VC	Hong Shan VC Investment
Fu Hui Heli Investment LP	Guotai Ju Nan Investment Management	Hong Shu VC
Fujian Jin Da VC	Guo Xin Hong Ji Investment	Hong Ta VC
Fu Quan Investment	Guo Yuan Direct Investment	Hony Capital
Fuson Industry Investment	GVCGC	Hope Bridge Capital
Fuson Pin Xin Investment	Haerbin Innovation Capital	Hou Tu VC
Fu Tian Innovation Capital	Haerbin Technology Investment	HTI
Fu Wei VC	Haian Tao Jin VC	HTVC Group
Fuxin VC	Haihui Growth VC LP	Hua Cheng Hua Li VC
Gao De S&T VC	Haihui Investment Management	Huahan Investment
Gao De VC	Hai Tong Kaiyuna Capital	Hua Hao Investment
Gao Jin VC	Hang Xin Investment	Hua Heng VC
Genetic Investment	Hang Yuan Fu VC	Hua Hong Cai Xin
George Investment	Hangzhou Hi-tech VC	Hua Ou VC
Gfxinde Investment	Hangzhou Lian Chuang Yong Jin LP	Hua Tai Zi Jin
GGV	Hangzhou Ling Feng Sai BoLe	Hua Xing VC
GIC	Hangzhou Sai Zhi VC	Hubei Hi-tech Investment
GIG	Hanlin VC LP	Hui Chao Gong Jin VC
GIG Chuang Fu	Harmony Capital	Hui Jin Lifang Capital LP
GIG Hui Fu	Hebei De Ren VC	Hui Quan Investment
GIG Rong Hua	He Guang Capital LP	Hui Sheng Yong Tai VC
GIG Rong Yuan	He Guang Yuan Jian Capital	Hui Yin Guang Chang Technology Innovation Park
Gionee Innovation Investment	Hefei Innovation Investment	Hui Zhi VC
Fosun Pingyao Investment Management	Hefei Technology Venture Investment	Hunan Cai Xin VC
Golden Yours	He Ji Investment	Hunan New Energy VC Fund LP
Golden Yours Zhi Du	He Jun Capital	Hunan Zhong Jin VC
Goldman Sachs	He Jun Hui Sheng Equity Investment	Hust VC
Good Capital	Henan VC	IDG. Guangdong
Govtor Capital	Heng Li VC	IDG. Tianlong
Govtor Mingly China Growth Fund	Heng Rou VC	IER VC
Greenwoods Asset Management	Heng Rui VC	IFC

