# Stock Market Liberalization and Venture Capital [*]

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## Abstract

We explore the impact of stock market liberalization on venture capital investments. Using machine learning algorithms, we build up the most comprehensive dataset on venture capital investments in China from administration data. We find evidence consistent with the hypothesis of a positive feedback effect on VC funding. Using heterogeneous treatment intensities for identification, we show that the ChiNext stock market introduction that facilitated venture capital exits leed to an increase in venture capital activity in the most affected industries, broaden the investor base and lead to a shorter duration until exit.

*Keywords:* stock market liberalization, venture capital, IPO, exit, cross-border venture capital, ChiNext, China.

*JEL Classification:* G32, G34, G35.

## 1. Introduction

According to conceived wisdom, primary equity markets geared to innovative start-ups are a prerequisite for the emergence of a vibrant venture capital sector. Policymakers and practitioners have pursued reforms liberalizing stock markets in many countries around the world with the explicit goal of fostering the financing of innovation creating new stock exchanges for young and small-capitalization companies, often characterized by less restrictive listing requirements and a more relaxed regulatory environment (Bernstein, Dev and Lerner, 2019).[3] Empirical evidence suggests that well-developed public equity markets are instrumental for young and fast-growing companies' development by allowing them to seek funding for R&D activities (Brown, Fazzari, and Petersen, 2009; Hall and Lerner, 2010).

Despite the broadly shared view that the creation of such entrepreneurial and technology-oriented primary equity markets should have a positive impact on venture capital (VC), there is surprisingly little hard evidence in support of such feedback effects. Our study aims to fill this gap. We do so by studying China which offers a fascinating laboratory to test the effects of IPO listing reforms, with a lively VC market and a series of experiments with new IPO listing venues created with the objective to increase the attractiveness and liquidity of the Chinese stock market. Our goal is to investigate feedback effects of these events on VC firms operating in China and in particular to understand to what extent IPO market reforms increase VC engagement in innovative firms. Specifically, we ask whether the introduction of new stock market segments *leads to* more deals and a larger amount of funds per VC (intensive margin) and the entry of new VCs (extensive margin), i.e. we aim to identify causal relationship between VC investment and the introduction of a junior stock market board (ChiNext).

We focus on the introduction of the ChiNext junior stock market in 2009, the most consequential event from the perspective of enriching exit options for venture-backed companies in China. ChiNext is not only the most important episode in the sequence of stock market liberalizations for listings of innovative firms,[4] but also allows us to establish a causal link between market reform and VC funding. To do so, we adopt a difference-in-difference approach around the introduction of the new market to identify a causal effect. We base our empirical strategy on the difference in

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[3] Examples include NASDAQ in New York, London's AIM, ChiNext in China, and EASDAQ in Brussels.

[4] There were three major stock market liberalization episodes between 2004 and 2019 (the Shenzhen SME Board in 2004, the NEEQ pre-listing market in 2013, and the STAR market in 2019) but as we discuss in Section 2.5, only the introduction of the NEEQ market offers a similar potential for measurable feedback effects on VC funding. We explore the NEEQ episode and find effects similar to those for ChiNext, as we briefly discuss in Section 6.

treatment between portfolio companies with activities that specifically benefit from the introduction of the ChiNext market, and those that do not. ChiNext listing rules provide guidance that distinguish between activities that are "especially supported" to seek ChiNext listings, activities where the regulator is "cautiously opposed" to possible ChiNext listing, and other sectors that are in a neutral position. This distinction by sector roughly follows Chinese industrial policy during our sample period that was engaged in a major push towards developing technology-oriented growth sectors. The listing guidance is consistent with this policy.

Thus, our difference-in-difference approach looks at differences in treatment. We consider companies in "supported" sectors as receiving a positive treatment shock, companies in "opposed" sectors as receiving a negative shock, and we consider all other companies as the control sample. We show that there is no difference in VC/PE funding between the treated and the control subsample prior to the two liberalization events. In other words, the two subsamples satisfy the parallel trends assumption. Our approach addresses important endogeneity concerns, in particular that common factors, such as economic growth, funding opportunities for small and high-tech companies, and excess capital supply for equity investments, are related to both phenomena and might drive both the demand for a more liberalized IPO market and the expansion of the VC market.

Our main results are as follows. We find that the introduction of ChiNext leads to a highly significant increase in first-round VC/PE investments in "supported" sectors, and to an equally strong decrease in "opposed" sectors, relative to the control sample. The fact that we find that the increase in investments is fully driven by a surge in first round investments underscores the hat the effect is plausibly causal and has meaningful real effects, by steering venture capital to new firms, rather than accelerating existing VC-backed companies.

We then undertake a series of additional tests, looking at the number of investors and the size of investments in follow-on rounds, and at the duration until exit. We find that companies with "supported" activities are able to attract more VC/PE investors but receive smaller funding rounds, and see quicker exits, relative to the control sample. On the flipside of this sector distinction, companies in "opposed" sectors are less to receive initial funding, their funding rounds include fewer investors but are larger, and their exits are delayed.

We also consider whether the effect of the ChiNext introduction is attenuated for state-owned firms (SOEs). If scarce venture capital funds are more attracted to private companies after the reforms,

SOEs might be crowded out from the VC market. We find fewer first-round investments in SOEs after the introduction of ChiNext but SOEs that are funded receive larger investments.

In extensions, we look at an alternative difference-in-difference methodology, based on sectors that on companies certification as "high-tech" that should improve their potential for a ChiNext listing. We find consistent results with those presented earlier. Based on this identification approach, we also look at a second liberalization reform, the introduction of the NEEQ re-listing market in 2013. We find robust and strong feedback effects for the NEEQ introduction a well.

We address other endogeneity issues, in particular the concern that we might pick up market timing effects as investors might be able to anticipate the listing reforms, and time their investments accordingly. We discuss that the very nature of the reform implementation in Chin, with strong elements of surprise about the timing and format, makes this unlikely. We also discuss that concerns that the causality might be reverse seem not to be plausible given the strong pattern we find of stock market liberalization being followed by a kink in VC/PE investments.

We also examine whether the treatment effect impacts the functioning of the VC market, by shifting more funding towards a later stage, by increasing the frequency of funding, or by broadening the investor base. We find that the arrival of ChiNext leads to first-round funding of start-ups obtained at a later stage in their life cycle. Also, ChiNext leads to an increase in funding frequency and an increase in the number of investors in each round which are indications of the new market increasing the efficiency and liquidity of the VC/PE market.

Our paper is the first to document feedback effects of IPO market liberalization on VC funding in a systematic, large-scale difference-in-difference study. Besides, an important contribution of our paper is the construction of a novel data base, the most comprehensive data base of VC portfolio companies in China to date.

China is attractive for research on venture capital since Chinese company registry data allow the construction of a comprehensive database of *all* investment firms engaged in venture capital-type financing activities, thus avoiding the potential selection biases of voluntary, self-reported databases that are common in many markets. A major contribution of our work is the construction of the to date most comprehensive database of Chinese VC investments, to the best of our knowledge, from the NECIPS electronic system that records the Chinese company registry. We use text-based machine learning techniques to identify VC-backed firms and to attribute VC investments to VC firms and to minimize errors (Mullainathan and Spiess, 2017; Athey, 2019),

and we work through the pyramidal structures of investment portfolios to identify the portfolio holdings in their entirety.

Our paper is related to various strands of the literature. A first strand of the literature develops theoretical explanations on the effects of stock market liberalization. Michelacci and Suarez (2004) develop a theory that explains the feedback effects that we investigate, arguing that if young firms can go public earlier, then limited capital by relationship investors (VC) can be more quickly be redirected towards new start-ups. Jovanovic and Szentes (2013) argue that the scarcity of venture capitalists gives VCs disproportionate and ultimate inefficient bargaining power, an effect that can be mitigated if more liquid exit markets allow market entry into the VC sector. Explaining the role of IPOs on entrepreneur incentives, Black and Gilson (1998) argue that venture capital will be more important in stock market-centered financial systems, because it provides successful entrepreneurs with the option to reacquire control from the venture capitalist after an IPO. Concerning VC incentives, Piacentino (2019) shows that VCs' concern to build reputation contributes to the functioning of IPO markets since VCs are incentivized to certify the quality of the start-ups that they take public, and hence to bring high-quality firms to the market.

Our work is closely related to previous literature on the relationship between stock market development and small firms and of innovation, a literature that consists mainly of cross-country comparative studies. Bernstein, Dev, and Lerner (2020) document the proliferation of new stock exchanges with lower listing requirements catering to start-up companies in many number of countries, triggered by a need for more entrepreneurial capital, and show that they attracted additional IPO volume rather than diverting going-public candidates from existing first-tier markets. Love (2003) shows that financial development impacts growth by reducing financing constraints that would otherwise distort efficient allocation of investment, using Euler equations to estimate the impact of financial frictions on investment inefficiencies. Nahata, Hazarika, and Tandon (2014) show that and better developed stock markets significantly enhance VC performance. Bae, Bailey, and Kang (2021) show that concentrated stock markets dominated by a small number of successful firms are associated with less efficient capital allocation, sluggish initial public offering and innovation activity, and slower economic growth. Moshirian et. al. (2021) investigate the effect of stock market liberalization on technological innovation, showing that economies exhibit a higher level of innovation output after liberalization, in particular in more innovative industries. Brown, Fazzari, and Petersen (2009) find significant effects of external equity for young, but not mature, firms that can explain their sustained R&D spending and

performance. Brown, Martinsson, and Petersen (2013) find that better access to stock market financing leads to substantially higher long-run rates of R&D investment, particularly in small firms. Nanda, Samila, and Sorenson (2020) show that that there is persistence in VCs' reliance on IPOs, with VCs with a high early IPO exit rate continuing with a higher IPO rate.

There is also literature on policy reforms that introduce pre-IPO markets or increase the liquidity of private markets which is relevant in particular for the NEEQ market in China. Huang et. al. (2021) investigate the effect of pre-IPO investments by institutional investors that traditionally invest only in public markets, showing that they reduce asymmetric information and boost market liquidity. Similarly, Ewens and Farre-Mensa (2020) show that the rise of private pre-IPO markets, encouraged by deregulation of securities laws, has increased the supply of private capital to late-stage private startups, and decreased the importance of early IPOs. Dambra, Field, and Gustafson (2015) provide evidence that the 2012 JOBS Act lead to an increase of IPO volume, especially for firms that benefit from the act's de-risking provisions that allow firms to file the IPO confidentially while testing-the-waters. Edwards and Todtenhaupt (2020) show that the exemption from federal capital gains tax in the JOBS act increased the profitability of US start-ups.

The paper is organized as follows. We present the institutional background on market liberalization and the evolution of the venture capital sector in China in Section 2. Section 3 explains the data and our strategy for matching company registry data to venture capital data. In Section 4 we discuss the methodology and empirical strategy. The main results are presented in Section 5. Section 6 looks at extensions, and Section 7 concludes.


## 2. Institutional Background

### 2.1 The Market for Venture Capital and Private Equity in China

Although venture capital (VC) started late in China, it has achieved rapid development in the past ten years and has attracted worldwide attention. Important drivers of its fast growth were the full implementation of new legislation on shareholding (share reform), policies explicitly oriented to encourage entrepreneurship, the rapid expansion of mobile internet and digital services, and the speed of structural change in China's economy. As a result, in less than two decades the Chinese VC sector has grown to match its US counterpart in number and size.

The emergence of venture capital in Chinas can be roughly divided into three phases: an early period, 1999-2004; a development period, 2005-2012; and the period since 2013, characterized by adjustments and consolidation. In the early period (1999-2004), internet companies such as Tencent, Alibaba, and Sina were investment hotspots for venture capitalists. As the legal framework for limited partnerships and domestic stock markets were not yet available then, only investors with foreign background were active in China. Until May 2005, only a small fraction of shares could be traded on the Shanghai and Shenzhen stock exchanges (Calomiris, Fisman, and Wang, 2010), meaning that VC/PE investors had no practical exit route through the domestic IPO market. In addition, limited partnerships were not legally introduced until 2006[5]; until then funds relied almost completely on foreign contract models.