Name	Name	Name
Infore Capital Group	Jun Wei Investment	MS Fiber Holding Limited
Infotech	JVR International	Nanchang High-Tech Investment
Intel Capital	Ke Feng Techonology Investment	Nanchang VC
Intel Investment	Ke Lian VC	Nanjing Dian Liang A Investment Centre
IP CATHAY ONE	Ke Sheng Investment	Nantong Gao Sheng Growth VC
Ivy Capital	Ke Xing VC	Nantong GPCP LP
Jiahua Zhuo Yue Investment LP	KPCB	Nantong Tian Zi Wei Investment LP
Jiang Du S&T VC	Kunlun Calaxy	National Development Creation Capital Management
Jiangsu Jin Sha Jiang VC	Mian Yang S&T Industrial Investment Fund	Natixis S.A
Jinke Gao Chuang investment Management	Lai Zhou Hi tech Investment	New Enterprise Investment
Jianguo VC	Lan Shan Investment	New Horizon
Jinda VC	Lan Shi VC	New Margin Capital
Jing Tian I and II (IDG)	Lan Yi VC	New Margin Capital, Yongjin
Jingfa VC	Lao Shan VC	New Oriental
Jiangsu Tian Shi VC	Leading Capita	Nian Li Da VC
Jinli VC	Leaguer Tsing-Yuan VC	Ningbo Dong Yuan VC
Jin Rong Xin Run He VC LP	Leaguer Tsing-Yuan VC , Wuxi	NJVC
Jin Rui Da Investment Management	Leaguer Tsing-Yuan VC, Changzhou	Nomura Holdings
Jin Ye Investment	Legend Capital	OCBC Capital
Jin Yi Da VC	Legend Capital I LP	OFC
Jiuding (Bao Jia) VC LP	Legend Holdings	OFC LP
Jiuding (Jia Xing Jia Hao)VC LP	Lei Shi Xin Yuan Tianjin LP	Orange Golden Cube Capital
Jiuding (Kun Wu) Investment	Lian Chuang Ce Yuan Investment	Orchid Asia
Jiuding (Long Tai) VC LP	Lian Sheng VC	Oriza Holdings
Jiuding (Ou Wen) VC LP	Liaoning Ke Fa Industrial Corp	Parallel
Jiuding (Shang Qi) VC LP	Li Bao Feng Yi Capital LP	PDSTI
Jiuding (Xia Qi) VC LP	Li Da VC	Perpetual Treasure Ltd
Jiuding (Zheng Dao) VC	Liu He Capital	Pilot VC
Jiuding (Zhou Yuan) VC LP	Li Yan Equity Investment	Ping An Cai Zhi Investment Management
Jiupai Investment	Li Yuan VC	Ping An Innovation Capital
Jiuzhou Investment Group VC	LNVC	Platinum VC
Join State Limited	Long Bo Investment	Prax Capital
Joint Fortune Capital	Long Shan Sai Bo Le VC	Primrose Capital
Jolmo Capital	Lute Investment	Principal Capital
Jolmo Capital China Venture	Mai Tian Li Jia	Principle Equity Investment
Jolmo Partners	Martix	QDSTVC
JS Ding Hong VC	Merrill VC	Qian Yuan Sheng VC
JS Gao Sheng Hi-tech VC	Kun Shan Venture Equity	Qi Xing VC
JS High-tech Investment Growth VC	Ming I and II (IDG)	QM8
JS Ying Neng VC	Ming Hua Investment	Raystone Capital LP
JSVC	Min Sheng supermarket	Raystone TaiHe LP
Jun Run Equity Investment	Mount Kellett Capital	RC Investment

Name	Name	Name
Rong Gao VC	Sheng Yu Investment	Suzhou High-tech Guo Fa VC
Rong Sheng VC	Shenzhen Fortune Caifu VC Management	Suzhou Kai Feng VC
Ruide Feng Hua Management	Shenzhen Fortune Caixin VC Management	Suzhou Song He Capital LP
RuiFu Shi Dai Investment	Shenzhen Fortune Caizhi VC Management	SXSTF
RuiHua Feng Neng Investment	Shenzhen Hen Yuan investment	SZMC
Rui Hua Investment	Shenzhen Innovation Capital Investment	SZVC
Ru Shan Investment	Shenzhen Shi Fang Lian VC	Tai Hao Sheng Da VC
Saicmotor VC	Shenzhen Songhai VC	Tai Yin VC
SAIF II	Shenzhen Zuo Jia Hui Zhi VC	TB nature ltd
SAIF III Mauritius	Shi Ji Investment	TB Polymer Limited
SAIF Tianjin	Shi Long International	TDF Capital
Sai Ji Investment	Shou Chuang Growth	TEDA VC
San Sheng Capital	Shou Yu Investment	THVC
SBCVC	SHTIC	Tian An Group
SBCVC Tianjin LP	Shun Tai VC	Tian Jin Bo Xin
SBI & TH VC	SIDVC	SRSI
Shanghai Jin Bo Investment and Development	Tsinghua University Education Foundation	Tianjin Da Chen Creation Fortune Equity Investment
SDIC	Sino-Century	Shanghai Techonology Investment
SCGC	Sino Wisdom Dianshi VC	Sino-Swiss VC
SEAVI	Sino Wisdom Haiyue VC	Tianjin OFC Partnership
Sequoia Capital Fund II	Sino Wisdom RuiyinVC	Tianjin VC
Sequoia Capital LP	Sino Wisdom Shengyin VC	Tianjin Wei De Capital LP
Shanghai Bo Feng VC	Sino Wisdom VC	Tian Tu Capital
Shanghai Bo Run	Small Ville Wealth VC	Tian Yi Investment
Shanghai Can Rong VC	Smart Base	Tian Yue VC
Shanghai Dong Zhen VC	SNDVG	Tong Fang VC
Shanghai Fan Ya Strategy Invst.	Softbank Xin Chuang LP	Tong Lian VC
Shanghai Hong Hua Capital	SOHA	Tong Ying VC
Seasonal Capital	South China Investment	Top Vantage VC
Shanghai Ling Hui VC	Sova Capital	Tsinghua Science Park
Shanghai Nano VC	Spread Energy Limited	TTGC
Shanghai New Allicance Capital	Tianjin Da Chen Creation Equity Investment	Tianjin Dachen Shengshi Equity Investment
Tianjin De Tong Investment Partnership	SSJ Investment	TTGC Angle LP
Shanghai Xin Lian VC	Standard Chartered Principal Finance	TTGC LP
Shanghai Zi Chen Investment	Stone Capital	TTGC Shanghai
Shang Li Investment	Suda Investment	TTGC Sunshine
Shan Shan VC	Sun Bridge Capital	TTGC Wuhan LP
Shan Shui Equity Investment	Sun Bridge Chuang Yuan Investment	Tuspark
Shaoxing Pingan Investment	Sure Joyce Limited	Tuspark Venture
Sheng Hua Kang Yaun VC LP	Suzhou Da Dao VC LP	Veken Capital
Sheng Hua Yang VC	Suzhou Gao Yuan VC	Vertex Group
Sheng Jing Jia Hua Investment	Suzhou Hai Fu Investment	Vision Investmen

Name	Name	Name
Walden	Xin Rong VC Fund LP	Zhe Jiang Yi Cheng VC Fund
Wan ChuanJi Equity Investment	Xin Rui Investment	Zhe Jiang Yi Du VC
Warburg Pincus	Yan Tai Kunde Investment	Zhe Ling Capital
Wei Mei VC	Ya Yin Investment LP	Zheng Dai United Investment
Wei Shi VC	YHVC	Zheng Tong VC
Wei Tong Assets Management	Yi He VC	Zhi Cheng Hai Wei
WI Harper	Ying Ming VC LP	Zhi He Capital VC
Wintech Investment Management	Ying Tong VC	Zhong Bao VC
Wuhan Borun Investment	Yi Run VC	Zhong Ke Yu Xiang VC LP
Wuhan Optics-Valley Fund	Yi Tong Sen Yuan Investment	Zhong Ke Yue Lu VC Fund
Wuhan Optics-Valley VC	Yi Wen Innovation Capital	Zhong Da VC
Wuhan S&T Investment	Yi Yuan Zhi Di VC	Zhong Hao New Energy Investment
Wuhu Da Cheng VC	Yong Hua Capital	Zhong He VC
Wuhu Rui Ye Equity Investment	You Feng VC	Zhong Jing Century VC
Wuxi Hua Ruan VC Partnership	Younger Investment	Yang Zhou VC
Xiamen Huo Ju VC	Yuan Feng VC	Zhong Ke Ke Rui VC
Xiang Cheng VC	Yuan Sheng Equity Investment	Zhong Cheng Xin Financial Cons. Investment
Xiang He Equity Investment LP	Yuan Wang VC	Zhong Cheng Xin Fang Quan Investment
Xiang Jiang Industry Investment	Yue Cai Investment	Zhong Ling VC
Xiang Rong VC	Zhang Jiang High tech	Zhong Ou VC
Xiang Tang VC	Zhao Xing VC	Zhong Zheng Da Dao Equity Investment
Xiang Tou Hi-tech Venture	Zhe Jiang Fuxin VC	Zhu Hai Hua Chuang Investment Management
Xi Ge Ma VC	Zhe Jiang Goldsun VC	Zhu Hai Tsinghua Science Park
Xi Nao VC	Zhe Jiang Jia Yin Investment	Zi Jiang VC
Xing Ye VC	Zhe Jiang Lan Shi VC	ZSVC
Xin Hu VC	Zhe Jiang Ou Xin VC	ZVC
Xin Hua Feng Yin VC	Zhe Jiang University VC	
Xin Nuo Tai VC	Zhe Jiang VC	

In **Table A7.2**, all the VC firms that have invested the China A share IPOs listed between 2004 and 2012 are listed by following the alphabetical order from A to Z.

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