In 2005, the National Development and Reform Commission issued policies to promote the rapid development of the venture capital market. The official launch of the ChiNext market in 2009 created a dedicated venue for exits of venture-backed companies. In 2013, the government made it clear that the China Securities Regulatory Commission (CSRC) was responsible for the supervision and management of private equity and hence of VC investment funds. In 2016, the government issued registration standards and procedures for private equity fund managers.

China's VC/PE firms are typically relatively small. The average size of assets under management (AUM) for VC firms (those focusing on early-stage investment) is US$20 million, mainly. The average size of and for PE firms (focusing on growth and mature portfolio companies) is US$42 million. By comparison, the average size of US funds (not firms) is US$99 million (AUM) for VC fund, and US$240 million for US PE funds, according to SEC data. Thus, compared with the United States, China's venture capital market is fragmented, and industry concentration is low.

The organizational structure of China's venture capital funds is roughly comparable to that in developed markets, comprising three layers: ultimate investors (LPs), intermediaries (venture capital funds and their GP), and various downstream entities that are financed. Ultimate investors include institutional investors and individual investors, the equivalent of limited partners. Many funds have a closed-end structure with a limited lifetime, often 10 years. Software, capital goods and medical devices and services are the three major sectors for venture capital investments.

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5  For the legal reference: Partnership Enterprise Law of the People's Republic of China (2006 Revision); https://www.lawinfochina.com/display.aspx?id=5428&lib=law

With regard to Private Equity (PE), the situation in China differs from that in developed economies where buyouts of mature companies dwarf VC investments, at least when measured by the amount of capital invested. Until very recently, there were no leveraged buyouts in China, related to several distinct features of the Chinese corporate landscape: potential target companies were mostly SOEs, while the majority of privately held companies were young and small, and banking regulation was prohibitive with regard to buyout financing. Thus, PE in the conventional sense of (leveraged) buyouts hardly existed until 2016.[6] In addition, a clean distinction between VC and PE in China is very difficult, since investment firms routinely undertake both VC- and PE-type investments, across different funds or within a single fund run by the same firm. Investment firms invest in both early and late stages rounds and may also undertake buyout activities. The blurring of the boundaries between VC and PE is especially acute in less developed regions. Hence attempts to identify VC and PE investments by tracing the investor firm, the best identification method available, are prone to attribution errors. To be on the safe side, we do not distinguish between VC and PE in this paper but pull them together under the label VC/PE firms, with the understanding that for our sample period, VC investments largely dominate the sample. For our research question, the distinction between VC and PE does not really matter, but it is useful to note that the market liberalization was motivated with VC investments in mind.

Concerning exit conditions, the frequencies and valuations of venture capital exits in China are still below those in the United States. In China, secondary market sales account for only about 1% of exits, while they are the most common exit route in other developed markets, accounting for 22% of exits in the US. This illustrates that obstacles for VC exits are still an important friction in China, and that relaxing such hurdles is a valid policy concern. The establishment of a multi-level system of equity capital markets that provide smooth and liquid exit markets for venture capital is viewed as a crucial step in the development of the financial system.

## 2.2 The Architecture of the Chinese Stock Markets and the Creation of ChiNext

Over the past twenty years, China's IPO system has evolved in a series of reforms that successively introduced new stock market boards, aimed at developing thriving IPO markets. The introduction is at the center of our study, but also provide a brief overview of the architecture

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[6] See Kang (2018) for a discussion of the pivotal case marking a change in ca. 2016. In 2021, the government launched a consultation process with the aim of legally separating VC investments from other private equity fund investments, https://www.ndrc.gov.cn/yjzxDownload/20210416fj1.pdf .

of China's stock markets and the overall sequence of its listing reforms. The Chinese stock market consists of three parts: the Main Boards of the Shanghai Stock Exchange and Shenzhen Stock Exchange, the Small and Medium Enterprises Board (SME Board) of the Shenzhen Stock Exchange, and the ChiNext Board in Shenzhen Stock Exchange. The main boards and the SME board have the same listing requirements while ChiNext has relative lower listing requirements. In addition, the NEEQ intermediate board and the STAR market were created as part of the liberalization events that we briefly discuss in Section 2.5.

## 2.3 The Introduction of ChiNext in 2009

It is useful to begin with the history of the Shenzhen SME Board that was an intermediate step towards ChiNext. Preparations for the introduction of entrepreneurship-oriented stock market boards in China started in earnest soon after March 1998, based on a proposal originally made by Siwei Cheng, a prominent economic reformer and official, that emphasized the links between venture capital and entrepreneurial boards. The initial plan was to introduce a secondary board targeting "high-tech companies" (the rudiment of ChiNext), similar to the Growth Enterprise Market in Hong Kong. However, in the wake of the .com/internet bubble and its dramatic bursting in 2000/2001, the initial plan was postponed in 2001. After several adjustments, the SME Board was inaugurated on 27 May 2004 in Shenzhen as an intermediate step towards the entrepreneurial board. Without introducing additional regulation changes in listing requirements and IPO procedure, Shenzhen SME aims to guide growth-based high-tech companies into a separate stock market segment. While there is no difference in listing requirements before 2014, small-cap companies are mostly steered towards the SME board through a mechanism called "window guidance" that comes into effect with each IPO filing. Companies on the SME board are then regulated separately after their IPO. In March 2014, the "window guidance" mechanism was eliminated, so that henceforth companies could choose their listing venue.

After the initial proposal for a secondary board for high-tech firms in August 1999, there was a long pause before ChiNext was created: after a small-scale trial session for ChiNext on 17 September 2009, ChiNext was eventually formally launched on 23 October 2009. While listing requirements on the Shenzhen SME Board and Main Board are very similar, the ChiNext has relaxed listing requirements along the five dimensions profits, revenues, assets, intangibles, and market capitalization. In particular, the requirements in terms of net profit, revenue, net cash flow, net assets, and growth rate, i.e., hard requirements are the same for Shenzhen SME Board and

Main Board. By contrast, ChiNext clearly has lower listing requirements on hard indicators and encourages growth instead of value stocks. Table 1 shows the relaxation in listing requirements for the five dimensions profits, revenues, assets, intangibles, and market capitalization for ChiNext listings when compared with listing on the main board or SME.

[insert Table 1 about here]

For example, the requirements on net profits are positive in three years before listing and larger than 30 million RMB (accumulated) for SME and the MB while positive in two years before listing and larger than 10 million RMB (accumulated). In addition, for ChiNext, this requirement can be replaced with a combination of net profits positive in one year before listing, larger than 5 million RMB (accumulated) and revenue larger than 50 million RMB (accumulated). Before the 2014 revision, growth rate is a necessity for listing on ChiNext.

At the end of 2020, 892 companies are listed on ChiNext, with a total market value of 10.93 trillion RMB (around 1.68 trillion USD). In comparison, 504 companies are listed on the Main Board (market value: 9.72 trillion RMB/1.50 trillion USD), and 994 companies are listed on the SME (market value: 13.53 trillion RMB/2.09 trillion USD).

## 2.4 How Did ChiNext Facilitate the Development of VC/PE Market?

ChiNext is a listing market that has a direct impact on the exit options for VC/PE investments. In terms of listing requirements, ChiNext is a step towards a lower regulatory bar for company listings. As VC/PE-backed companies tend to be technology-based companies that have more difficulties to pass the revenue and asset requirements of the main board, the lower listing requirements of NEEQ can alleviate the exit pressure for VC/PE firms, especially for those that do not have strong foreign exit options. This relaxation of the exit conditions may alter the incentives for VC/PE firms to invest, and lead to more deals overall.

## 2.5 Other Stock Market Liberalization Episodes

There were three other major stock market liberalization episodes between 2004 and 2019: the creation of the Shenzhen SME Board in 2004 discussed in Section 2.3, of the NEEQ pre-listing market in 2013, and of the STAR market in 2019.

The creation of the Shenzhen SME Board in 2004 was the first reform specifically meant to facilitate listings of smaller companies. However, the Shenzhen SME did not attract listings of young high-tech companies because domestic investors faced prohibitive exit obstacles.

The creation of the NEEQ pre-listing market at the end of 2013 is the second important liberalization event from the point of view of potential feedback effects on VC funding. NEEQ is a market that allows the trading of shares for companies that are not formally listed on one of the major stock exchanges, and that may eventually seek such a full listing on ChiNext, Shenzhen SME or the mainboard later. The main purpose of this intermediate board is to help companies that do not yet satisfy the listing requirements of the stock exchanges to have access to a large pool of capital. we provide more institutional detail and investigate the effect of the NEEQ introduction in an extension in Section 6. We find similar feedback effects on VC/PE funding compared to the ones reported for the 2009 ChiNext introduction.

Finally, the launch of the STAR market in 2019 was a high-profile event that was clearly directed to attract listings from high-potential companies with large market capitalizations and to facilitate the reshoring of Chinese tech companies that are listed abroad. The STAR market launch was successful in attracting some eye-catching initial listings. However, the launch of STAR market is too recent for a meaningful analysis. Also, by virtue of its design to target a higher valuation segment, its impact on smaller companies that dominate the Chinese VC industry and that are the focus of our study is probably more limited.

## 3. Data and Sample

An attractive feature of China for research on VC/PE is that Chinese company registry data allow the construction of a comprehensive database of all investment firms engaged in venture capital-type financing activities, thus avoiding the potentially biases of databases in developed markets. In most countries, VC/PE data are based on self-reported data, collected via trade associations, commercial database providers relying on various data sources such as limited partners, voluntary reporting, regulatory filings, freedom-of-information requests. Chinese registry data record the universe of VC-type funding activities and hence avoid the selection biases of voluntary, self-reported data. We lay out our procedure in constructing such a bottom data base of the universe of VC data below.

In our comprehensive database, it is possibly to adopt a broad or a narrow definition of what is considered as a VC firm. In the narrow sense, one can limit the label venture capital in China can refer to equity investment made before a company makes a profit. Generally speaking, this kind of investment is very early and small in scale. In the broad sense, the term can refer to the equity investments in the growth stage of companies that have not been listed. This investment then obtains capital appreciation gains through equity transfer. For the purposes of this analysis, we adopt the broad definition. To construct our data base, our paper looks at all equity investments by either funds or GP firms. We look for heterogeneous effects based on portfolio company age.

We obtain our data on firm characteristics and other firm-related information including annual updates of the shareholder structure by extracting them from China's national company registry, the National Enterprise Credit Information Publicity System (NECIPS).[7]

For the purposes of our study, the key part of our data collecting process focuses on identifying investment firms, that is firms whose main line of business activities is investing in other non-financial companies. The classification between investment and non-investment firms is made using machine-learning algorithms that "read" the business descriptions in NECIPS (see below and Appendix B). Then we identify all companies in NECIPS where firms identified as investment firms in our sample are equity holders, i.e. we track down companies in which investment firms invest. If the company where an investment firm is an equity holder is also an investment firm, we continue to track down the ownership chain until we find a non-investment firm. That said, we consider the investment firms in the tracking process as middle layers in the system. These middle layers are investment vehicles or fund-of-funds in practice. For reasons of convenience, we follow the venture capital and private equity literature and call the former Investment Firms or VC/PE Firms, and the latter their portfolio companies. A more detailed description can be found in Appendix A.

### 3.1 Company Registry

The company registry contains the universe of firms established and registered in China from 1949 to the sample collection date, 30 June 2021. Our original full sample consists of more than two

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[7] Specifically, our access to the data is through a third-party technology company that has access to the underlying information in the government administration system.

million companies. As detailed below, our focus is on identifying investment firms and portfolio companies.

For each registered firm, the registry records the establishment date, legal representative, the corporation form (Limited Liability Corp., Corporation, Limited Partnership, General Partnership etc.), whether it is a SOE, and its current status (active, liquidated or deregistered). In addition, we have access to industry classification data, based on the standard national two-digit industry classification, through the third-party data platform that also provides access to the original data.[8]

NECIPS, the government registration system, launched the digitization of its records for the universe of firms in 2013. All companies can be found in the online system, regardless of their establishment date and current status, i.e., whether the firm is still active, or liquidated/deregistered. All inactive firms are kept in the system. We use two ways to track historical information on equity shareholders. First, for each of the annual snapshots of the equity holders that companies are required to upload at regular deadlines, NECIPS records the date when the current shareholder initially injected capital into the firm/had a change in investment amount. Because the digitized system starts in 2013, historical equity investments since 2013 are completely recorded. Second, we have historical shareholder information prior to 2013 since there is a separate section on all historical ownership changes at the firm. We use the pre-2013 equity shareholder data that the third-party data provider records using algorithms analyzing this section.

In addition, NECIPS contains annually updated records on the complete set of companies in which the firm is an equity holder. We use this information to track down the portfolio companies.

### 3.2 Identifying Investment-Type Firms: Firm Scope Description and Machine Learning

NECIPS does not provide indicators on whether the firm is an investment firm or not. Instead, the system provides a comprehensive description of the firm's business activities, including both current and historical ones. We use machine learning algorithms to "read" the business descriptions and identify firms whose business descriptions is mainly about investment activities. The terms in the business description are standardized and use the official expressions provided by the government administration and thus are ideal for machine-based textual analysis. We use

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[8] The industry classification follows the Industrial classification for national economic activities GB/T 4754-2017 (UNSD: 2006, International standard industrial classification of all economic activities, NEQ), available at National Bureau of Statistics (RPC): http://www.stats.gov.cn/tjsj/tjbz/hyflbz/201905/P020190716349644060705.pdf.

the official AMAC (Assets Management Association of China) list as the benchmark and classify companies as investment companies when their business description is highly similar to that of companies listed as investment companies in the official AMAC list.

Machine learning algorithm instead of simple textual analysis based on a fixed set of keywords is needed in this step because words that stand for investment are too broad in meaning and are very likely also be in business descriptions of many non-investment firms. Sophisticated machine learning models can provide a much more accurate classification than the use of keywords. For example, there are many potential combinations of different terms and various formats of the same expression, which explains why keyword-based classification leads to inferior results.

More specifically, in the first step, we classify the phrases into different categories, from closely related to VC/PE investments, related to investments, related to financial, and others using machine learning algorithms. The input features of the machine learning classification models are the textual similarities between the phrase and a set of 600 standardized phrases from the business descriptions of companies in the official list of investment-type firms provided by AMAC. In the second step, we calculate a score for each company based on the distribution of different types of phrases. The final classification of investment and non-investment firms is based on the combination of the score and the company name. Details of the approach are laid out in Appendix B.

### 3.3 Shareholders and Portfolio Companies

**Shareholders:** For a given company, the registration data provides information on the complete set of shareholders, including individuals and companies. The shareholders can be both individuals and companies. For shareholders who are companies, we also get a classification of their location: mainland China, Hong Kong, Taiwan and foreign countries. The third-party data provider adds short additional information on non-mainland registered companies. For each shareholder, the registration data contains information on the capital injection dates and the amount of the registered/actual capital held by the shareholder. We use this date to identify the investment date of each equity stake, and we use actual capital amounts.[9]

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[9] Actual capital better proxies for actual cash flow stakes than registered capital. Registered capital has an important use in the event of bankruptcy, when it represents the largest amount of capital that can be claimed in case of liquidation. Outside bankruptcy, the same amount of registered capital claimed by the shareholder can correspond to different amounts of actual investments and is thus not a useful data item.

Using our machine-learning based classification algorithm described in the previous subsection, we classify all shareholders registered in Mainland China into those that are investment firms and those that are not.

**Portfolio Companies:** For each company, the registry data also provides the comprehensive records of all the companies in which the company is an equity shareholder. We track down all the portfolio companies of a given firm using this information. For companies invested through layers, we track down the chain of investments until we reach the final layer. This information is complete since 2013. For investments before 2013, in the registry data, the ownership information might have been replaced with more recent ownership data, and therefore be missing. However, since the registration entity in VC/PE in China is usually on a very granular level, i.e., for a specific investment or a specific investment time period, the VC/PE firm usually registers a specific fund, the missing data issue is not serious drawback. In addition, some companies also report historical investment data, helping to complete the data.

In this way, we are able to identify all VC/PE deals as pairs of portfolio company and investment firm registered in Mainland China.

## 3.4 Final Sample and Listing Information

For each investment firm, we track down all of its equity investments, including those made through pyramidal layers of investment holding vehicles, using the "companies invested in" data in the annual report, and basic and historical information sections in the NECIPS registry system. To further improve the completeness of the tracking of their equity investments, in addition we verify all equity investments by firms whose names indicate that the nature of their activities is equity investments, and check whether we can associate them to our sample of investment firms. In this way, our sample is complete and self-contained in the sense that all investments by a given investment firm are included and that all shareholders that are investment firms are included. We limit our analysis to the investment period of 2006-2013. This gives us a final sample consists of 81,909 portfolio companies and 45,953 investment firms. To ensure we study real VC/PE investments, investment firms are not included in the portfolio company sample. Details on the sample construction are in Appendix A.

The third-party data provider also provides the listing information of the company that we use to identify portfolio firms that undertake IPOs.

## 3.5 Summary Statistics

Table 2 reports the sample distribution and summary statistics of the portfolio companies in our sample, showing the explosive growth of VC-backed companies in the last decade. We split the sample distribution by establishment years and report summary statistics.

[insert Table 2 about here]

## 4. Empirical Methodology

In this section, we first discuss the empirical challenges in identifying a causal relationship between the creation of new junior stock market venues (in particular, ChiNext) and subsequent VC/PE investments. Then, we lay out our identification strategy that is based on a regulation-driven heterogeneity in the treatment intensities in different industries where the portfolio company locates. Finally, we discuss how the unpredictable nature of the IPO market reforms in China helps us to mitigate other endogeneity concerns.

### 4.1 Identification Challenges

The main endogeneity concerns are about simultaneity, i.e. the possible existence of common factors that are related to both the expansion of the VC/PE market and the IPO market liberalization. Such concerns arise naturally in the context of the fast development of the Chinese economy in the sample period. Common factors can be related to economic growth, funding needs of small and high-tech companies on the demand side, idle investor capital on the supply side, and others, and they can conceivably lead to both calls for less restrictions on IPOs for innovative and smaller companies and to the expansion of the VC/PE market. To the extent that such common factors affect both sides only through the contemporaneous fluctuations in the macroeconomic and financial conditions, we can control for them by including *year* fixed effects. Similar, we include sector and region (province[10]) fixed effects to account for the common factors that are attributed to sector and region variations. For example, innovative and high-tech companies may be located more likely in more developed regions where there are more capital available as well.[11]

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[10] The government administration data only provide location information at the province level.

[11] We do not include *sector×year* fixed effects and *region×year* fixed effects as our workhorse DID specifications below explore the time variation in different companies that are likely to be located in different regions, e.g., in high-

However, there are many additional possible concerns about common factors that cannot be fully addressed by such regional or industry time fixed effects. Therefore, we use an identification strategy that comprehensively addresses the endogeneity concerns about simultaneity. For this reason, we use the difference-in-difference methodology to estimate the causal relationship of lower IPO thresholds and subsequent VC/PE investments, exploiting plausible cross-sectional differences in the exposure to the treatment applied to companies with the introduction of ChiNext.

Before entering into the details of our difference-in-difference strategy, we discuss the pitfalls of a possible simpler alternative, which would consist in considering as treatment group the portfolio companies that are eventually listed on ChiNext. This approach is problematic because, first, many regulatory changes in financial markets lead to both direct as well as to indirect treatment effects, or general equilibrium effects (Boehmer, Jones and Zhang, 2020). In the case of a newly created listing board, the new junior board also has an impact on other VC/PEs who expect the listing prospects of their portfolio companies and future VC/PE investments to improve. Potentially, all VC/Pes could be in this category of indirectly affected firms. Estimating only the direct treatment effect would underestimate the feedback effect at the heart of our paper.

Second, there is a relatively long lag between initial VC investment (the outcome variable of interest) and future exit (the behavior directly affected by the change in IPO markets) that usually lasts for four to seven years. Chinese IPO markets and their regulations were and are developing fast and it is hard to project expectations about future listing conditions over such a long horizon. As a result, it is rational for investors to prefer investments in companies that are likely to be safe bets to pass listing requirements in spite of this uncertainty, compared with companies with listing prospects that are less robust to shocks in future listing conditions.

Third, and relatedly, the risky nature of VC investments means that VC/PE firms are exposed to large uncertainty about the intrinsic value and listing prospects of their portfolio company under consideration. This means that a relaxation of listing requirements amounts to a reduction in the expected cutoff over a distribution of outcomes for VC/PE investments. This stochastic change in listing expectation may not affect all VC/PE firms equally, and some firms identified as "treated" (because of a ChiNext exit in their portfolio) may experience a smaller expected effect than others

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tech industry centers, and in different industries that changes over time. For this reason, controlling for *sector×year* and *region×year* fixed effects would absorb the variation we exploit for identification.

that are "not treated" (because they have no ChiNext exit yet) but hold a portfolio of companies with a considerable reform-induced upgrade in listing prospects.

Considering these reasons, we adopt a different approach to classify treatment and control group, based on whether the company is doing a business activity supported by the ChiNext listing policy guidance.

## 4.2 Identification Strategy: Classification following ChiNext Guidance

To address the endogeneity concern on simultaneity, we exploit a peculiar regulation-related feature of ChiNext listings in the *Guidance on the further details of issuance sponsorship for companies listing on ChiNext* ("*Guidance*" henceforth) that amounts to a differentiation of listing opportunities by sector of activity. The *Guidance* was published on March 19th, 2010, right after the very first couple of trials on ChiNext, and it is the unique policy document that guided the rules for ChiNext listings for the period of 2010-2013 on which we focus, and to considerable extent also beyond 2013 (when there were some regulation changes.) The only clearly stated policy in the *Guidance* is that companies with business activities in nine "especially supported" categories are encouraged to list on ChiNext and promised government support for this move.[12] On the other hand, companies in seven "cautiously opposed" categories are discouraged to be listed on ChiNext.

More specifically, the nine "especially supported" categories are: *New Energy; New Materials; Information Technology; Biotech & New Medicine; Energy Conversation & Environment Protection; Aerospace; Marine; Advanced Manufacturing;* and *High-Tech Services*. The seven "cautiously opposed" business activity categories are *Textile & Garment*; *Electricity, Gas, Water, & Other Utility Production & Services; Real Estate & Civil Engineering; Transportation; Liquor & Wine, Food, and Beverage; Finance;* and *General Services*.

As stated in the *Guidance*, ChiNext also welcomes listings from companies doing other types of business activities if they are sufficiently innovative and have high growth potential. Listing sponsors should be cautious for companies whose business is related to overcapacity and repeated production activities. Since this sectoral differentiation is the only clearly stated policy in the *Guidance*, it is very likely that investors would shift their investment scope in response to this

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[12] Five other policies are laid out in the Guidance, but the others invoke general principles on duties and due diligence, for example the principle that the sponsor should undertake due diligence to make sure that the company is innovative.

policy announcement. If VC/PE investors respond to the creation of junior stock market boards, they have a stronger incentive to invest in companies with better prospects for a future listing on the newly created stock market boards. Thus, companies in the nine "especially supported" categories should attract more VC/PE investments, and the opposite should be true for companies in the seven "cautiously opposed" categories.

To identify whether the business activities of portfolio companies belong the "especially supported", the "cautiously opposed" or to "other" categories, we use the business description in NECIPS (the industry code in NECIPS is too coarse to be useful.) We classify a company as belonging to the "especially supported" categories if its business description, including historical ones, contains one of the nine names of the "especially supported" categories as listed above. We classify a company as belonging to the "cautiously opposed" categories if its business description, including historical ones, contains one of the seven names "cautiously opposed" categories and does not contain any of the names of the nine "especially supported" categories as listed above. A company is classified as "other" if it does not belong to either of these groups.[13]


## 4.3  Empirical Specification

For the first group of analyses focusing on the "especially supported" companies, we classify portfolio companies in the nine "especially supported" categories as being observations in the treated group, and other companies as being in the control group. Similarly, for the second group of analysis focusing on the "cautiously opposed" companies, we classify portfolio companies in the seven "cautiously opposed" categories as being in the treated group, and other companies as being in the control group. As a robustness check, we also conduct analysis where we limit the control group to companies that are neither in the "especially supported" nor in the "cautiously opposed" categories.

By starting for the universe of VC/PE-backed companies and defining large control samples, this strategy allows us to obtain control samples that are close in their characteristics to the treated

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[13] We find that this assignment method based on category names or keywords in the business descriptions is reasonably precise and effective since the keywords used are very specific. Using more complex machine learning models would be very computation-intensive since it involves multi-category machine learning classification without a benchmark. Our approach may, however, undercount the opposed groups of Real Estate & Civil Engineering and Finance; many portfolio companies belonging to these two "mildly opposed" categories are likely to be missed by our classification method.

sample, regarding for example their technology intensity, size, age, business plan and strategy. For the same reason, we exclude companies that are not VC/PE-backed companies (companies that never receive a VC/PE funding round prior or after the ChiNext launch) since companies without VC/PE backing are much more likely to differ in observable and unobservable firm characteristics.

Our main analysis uses a panel with observations in the portfolio company × year format. We compare the difference in the output variable $Y_{it}$ (e.g. the probability of gaining VC/PE funding in year $t$ for company $i$) before and after the introduction of junior stock market boards for the treatment and control groups. We conduct two types of analyses, a standard across-portfolio-company analysis and a within-portfolio-company that includes portfolio company fixed effects.

For the across-portfolio-company analysis, we estimate the following specification,

$$Y_{it} = \beta_1 \cdot Treated_i \times Post_{i,t} + Treated_i + \theta_t + \delta \cdot X_{i,t} + \epsilon_{i,t} \tag{1}$$

For the within-portfolio-company analysis, we estimate the following specification,

$$Y_{it} = \beta_2 \cdot Treated_i \times Post_{i,t} + Treated_i + \gamma_i + \theta_t + \epsilon_{i,t} , \tag{2}$$

where $Treated_i$ is a dummy equal to 1 for companies in the treatment group and 0 for companies in the control group. $Post_{i,t}$ is a dummy equal to 1 for outcomes measured after the introduction date of the event, $\theta_t$ are the year dummies controlling for the aggregate trend of the VC/PE market. $X_{i,t}$ are portfolio company characteristics that can be time-variant such as company age at the VC/PE investment, and time-invariant such as the location and sector of the company. $\gamma_i$ are the portfolio company fixed effects that controls for company-level time-invariant differences. $\epsilon_{i,t}$ is the error term. Because the assignment can be correlated within the industry cluster, we cluster standard error at the sector level (Abadie et. al. 2017). That is to say whether the company is doing a supported or opposed type of business activity defined by the "Guidance" can be correlated for companies in the same broad sector cluster. (This should be true given business activities should be related to sector.) Results when clustering at the portfolio company level give smaller standard errors and are less conservative (Bertrand et. al. 2004, Cameron and Miller 2015).

To avoid any contamination due to the overlap of time periods of different events, we restrict the pre-treatment period to 2006 to 2009. That is, we limit it to only include the period after the Split-Share Structure Reform of 2005 was adopted that implied major changes on Chinese stock markets (Carpenter, Lu, and Whitelaw, 2021; Li et al, 2011). For the same reason, we limit the post-

treatment period to the years 2010 to 2013, before the introduction of the NEEQ market and before the guidance of ChiNext was modified.

## 4.4 Identification Assumptions

Our empirical strategy is to deploy a difference-in-difference analysis that exploits the difference in treatment intensities between companies in and not in the "especially supported" ("cautiously opposed") categories after the introduction of ChiNext. Our identifying assumption is that companies in the "especially supported" ("cautiously opposed") categories are more likely to be listed on the new listing venue, and hence benefit more from the improvement in exit options than other companies. In other words, we employ an instrument variable type difference-in-difference analysis.

The rationale behind our empirical strategy is that the policy of creating junior stock markets was clearly aimed at early-stage innovative companies that were hitherto unable to list on public markets due to high listing requirements on the main board. Thus, they benefit from having IPO exit options prior to having reached the maturity required enough to meet the existing listing requirements. To verify that companies who benefit from the stock market liberalization are indeed companies in the "especially supported" categories, and the opposite true for in the "cautiously opposed" categories (first stage in the IV analysis), we check the correlations between business activities that are "supported" or "opposed" and being listed on the ChiNext.

[insert Table 3 about here]

Table 3 reports OLS regression results of our investigation of such correlations. Panel A shows the results for the entire sample of portfolio companies. Columns (1) to (3) compare portfolio companies doing business activities in the nine "especially supported" categories with all other companies. The dependent variable is a dummy variable that is equal to one if the portfolio company is listed on ChiNext. The regressions show that being in the "supported" categories positively and significantly predicts being listed on ChiNext. Columns (4) and (6) compare companies doing business activities in the seven "cautiously opposed" categories with all other companies. Being in these "opposed" categories shows a negative and significant association with being listed on junior stock market boards. Panel B shows the results for the subsample of portfolio companies that are listed on all boards, including the Main board in Shanghai and Shenzhen, the

SME board in Shenzhen and ChiNext. The dependent variable is unchanged compared with Pnael A. We observe the same positive and significant results for the "especially supported" categories. Likewise, we observe negative results for the "cautiously opposed" categories, though insignificant from zero after controlling company characteristics. These findings support our identification assumption that the "especially supported" and "cautiously opposed" business activity dummies predict being listed on ChiNext, and that the higher listing requirements on other stock market boards impede the listings of young and high-tech companies.

We remark in passing that the small fraction of companies that actually chose to go public (875) compared with the number of companies in the "especially supported" categories (18,710) points to the problems we would encounter if we were to limit the treated sample to companies that actually listed on ChiNext: we would dramatically undercount the set of firms affected by the IPO liberalization.

It is also worth keeping in mind that, to the extent that the difference between the treatment and control group is one of having a stronger treatment intensity, with both groups experiencing some of the effect of the ChiNext, our results are underestimating the true treatment effect. Also, since we only look at the VC-backed sample, we may also underestimate the true treatment effect by overlooking the shifts between VC-backed and non-VC backed companies; But it is funding and time demanding to get the non-VC backed sample.)

## 4.5 Other Endogeneity Concerns and the Lack of Predictability of IPO Reforms

Before we turn to the empirical results, we briefly discuss two other endogeneity concerns besides simultaneity. One concern is reverse causality that more actual or expected VC investments possibly triggering the IPO market reform. We believe is not a very pressing concern in the context of our study, considering that our post-event window is relatively short (up to three years after the introduction of the ChiNext).[14] In addition, the policy discussions prior to the IPO market reform show that policymakers were targeting an improvement of the liquidity of the stock market, but did not consider VC/PE investments. In its decisions on the timing and exact format of listing reforms, the China Securities Regulatory Commission (CSRC) focused on the stock market and the general economic and financial situation. While it is true that some policy discussions

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[14] We cannot rule out that listing markets and VC/PE markets interact with each other when considering a longer post-reform horizon, but such longer horizons are outside the scope of our study.

mentioned possible benefits of additional IPO venues for the VC/PE market, it is very unlikely that the VC/PE firms carried sufficient weight to influence the reforms. Finally, the dominant role that government in China's financial reforms also mean that the voice of private investors carried little weight (Brunnermeier, Sockin, and Xiong, 2017).

Another concern is that, independently of simultaneity, VC/PE investors might be able to anticipate the listing venue reforms, and time their investments accordingly. However, as our discussion in Section 2 shows, the specificities of the reform process in China make it nearly impossible for investors and even policymakers to predict the exact timing of the introduction of new junior stock listing venues with sufficient precision. Policy reforms in China are often preceded by multiple protracted rounds of discussions, experiments, policy evaluations and shifting declarations of intent, and with considerable modifications in the design (Brunnermeier, Sockin, and Xiong, 2017). This pattern holds especially true for financial market reforms of high economic significance to which reform of listing venues clearly belong.

For example, concerning ChiNext, the idea was first brought up in 1998 in a landmark proposal by Siwei Cheng, a prominent economic reformer and official. The initial plan was to introduce a secondary board targeting "high-tech companies" (the rudimentary core of ChiNext) similar to the Growth Enterprise Market in Hong Kong. However, with the unravelling of the dotcom bubble and the aftermath of the dramatic implosion of Nasdaq in the United States, the initial plan for an entrepreneurial board was suspended, and then officially postponed in 2001. ChiNext was eventually introduced, but many years later, on 23 October 2009, and in a very different format. In addition, political frictions make the final implementation date even harder to predict. Given the time gap between the investment and the exit is usually four to seven years in China, it is impossible for private actors to generate reliable expectations about the policy change and implementation schedule over such a protracted period. Even if the market launch was ultimately expected, investors could not predict its timing, and could not make final preparations for an IPO without the actual policy change being implemented.

In short, the lack of policy predictability implies that VC/PE investors could neither predict with sufficient accuracy the exact introduction date of the new board within a three-year window nor meaningfully influence the IPO reform. The strong level of policy uncertainty during the IPO reform process lends support to our identification strategy.

## 5. Empirical Results

### 5.1 New Markets and VC/PE investments: Aggregate Trends

Figure 1 reports the total number of VC/PE-backed investments in each year the entire sample of portfolio companies over the 2005 to 2019 time period. We start in 2005, the year when share trading on Chinese stock markets was liberalized.[15] We focus on the introduction of ChiNext board on the Shenzhen Stock Exchange on October 23rd, 2009. To show that the effect is not limited to this single liberalization episode, we also provide evidence for the introduction of NEEQ (National Equities Exchange and Quotations) on December 31st, 2013.

The number of deals increased from 3,441 in 2005 to 36,636 in 2019, with a peak of 53,204 in 2016. The increase in VC/PE-backed investments is substantial, showing the momentous rise of private equity funding in China, but to a smaller extent also because our data is more complete for more recent years. The number decreases in more recent years, partially reflecting the cooling of the VC/PE market. Consistent with the idea that the introduction of junior stock market boards has a feedback effect on the VC/PE market, the figure shows a noticeable kink around the introduction of the ChiNext in 2009, and a more dramatic kink and increase in 2015, one year after the introduction of NEEQ.

Figure 1 show the number of VC/PE transactions in China for the 2005 to 2019 period. It shows clear kinks with persistent upwards trend after the introduction of ChiNext in 2009 and of NEEQ in 2013.

[insert Figure 1 about here]

Figure 2 breaks down the number of deals by different categories of portfolio companies in each year over the 2005 to 2019 time period. The four figures illustrate the idea of our identification strategy quite well: in Panels (a) and (b), we decompose the full sample of VC/PE deals in portfolio companies with and without a "High-Tech" certificate. Consistent with the idea that new junior stock markets promote VC/PE investments mainly for high-tech companies, the kink features prominently for companies with a "High-Tech" certificate in Panel (a), while the time trend evolves more smoothly for non High-Tech companies in Panel (b). In comparison, Panels (c) and

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15 Regulation document: Operational Guidelines for the Pilot Reform of the Share-trading Business of Listed Companies (Effective date: 05-08-2005). http://www.lawinfochina.com/display.aspx?lib=law&id=4162&CGid=

(d) show no clear difference in the time trends between companies with and without a "Small-Micro" label. if anything, the trend change after 2013 looks more abrupt for companies without a "Small-Micro" label.

[insert Figure 2 about here]

## 5.2 Results of the Difference-in-Difference Analysis: Funding of New Companies

For our difference-in-difference approach, we deploy our panel of portfolio companies with yearly observations. We begin our exploration by looking at *extensive margins*, by which we mean the impact on *new first-round* investments, i.e. companies receiving VC/PE funding for the first time. This test can be viewed as looking at the extensive margin of the feedback effect. We compare the difference in the probability of gaining one or several rounds of VC/PE funding in any given year before and after the introduction of the ChiNext junior stock market board for the treatment and control groups. To avoid any contamination due to the overlap of time periods of different events, we restrict for each event the post-event period and require it to stop before the following event. More specifically, for ChiNext, the pre-period is 2005 to 2009, and the post-period 2010 to 2013. We restrict the analysis to the subsample of 111,690 portfolio companies that have at least one VC/PE deal in the study time period 2005 -2013, which excludes companies that were established or received their first VC or PE funding only in the years after 2013. This limitation means that our results yield a conservative estimation of the impact of the introduction of ChiNext.

Figure 3 reports the dynamic patterns of annual probabilities of obtaining a new VC/PE investment before and after the introduction of ChiNext, with 95% confidence intervals (using a dynamic difference-in-difference specification with yearly dummies). We compare portfolio companies in the nine "Strongly supported" categories to all other companies. Panel (a) shows the across-company dynamic model that controls for year fixed effects, i.e., follows specification (1). Panel (b) shows the dynamic model that estimates the within-company effects, i.e., follows specification (3).

The plots clearly show a strong discontinuity around the ChiNext introduction, with 2010 the first year of its impact. For companies in the "Strongly supported" categories, the ChiNext introduction led within one year to a jump to a significantly higher probability of receiving a VC/PE investment round, with a difference that kept increasing until 2013. In the years preceding the ChiNext market,

these companies had actually a significantly *lower* propensity to attract VC/PE funding. The pretend prior to the ChiNext introduction shows weak converging trend between the treated and control sample, but the convergence was slow, decreasing and nearly inexistant in the years that immediately preceded the listing policy change (2008-2009).[16] However, the graph appears to be consistent with the policy impact being distinct from any pre-treatment trends (parallel trends assumption).

[insert Figure 3 about here]

Figure 4 shows the plots for the counterpart treated sample, the one for "mildly opposed" companies. In this case, we find a significant decrease in investment probabilities that takes immediately hold, and we also find clear parallel trends during the entire pre-event period 2006-2009 in this case.[17]

[insert Figure 4 about here]

Table 4 reports the difference-in-difference results on the impact of the introduction of ChiNext on VC and PE deals. For each portfolio company, the first year in the panel is the minimum of the founding year and 2005, i.e., we assume that in the government administration system, equity investment before the founding year is not recorded. The dependent variable *VC* is a dummy variable that is equal to one if the company has at least one VC round in the observation year. The results are very strong, and in line with the graphical evidence of Figure 3. In Panel A, the variable of interest, *Supported × Post*, measuring for the portfolio companies in the nine "Strongly supported" categories the change in probability of obtaining a new funding round, shows at significant *increase* in all specifications ($p < 0.01$). Panel B looks at the other part of the treated sample, the seven "Mildly opposed" categories, with the interaction term *Opposed × Post*, measuring the increase of obtaining a new funding round for the portfolio companies in the nine "Strongly supported" categories, showing at significant *decrease* in all specifications ($p < 0.01$). Importantly, for both variables of interest, the last specification in column (6) includes portfolio

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[16] A moderate convergence in pre-trends is plausible since it fits with other economic trends of this period favoring high-tech investments, including the expectation of future IPO liberalizations (even though their exact form and date were unpredictable).

[17] It makes sense that parallel hold for *Opposed* categories because investors did not see a reason to treat these sectors differently from *Other* categories, but not for the high-tech sectors in the *Supported* categories.

copnay fixed effects and hence amounts to a *within* company analysis. With this high-powered set of fixed effects, the results become even stronger.

[insert Table 4 about here]

We deploy an alternative specification of the control sample that is limited to companies in the other categories that neither "especially supported" nor "weakly opposed". The results are shown in Table 5. We test both treated samples, "especially supported" and "weakly opposed", in joint regressions. For the *Supported × Post* interaction term, the results are essentially the same as before. The *Opposed × Post* interaction term now shows a weaker ($p < 0.05$) and, somewhat oddly, a positive coefficient. Importantly, however, the change in the probability of companies in the *Supported* categories is at least eight times larger than the change in the *Opposed* categories, explaining that in the regressions of Table 4 the negative effect on *Opposed* categories was explained by the strong increase in the *Supported* subsample.

[insert Table 5 about here]

## 5.3 Results of the Difference-in-Difference Analysis: Intensive Margin

We next turn our attention to tests that look at the intensive margin of the feedback effect, namely the size and intensity of investments in portfolio companies.

We first look at the number of investors in a given year of observation as a proxy of investment size. Table 6 shows the results when we look at the number of investors in new financing rounds as a proxy for intensification of VC/PE investments. The format is the same as in Table 4, but the dependent variable is different and the regression only takes into account *company×year* observations in which there are VC/PE investments into the company in that year. We find a strongly significant *positive* response ($p < 0.01$) in Panel A that looks at portfolio companies in the *Supported* categories, and we find an equally strong *negative* response ($p < 0.01$) in Panel B that looks at portfolio companies in the *Opposed* categories.

[insert Table 6 about here]

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We then look at an alternative measure of the intensive margin, the amount of investments in a given *company×year* observation. We study this measure as a proxy for intensification of VC/PE investments. Table 7 shows the results for the variable *investment amount*, in the same format as Table 6. We find a negative albeit insignificant reaction to the ChiNext introduction shock when we look at the *Supported* categories (Panel A), but a weakly positive reaction when we look at the *Opposed* categories (Panel B). Investment amounts appear to go in the opposite direction, for reasons that remain to be explored.

[insert Table 7 about here]

Finally, we consider a third measure of the intensive margin, the share of equity of new investments into the portfolio company in a given *company×year* observation. Table 8 shows the results, again in the same format as in Table 6. In Panel A, we find a negative and strongly significant reaction to the introduction of ChiNext for the *Supported* categories in most specification, but an insignificant result when we look at the within companies specification in column (6). We find a strongly positive reaction when we look at the *Opposed* categories but again no reaction to the within-company specification (Panel B).

[insert Table 8 about here]

## 5.4  Results of the Difference-in-Difference Analysis: Duration until Exit

A final investigation in our sequence of our difference-in-difference analyses addresses the duration of investments. The idea behind the following tests is that the availability of IPO markets that allow for an earlier exits will speed up the exit and hence shorten the horizon during which VC/PE funds remain invested. We measure *duration* of investments as the time lapse between the first investment round to the final exit (there could be multiple exits if there are partial listings or a prelisting on the NEEQ market, for instance), in months (taking average durations if there are several investors with different individual durations of investments).

The results are presented in Table 9. We again look at the reaction in separate panels for companies in sectors that are *Supported*, comparing them relative to the sectors that are neither supported nor opposed, and for companies in *Opposed* sectors. The set-up is, except for the change in the independent variable, identical t that of the Tables 4 and Tables 6 to 8. We limit the sample to

observations where there are VC/PE investments in the company, and where we observe an exit before 2021.

The finding are in line with our hypothesis. In Panel A, we find negative and highly significant signs for the interaction term *Supported×Post*, meaning that VC/PE investors indeed shorten their investment horizon and exit faster after the ChiNext introduction. In Panel B, we find the expected positive signs for *Opposed×Post*, but the coefficients are insignificant. The asymmetry in the reaction between *Supported* and *Opposed* is quite plausible: the introduction of the new market materially changes exit conditions for sectors that are encouraged to use the new venue, but leaves them comparatively unchanged for all other sectors (neutral or opposed). Thus, in contrast to our our previous analyses on investment volumes and investor numbers where we expect an more symmetric effect of amplification and diversification of the investor base between *Supported* and *Opposed*, as Tables 4 and Tables 6 to 8 indeed document, conditionally on the companies obtaining funding. So in the case of exits and exit speed an asymmetric effect is quite normal.[18]

[insert Table 9 about here]

## 6.   Extensions

### 6.1   State-Owned Enterprises

State-owned enterprises (SOE) are likely to enjoy privileged conditions in gaining VC funding and obtaining access to IPO markets. In fact, one motivation of IPO reform is to provide opportunities to non-SOEs to IPO and raise fund from the public. In this subsection, we investigate whether the feedback effects are different for SOEs and non-SOEs. Several alternative hypotheses are possible, On one hand, it makes sense to expect a more subdued effect for SOEs, or even a negative one if SOEs are now crowded out from a limited pool of VC/PE funds. On the other hand, if there are strong complementarities between VC/PE investors that follow government-led investor entities (Fei, 2022) the effect could also be positive.

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[18]   That is to say, for the (smaller number of average funding size) of companies in *Opposed* sectors that obtain funding, there should be a smaller effect on exit speed compared to neutral than for the (larger and better funded) companies in *Supported* sectors.

We introduce a dummy variable that is one for companies that are SOEs, and rerun our main difference-in-difference tests using this distinction. We report our results in Table 10.

Panel A looks at the extensive margin, of new companies that obtain VC/PE funding. The effect is strongly negative, which would be in line with a crowding out effect for SOEs since VC/PE investors now prefer private portfolio companies. Panel B lo0ks at the intensive margin, or investment amounts. Here we find a positive effect of the ChiNext introduction, which is the opposite but could be plausible in view of possible complementarities with government-led investment entities. Panel C looks at investment duration, similar to Table 9, and shows no significant effect.

[insert Table 10 about here]

## 6.2 Alternative Identification: High-Tech Certification

We use an alternative approach to identification for our diff-in-diff methodology, exploiting a peculiar feature of listing choices on the new stock markets that is informal but quite powerful. Companies can acquire an official certification from the *State Council Information Office,* called the "High-Tech" certificate. Applications for the certificate can be submitted at any time,[19] and the certificate appears to be particularly useful for the regulatory process for an IPO. We find that the "High-Tech" certificate is a strong predictor for a subsequent listing on either ChiNext or NEEQ although no formal rule gives preference to companies with this certificate. Thus, companies with a "High-Tech" certificate should attract more VC/PE investments, and the same should be true for companies with characteristics that make them more likely eligible for this certificate.

Hence, we categorize portfolio companies with the "High-Tech" certificate as being observations in the treated sample, and companies without as being in the control sample. We again deploy a difference-in-difference analysis that exploits this difference in treatment intensity and compares

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[19] In more detail, there is a list of industries proposed by the SCIO (State Council Information Office of the People's Republic of China) as High-Tech industries. Companies registered in mainland China that are at least one year old can apply and get the certificate "High-Tech" company when the company passes a weighted score on innovation inputs and outputs. The certificate needs to be re-approved every three years. We observe the "High-Tech" certificate for each company in our data.

changes in VC/PE investments between companies with and companies without the "High-Tech" certificate.

We repeat our test for ChiNext using this alternative approach. We briefly summarize the results that are documented in the Online Appendix. As a validation exercise, we find that companies with a "High-Tech" certificate are strongly more likely to list on ChiNext. Graphical evidence shows a strong increase in funding after the ChiNext introduction for companies certified as "High-Tech". Our panel regressions show that after ChiNext was introduced, companies with a "High-Tech" certificate where more likely to receive VC funding and attracted more investors.

## 6.3 The NEEQ Pre-listing Market

The NEEQ (National Equities Exchange and Quotations) pre-listing market, introduced at the end of 2013, can be viewed as a hybrid model of the OTCBB and NASDAQ in the U.S. The main purpose of this intermediate board is to give access to a larger pool of capital to companies that do not satisfy the listing requirements of ChiNext, Shenzhen SME or the mainboard.

NEEQ was introduced after extensive experiments over a long period of time, with the first experiment in 2006 limited to Beijing's Zhongguancun tech district. There were a few more trials in subsequent years in different cities, but very few companies listed in the trial spots of NEEQ prior to December 2013, mainly because of concerns about capital supply and liquidity due to the small scale of the markets. On 31 December 2013, NEEQ was launched nationwide, aided by large government subsidies on fees. The launch succeeded in creating a large pre-listing market: at the end of 2020, 8,187 companies were listed on NEEQ, with a total market value of 2.65 trillion RMB (around 0.41 trillion USD).

The listing requirement on NEEQ was and is low: as long as the company is two years old, has real business activities and complies with regulations and laws, it very likely qualified and would have been approved for a NEEQ listing.[20] Specific minimum values for operating income and net assets were only published in 2017, with thresholds that are quite low: for example, while ChiNext requires a revenue of more than 50 million RMB *and* net profits of more than 5 million

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[20] More specifically, the original 2014 listing requirements were that the company has: 1) continuous operations for more than two years; 2) a proven ability for business operations and continuation; 3) a clear shareholder structure, no illegal behavior in share issuance and transfer; 4) the recommendation and advice of a major investment bank; 5) fulfills other requirements of NEEQ. As the requirements were not specific, there were requests for more details on the requirements that lead to the 2017 revision.

RMB *and* net assets of more than 20 million RMB, NEEQ asks for operating income of more than 10 million RMB *or* net assets of more than 30 million RMB.

Among observers, there is some ambiguity whether NEEQ should have a positive effect on fostering VC/PE exits. In the optimistic view, venture capital companies obtain with NEEQ an option for an intermediate step towards exit. The sequence of steps towards exit typically follows the following cycle: VC investment, listing on NEEQ, and then full IPO. Some portfolio companies listed on NEEQ will eventually exit in a full IPO, and some will not, making listing on NEEQ a more flexible exit route. Compared to a full IPO, VC firms can shepherd portfolio companies through a listing on the NEEQ market and then exit through trading. NEEQ lowers the requirement of exits and shortens for VCs the duration of the investment period.

In the more skeptical view, because of the low liquidity and requirements on NEEQ, the direct benefits from a NEEQ listing are small. Also, the pricing mechanism on NEEQ may not be a reliable valuation gauge, leading probably to valuation discounts. More importantly, a company listed on NEEQ still needs to satisfy the IPO requirements of ChiNext or other boards when it finally wants to list there. As a result, medium-size companies probably have the most to gain from a NEEQ listing, but top companies may still prefer to wait until they can directly list on the domestic and foreign IPO boards. Practitioners often express the opinion that ChiNext was a genuinely successful reform, unleashing a going-public wave that brought many high-quality companies into the market. NEEQ, on the other hand, is often described more ambiguously: since the listing requirement are low and NEEQ has an "intermediate" pre-IPO character, it offers much smaller benefits in terms of liquidity and continuous valuation for listed companies, and it is more vulnerable to a quality drop in the profile of companies brought to the market.

We repeat a number of our test for the NEEQ introduction, based on the identification approach of companies that receive a "high-tech" certification. The results (documented in the Online Appendix) are more nuanced, in line with the different character of NEEQ which is a pre-IPO listing market that does not immediately create liquidity for VC/PE investors. Consequently, for NEEQ, there is no impact on the first funding age, and the number of investors and of rounds tends to decrease. These differences between ChiNext and NEEQ highlight that the two events are very different types of market launches.

## 7. Conclusion

Looking at the case of China, the most dynamic market for venture capital in the past decade, this paper explores the question whether stock market liberalizations create identifiable feedback effects on venture capital and private equity financing. Over a 15-year period in the 2000s and 2010s, China has enacted a series of capital market liberalizations with the goal of increasing the attractiveness and liquidity of the Chinese stock market for innovative firms. We investigate whether the introduction of ChiNext in 2009, the most important new stock market listing venue for start-ups, has increased to flow of funds of VC funds to firms that benefit from the improved exit opportunities and heightened exit liquidity.

We identify a causal relationship between the changes in VC/PE investment and the availability of a junior/intermediate stock market board. Looking at the introduction of ChiNext and using a difference-in-difference identification approach that distinguishes between firms with activities that are encouraged ("supported"), discouraged ("opposed") to list on ChiNext or are in neutral position with regard to a ChiNext listing, we find strong and robust evidence consistent with our hypothesis of a positive feedback effect on VC funding. After the ChiNext introduction, companies in "supported" sectors are more likely to receive first funding rounds, are able to attract more VC/PE investors, receive smaller funding rounds, and see quicker exits. On the flipside of this sector distinction, companies in "opposed" sectors are less to receive initial funding, their funding rounds include fewer investors but are larger, and their exits are delayed.

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# Appendix A     Procedure for the Construction of the Portfolio Company Dataset

The main goal of the portfolio company dataset build-up procedure is to collect the complete sample of equity-backed (VC/PE backed) registered in mainland China using the government administration system National Enterprise Credit Information Publicity System (NECIPS henceforth). We use the portfolio company list from the commercial database Zero2IPO as the seed list and track down the co-investors in all layers of the network of the equity-shareholders of the seed list. We build up a portfolio company dataset on all companies invested by the equity-shareholders of the seed list and the co-investors. We expand the commercial data by around 1623.43%, from 26,188 to 451,332.

Usually, the commercial database have limited data source and only covers VC/PE deals that have media coverage/on the VC/PE fund's website/directly from the VC/PE fund source. There could be strong survival bias as VC/PE funds are more likely to report successful deals and/or more famous VC/PE funds are likely to have media coverage etc. The NECIPS system instead provides equity shareholder information for all companies and funds registered in mainland China which helps us to identify equity-backed companies. An example of the shareholder information in NECIPS is provided in *Data Note 1*. The shareholder information is annually updated from 2013 until the write-off of the fund/company, with the actual entry date (can be earlier than 2013) recorded. Historical information of shareholder changes is also reported before 2013.

Because we cannot directly access the entire list of companies in the NECIPS but need to have a list of companies in the first place to access related information, we use the complete portfolio company list from the commercial database Zero2IPO as the seed list. Then, we use the information on shareholders and investments in the annual report as well as the historical changes sections to track down co-investors and related portfolio companies. While it may still miss some companies whose equity investors never involved in syndicated deals with the investors in our sample, we believe the proportion is low given the highly network-connected nature of the VC/PE industry.

More specifically, we start with a list of 38,972 portfolio companies that have at least one round of angel/VC/PE investments during the period of 1984-2019Q1 that are collected from Zero2IPO and can be matched to a registered company in the government administration system NECIPS. We downloaded all angel/VC/PE investments in Zero2IPO and employed several RAs to search and match the portfolio companies' name with the entities registered in the NECIPS.[21] 1984 is the year of the earliest VC investment recorded in Zero2IPO and we stop at 2019Q1 because it is the latest date of the data collection for that part.

We provide a detailed technical note on the matching process and matching rate for the 2005-2014 sample period in *Data Note 2*. Around 96.62% of the domestically located portfolio companies in Zero2IPO can be matched to a company registered in NECIPS. This gives us confidence in the consistency between the two data sources in terms of companies' names, which lays the foundation of our dataset build-up procedure. 2005 is the first year that the concept of venture capital and limited partnership fund format is formally brought up, and therefore in earlier years, the equity investments are likely to be of less formal format. As we track the equity investments in the government administration data using the equity shareholder information, it needs to be of formal means, and deals starting from 2005 are likely to be matched to companies showing an equity shareholder investment in the government administration data. We stopped in 2014 for the detailed documentation simply for labor economization reasons. Later years are highly likely to have similar or even larger matching rates.

In the next step, we track down the shareholders of the seed list and use a list of keywords[22] to detect potential investment firms among the shareholders. Then we collect all the companies invested by those potential investment

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[21] We gain the access to NECIPS through the open API of the third-party database company.

[22] 投资 (invest),管理 (manage), 合伙 (partnership), 资本 (capital), 资产 (asset), 产业 (industry), 中小 (small and middle) ,创业 (venture),引导基金 (guided fund),股权 (equity),发展基金 (development fund),金融 +服务 (finance + service),孵化 (incubator), 创投 (VC), 金融控股 (financial),金控(financial),基金 (fund).

firms, the shareholders of the collected potential portfolio companies and loop over until no new companies are discovered.

After we collect the registered names (including used names) and business descriptions (including historical ones) of all companies using the investment and shareholder relationships, we develop a machine learning based algorithm to classify companies into investment firms and funds and non-investment firms. Data Note 3 provides details on the machine learning based classification algorithm.(TBD). Basically, we use the official list of equity investment firms and funds from Assets Management Association of China as the benchmark sample and train several machine learning algorithms to classify the phrases, descriptions, and companies into different types.

Using our investment firm classification algorithm, we identified 349,680 investment firms investing in 887,753 companies, Among the 887,753 potential portfolio company candidates, 279,927 are classified as investment firms in our algorithm and 607,826 are non-investment firms. Among the 349,680 investment firms, 283,012 invested in at least one non-investment firms. Around 70.96% of the portfolio companies in the seed list from Zero2IPOs are classified as portfolio companies using our algorithm. The majority (95.56%) of companies in the seed list not classified as portfolio companies under our criteria do not have investment firms as equity shareholders. The potential reason can be 1) purely misinformation in the commercial database; 2) the investment is not taken as an equity format but other format such as cash investments; 3) the general partner manager/angel investor enters as equity shareholder directly. Data work on the third case is for future study and the government administration cannot help to detect the first two cases. The rest of companies that have different classification between Zero2IPO and our method are investment firms identified by our algorithm. In this step, we expand the commercial portfolio company dataset by around 2126.63%, from 27,298 to 607,826.

Some equity shareholders are directly related to the underlying companies (potential portfolio companies we identified in the previous step), and therefore such equity investment should not be considered as VC/PE equity investments. Rather, these are re-formatting of self-investments into the same company. Tax and management control can be reasons for such chain-like format of shareholder-underlying company relationships. We further rule out the following relationships between the equity shareholder and the underlying company in identifying portfolio companies:

- The equity shareholder and the underlying company share the same legal representative and/or the same chairman (董事长)/ main manager (总经理) if the company has no chairman.
- The largest two shareholders of the equity shareholder firm is the legal representative/chairman (main manager if no chairman) of the underlying company. Largest shareholders are restricted to who takes at least 10% of the shares and at most two shareholders with the largest amount. This mainly addresses the situation where no main executives are recorded in the NECIPS database, which are most likely for limited partnership format funds/firms.

After excluding equity shareholders that are related to the underlying companies, we have the final sample of 451,332 portfolio companies and 231,745 investment firms. The potential portfolio company sample shrinks by 25.75% and the investment firms that invested in at least one non-investment portfolio company shrinks by 7.51%. Around 4% of the original Zero2IPO portfolio sample are only invested by self-related equity shareholders. i.e., 26,188 of the original Zero2IPO sample are true portfolio companies invested by equity investment firms using our algorithm.

Finally, we construct a deal-level sample by using the shareholder information in the annual reports. We use the actual capital injection date as the deal date. We further clean the sample by 1) drop the observations (portfolio-company-investment-firm pairs) where the actual capital injection is missing or equals to zero (this in principle should mean the capital is not injected into the company (yet)); 2) drop the observation where the actual capital injection year is smaller than 2005 (based on regulation constraints, we assume 2005 is the first year of meaningful VC/PE domestic deals in China) or larger than 2019 (means data error); 3) the difference between the actual capital injections of the current and the previous observation is negative (should mean that shareholder retract some of the capital or the shares are redistributed. In both cases, it does not mean new investments). Our final sample consists of 205,087 portfolio companies and 143,082 investment firms.

# Appendix B    Machine Learning-Based Algorithm for Company Classification

Every company has an official business description in the NECIPS system. We include both the current and historical business descriptions in the text that is parsed by our algorithm. We first use machine learning-based textual analysis to classify every sub-description within the entire description. The textual analysis relies on the similarity between the phrases of companies in our sample and companies in the official Assets Management Association of China (AMAC henceforth) list. Using the distribution of categories of the whole description, we calculate a score to measure the degree of investment. Finally, we classify the company into investment and non-investment firms based on the score and the company name.

In Step 1 and 2, we use the business descriptions of an official list of investment companies provided by AMAC and a part of the sample not included in AMAC list[23] to generate the list of phrases of have non-essential meaning. This improves the accuracy of our algorithm in the subsequent steps. Steps 3 and 4 develop the classification in "investment type" and "non-investment type."

Step 1:  Use AMAC sample to generate a deleted list and a remaining list (500 phrases respectively) as the benchmark to judge whether the phrase has non-essential meaning (deleted phrases) or not (remaining phrases).[24]

1.1 Classify phrases roughly to deleted part and remaining part according to their location in business descriptions.[25] Deleted part contains the sentences that appear in brackets, in parentheses, and before colons.[26] All other sentences are in remaining part.

   Results: deleted phrases list, sample size is 5,268 after dropping duplicate; remaining phrase list sample size is 14,738 after dropping duplicate.

1.2 To ensure accuracy, we manually inspect the two lists respectively, select 200 high frequency phrases, and use TFIDF to select 300 more phrases which have the highest similarity with the 200 phrases.

Step 2:  Use machine learning algorithm (binary classification) to build up a full list of phrases have non-essential meaning.

2.1 Cut business descriptions into phrases at punctuation marks in AMAC sample and the unknown sample and delete the phrases which have the opposite meaning of those in the remaining list in step 1.[27]

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[23] As we have an increasing sample size in the process of collecting companies invested by investment companies, we use a subsample of business descriptions in AMAC sample (sample size: 69,526) and unknown sample (sample size: 2,501,407) to build up the list of phrases having non-essential meaning (step1 and step2).

[24] The final lists of deleted and remaining phrases are on the website (yue-fei.com)

[25] Further inspection is needed because the descriptions are haphazard occasionally. For example, sometimes the sentences having non-essential meaning are not in brackets or parentheses.

[26] The sentences are usually restrictive statements (for example, 不得以公开方式募集资金开展投资活动, "should not do investment activities using open funds raised from the public") , additional notes (for example, 法律、法规另有规定除外, "except for specific requirements by the laws and regulations") and phrases indicating item categories (for example, 一般经营项目, "general business items"). These phrases can appear in the business descriptions of investment type and non-investment type companies and therefore lead to a high textual similarity without helping to determine whether the company is an investment type.

[27] For example, "should not XX", "XX is not allowed", "except XX", etc. where XX is in remaining list in step 1. These phrases have high TFIDF-similarity with the phrases in remaining list, but their meanings are totally contrary to those in remaining list. Therefore, we pre-exclude them to avoid misallocation in the following steps.

Results: AMAC sample (phrases), sample size is 18,890 after dropping duplicate; unknown sample (phrases), sample size is 2,131,229 after dropping duplicate.

2.2  2.2 For phrases in AMAC sample (phrases) and unknown sample (phrases), use TFIDF to calculate similarities of each phrase with the phrases in deleted list and remaining list build up in Step 1. The 1000 TFIDF-similarities are the input variables for ML.

2.3 Randomly select 10,000 phrases and label manually to train the model. In two candidate ML algorithms, Support Vector Machine (SVM) and Artificial Neural Network (ANN), SVM is selected.
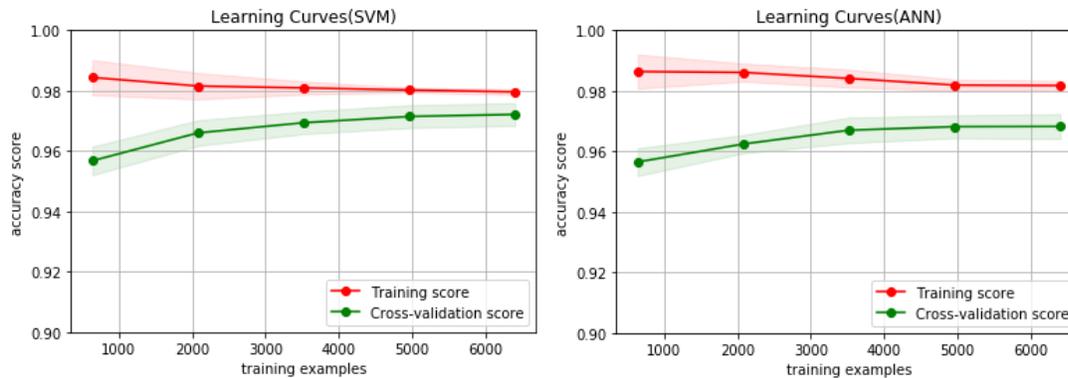


Result: 134,386 phrases are classified to deleted part.

Step 3:  Generate a class distribution for business descriptions.[28]

3.1 To reduce the sample size for practical purpose, we only select the business descriptions including 投资("investment"), 管理("management") or 私募基金("private offering fund") as candidates, and others are regarded as non-investment companies.

3.2 Delete the deleted phrases generated in step 2, and the phrases which have the opposite meaning with those in the remaining list in step 1 (the same as 2.1). Cut business descriptions into business description categories[29] at semicolons and full stops.[30]

3.3 Using a high-frequency phrases list classified manually[31], two methods are applied for classification: (1) If an item can be totally covered by some classified phrases, then its class distribution is assembled by the classes of those phrases. (2) All items have 0 TFIDF-similarity with classified phrases except class 0 phrases are class 0.[32]

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[28] Because a business description normally contains multiple business items, it is not easy to judge whether it is investment type as a whole.

[29] Business description category: a list including all business items for a company.

[30] If a business description category only contains one item, then the algorithm cuts it at commas.

[31] The list contains over 600 phrases in high frequency items from AMAC sample. Investment type: class 1 and 2, management type: class 3, "not-sure" type: class 4, and industry type: class 0. We assign the "not-sure" type because some phrases appear in both the investment type and the non-investment type. For example, 企业策划 ("enterprise planning"), 财务咨询 ("finance consulting"), etc.

[32] In practice, we only need to check whether the item has the same words in classified phrases (except class 0).

3.4 All items fail to be classified in 3.3 are cut off to phrases at punctuation marks and use the same methods as 3.3 for classification. In addition, some special investment type phrases are discerned by regex expressions.[33]

3.5 The remaining phrases are classified by two SVMs. The first one classifies the phrases to class 0 and not class 0, and the second one classify those not class 0 to detailed classes.
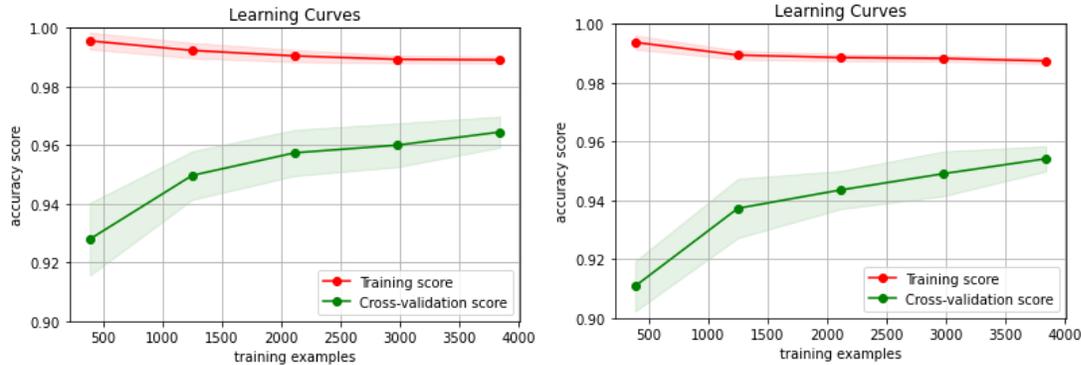


3.6 Assemble every part of a business scope item to obtain class distribution.[34]

Step 4: classify companies into investment type and non-investment type.

4.1 In China, companies with type "有限合伙" or "有限责任合伙" ("limited partnership") are highly likely investment companies and the business description for those companies may not be informative. They are found by company name or company type.

4.2 Three criteria are designed to find investment companies: (1) Score class distribution by three different methods. The companies whose scores satisfying three threshold values simultaneously are investment type.[35] (2) It is hard to judge some companies by business descriptions[36], so the second criterion finds investment companies whose names contains some specific phrases.[37] (3) Because companies always put their main business in the front of their business descriptions, the third criterion concerns whether the first three items of business descriptions has enough investment-related phrases.

4.3 In all the investment companies selected by the three criteria, peculiar companies are picked out by finding keywords in company names.[38]

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[33] Some companies list the industries where they invest. These descriptions are hard to find by other methods because they contain many words for an industry, e.g., 在电子、通信领域进行投资 ("investment in electronics and communications"), 对石油制品、石化项目的投资 ("investment in petroleum products and petrochemical projects").

[34] Some phrases are only assigned one class number, but their meanings are mixed. For example, some companies invest in companies and securities at the same time. We revise them manually and obtain a revised class distribution.

[35] Threshold values are determined by setting different values, manually judge the company within the scope and calculate accuracy.

[36] Some business descriptions do not mention investment activities specifically, but they do not mention industrial activities either.

[37] The names of companies with high investment scores are collected. Because normally, the front part of a company name is proper name, we delete it by locating investment-related keywords and only remain the part that indicates its type and nature. The latter part is used to find more investment companies.

[38] The main types of these peculiar companies are: energy resource, infrastructure and real estate, tourism, finance. Companies are also excluded if their names show that they are in some specific industry.

**Figures**
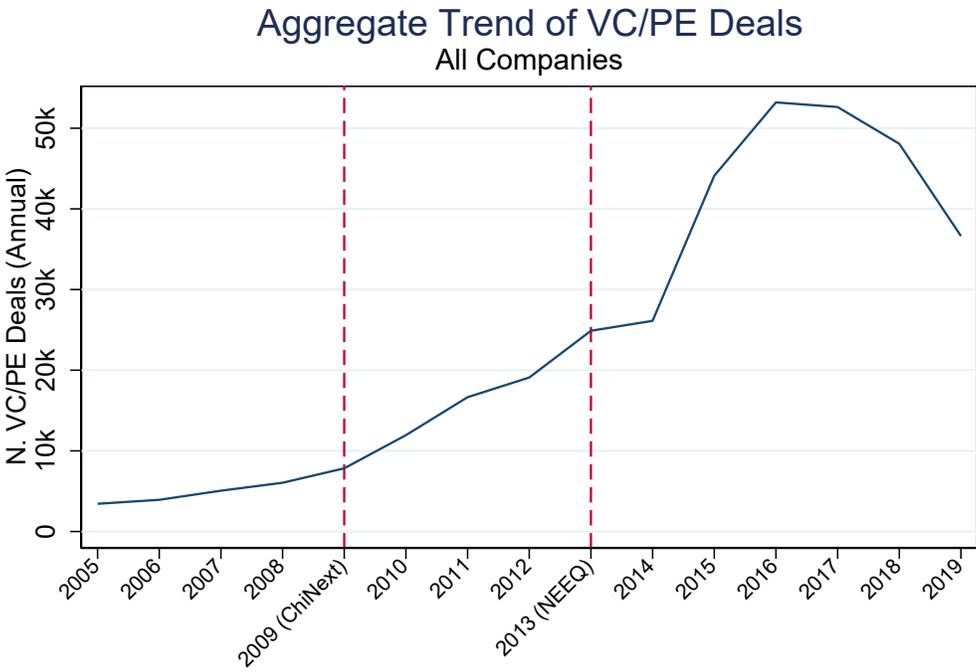


**Figure 1: Aggregate Trend of VC/PE Deals in China (2005 – 2019)**
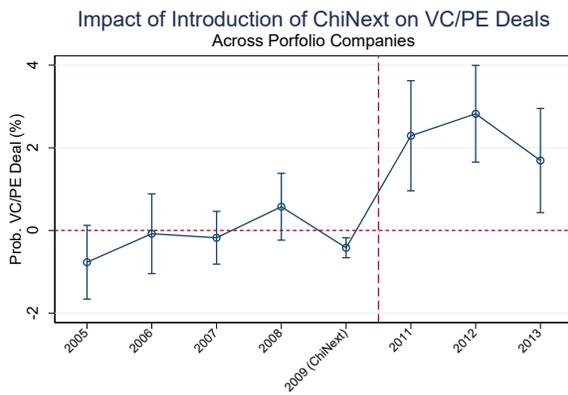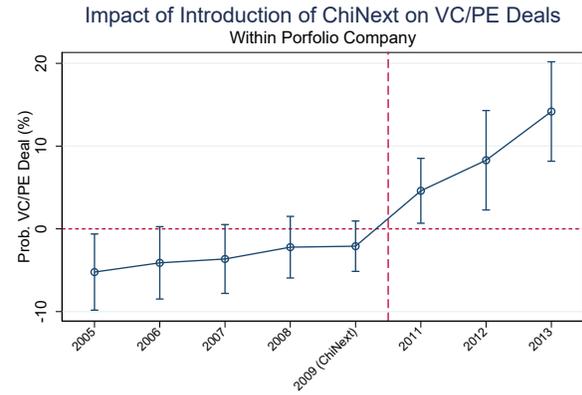
Panel (a): Across company effects                    Panel (b): Within company effects

**Figure 2: Difference in probabilities of obtaining a VC/PE investments (ChiNext)**

This figure shows the annual probabilities of obtaining a VC/PE investments before and after the introduction of ChiNext in 2009, with 95% confidence intervals, as the difference between the subsample of companies with a "High tech" certificate and those with it (Panel (a)) or as the difference from the companies own mean value (Panel (b)). The first year after the event (2010) is omitted for co-linearity reasons.
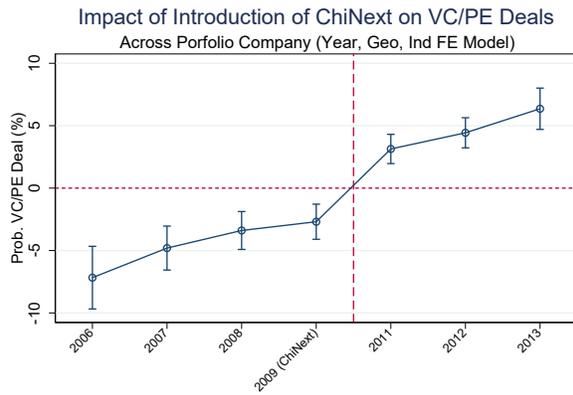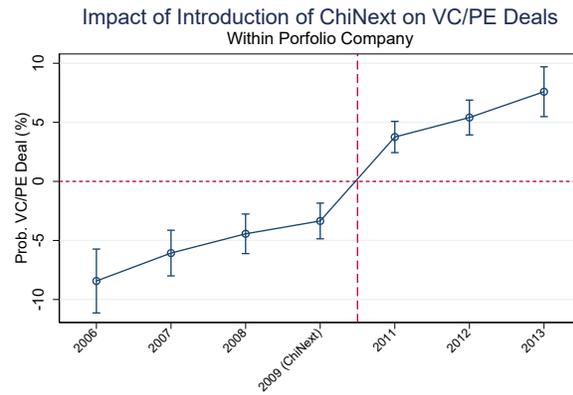
Panel (a): Across company effects            Panel (b): Within company effects

**Figure 3: Difference in probabilities of obtaining VC/PE investments – Supported vs Others**

This figure shows the annual probabilities of obtaining a VC/PE investments before and after the introduction of ChiNext in 2009, with 95% confidence intervals, as the difference between the subsample of companies with a "High tech" certificate and those with it (Panel (a)) or as the difference from the companies own mean value (Panel (b)). The first year after the event (2010) is omitted for co-linearity reasons.
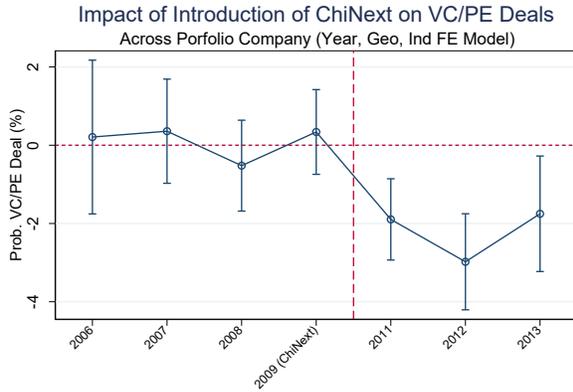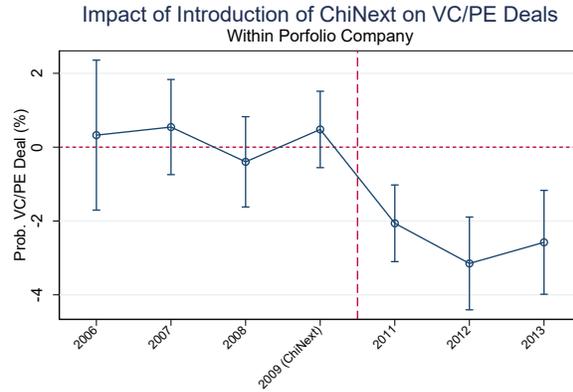
Panel (a): Across company effects                Panel (b): Within company effects

**Figure 4: Difference in probabilities of obtaining VC/PE investments– Opposed vs Others**

This figure shows the annual probabilities of obtaining a VC/PE investments before and after the introduction of ChiNext in 2009, with 95% confidence intervals, as the difference between the subsample of companies with a "High tech" certificate and those with it (Panel (a)) or as the difference from the companies own mean value (Panel (b)). The first year after the event (2010) is omitted for co-linearity reasons.

# Tables

## Table 1 Listing requirements on ChiNext and NEEQ

**Panel A: Comparison of listing requirements on Main/SME boards and ChiNext**

| Indicator | Main Boards & SME Board | ChiNext |
|---|---|---|
| Listing Requirement: Profits | | |
| Net Profit | Recent three years always positive & accumulated sum > 30 million yuan | Recent two years always positive & accumulated sum ≥10 million yuan & growth rate always positive (until May 14, 2014) OR Recent one year positive & ≥ 5 million yuan (until May 14, 2014) |
| Revenue | | & ≥ 50 million yuan & growth rate ≥ 30% (recent two years) (until on May 14, 2014) |
| Listing Requirement: Revenue and Cash Flow | | |
| Revenue | Recent three years accumulated sum > 300 million yuan OR | N/A |
| Net Cash Flow | Recent three years: accumulated sum > 50 million yuan | |
| Listing Requirement: Assets | | |
| Net Assets | Latest statement: no unrecovered losses. | Latest statement: ≥20 million yuan & no unrecovered losses |
| Listing Requirement: Intangibles | | |
| Intangible Assets | Latest statement: ≥ 20% of total asset * | N/A |
| Listing Requirement: Market Capitalization | | |
| Capitalization | At least 30 million yuan before issuance | At least 30 million yuan after issuance |

* After deducting land usage right, waters of aquaculture right, and mining right etc.

**Panel B:    Listing Requirements of NEEQ**

Panel B describes the listing requirements of NEEQ at the time of the introduction in 2013. The rules published in 2013 were rather vague and led to many questions and requests for clearer requirements, pushing the regulator to publish in 2017 a detailed version without substantially changing the rules but tightening them at the margin ere some vagueness left wiggle room before).

| 2013 rules | 2017 Details |
|---|---|
| the company is more than two years old with continuous operation records in NECIPS | Continuous operating records in every reporting period |
| | Operating income ≥ 10 million yuan in recent two accounting years |
| | OR |
| | Net Asset ≥ 30 million yuan in last reporting period |
| | Share issuance ≥ 5 million yuan in last reporting period |
| | Net Asset/share ≥ 1 yuan in the last reporting period |
| clear business operation and continuation ability | |
| clear shareholder structure, no illegal behavior in share issuance and transfer | Detailed requirements on amount of capital, assets, and company resources by the controlling shareholders |
| | Detailed requirements on the company's accounting and finance departments |
| | Detailed requirements on accounting disclosure |
| with the recommendation and advice of the main investment bank | |
| other requirements of NEEQ | |

**Table 2    Portfolio Companies: Summary Statistics**

Frequencies of company creation or upscaling according to Establishment Year

| Year | N | % | Year | N | % | Year | N | % | Year | N | % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1949-1980 | 235 | 0.11 | 1990 | 325 | 0.16 | 2000 | 2,468 | 1.2 | 2010 | 10,506 | 5.12 |
| 1981 | 172 | 0.08 | 1991 | 280 | 0.14 | 2001 | 3,060 | 1.49 | 2011 | 11,604 | 5.66 |
| 1982 | 97 | 0.05 | 1992 | 837 | 0.41 | 2002 | 3,475 | 1.69 | 2012 | 11,930 | 5.82 |
| 1983 | 60 | 0.03 | 1993 | 1,237 | 0.6 | 2003 | 4,201 | 2.05 | 2013 | 15,099 | 7.36 |
| 1984 | 149 | 0.07 | 1994 | 972 | 0.47 | 2004 | 4,178 | 2.04 | 2014 | 17,650 | 8.61 |
| 1985 | 176 | 0.09 | 1995 | 1,030 | 0.5 | 2005 | 5,410 | 2.64 | 2015 | 18,391 | 8.97 |
| 1986 | 167 | 0.08 | 1996 | 1,109 | 0.54 | 2006 | 5,887 | 2.87 | 2016 | 19,584 | 9.55 |
| 1987 | 166 | 0.08 | 1997 | 1,343 | 0.65 | 2007 | 6,378 | 3.11 | 2017 | 18,125 | 8.84 |
| 1988 | 263 | 0.13 | 1998 | 1,724 | 0.84 | 2008 | 6,545 | 3.19 | 2018 | 13,878 | 6.77 |
| 1989 | 377 | 0.18 | 1999 | 1,906 | 0.93 | 2009 | 8,324 | 4.06 | 2019 | 5,769 | 2.81 |

**Table 3  Companies Business Activities – Supported vs Opposed and Being Listed on ChiNext**

This table reports the OLS regression results on the correlation between whether the company is doing business activities that are especially supported or cautiously opposed by the listing "Guidance" and being listed on the ChiNext for the entire portfolio company sample (Panel A) and the subsample of portfolio companies listed on all boards (Main and ChiNext) (Panel B). *ChiNext* is a dummy that equals one if the company is listed on ChiNext (×100 for ease of reporting). The entire portfolio company sample only contains companies that receive at least one VC/PE investment during 2006 to 2013, with a total of 81,909 companies. *Supported* and *Opposed* are dummies that equal one if the company is doing business activities in the nine "especially supported" and the seven "cautiously opposed" categories respectively. Controls for *Company Age*, *Sector* (large classification in NECIPS) and *Province* fixed effects are indicated in each column. Standard errors are in parentheses. $^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$.

**Panel A: Portfolio Company Sample, All**

|  | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
|  |  |  | I. ChiNext×100 |  |  |  |
| Supported | 0.95$^{***}$ | 0.50$^{***}$ | 0.52$^{***}$ |  |  |  |
|  | (0.05) | (0.06) | (0.06) |  |  |  |
| Opposed |  |  |  | -0.43$^{***}$ | -0.11$^{**}$ | -0.12$^{**}$ |
|  |  |  |  | (0.05) | (0.05) | (0.05) |
| Company Age |  | 0.04$^{***}$ | 0.05$^{***}$ |  | 0.04$^{***}$ | 0.05$^{***}$ |
|  |  | (0.00) | (0.00) |  | (0.00) | (0.00) |
| Sector FE | No | No | Yes | No | No | Yes |
| Province FE | No | Yes | Yes | No | Yes | Yes |
| Observations | 81,909 | 81,888 | 81,888 | 81,909 | 81,888 | 81,888 |
| $R^2$ | 0.004 | 0.036 | 0.037 | 0.001 | 0.036 | 0.036 |

**Panel B: Portfolio Company Sample, Listed Companies**

|  | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
|  |  |  | I. ChiNext×100 |  |  |  |
| Supported | 15.01$^{***}$ | 10.53$^{***}$ | 10.57$^{***}$ |  |  |  |
|  | (3.26) | (3.38) | (3.46) |  |  |  |
| Opposed |  |  |  | -11.00$^{***}$ | -4.15 | -4.53 |
|  |  |  |  | (4.17) | (4.41) | (4.50) |
| Company Age |  | -1.08$^{***}$ | -1.05$^{***}$ |  | -1.08$^{***}$ | -1.06$^{***}$ |
|  |  | (0.31) | (0.31) |  | (0.31) | (0.31) |
| Sector FE | No | No | Yes | No | No | Yes |
| Province FE | No | Yes | Yes | No | Yes | Yes |
| Observations | 875 | 855 | 853 | 875 | 855 | 853 |
| $R^2$ | 0.024 | 0.140 | 0.180 | 0.008 | 0.131 | 0.171 |

**Table 4 Extensive Margin Effect of the Launch of ChiNext on VC/PE investments**

This table reports the difference-in-difference results on the impact of the introduction of ChiNext on VC and PE deals on the extensive margin (new investments in a given year). Companies doing business activities in "especially supported" categories (Panel A) and in "cautiously opposed" categories (Panel B) are in the treatment group and all other companies are in the control group. The dataset is a portfolio company-year panel of 81,909 companies during the period of 2006 to 2013 (both included). For each portfolio company, the first year in the panel is the minimum of the founding year and 2006. The 81,909 companies are portfolio companies that have at least one VC/PE deal in the period 2006 -2013. The dependent variable *VC* is a dummy variable that equals one if the company has at least one VC round in the observation year. The independent variables *Supported* (Panel A) and *Opposed* (Panel B) are dummies that are equal to one if the company is doing business activities in the nine "especially supported" and seven "cautiously opposed" categories respectively. *Post* is a dummy that equals to 1 if the year is after 2010 (included). Controls for *Company Age*, *Sector* (large classification in NECIPS), *Province* and *Company* fixed effects are indicated in each column. Standard errors are clustered at the sector level and are in parentheses. $^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$.

**Panel A: Supported vs the Rest**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | | | I.VC×100 | | | |
| Supported × Post | 8.07$^{***}$ | 7.98$^{***}$ | 8.00$^{***}$ | 8.04$^{***}$ | 8.06$^{***}$ | 9.37$^{***}$ |
| | (0.89) | (0.90) | (0.90) | (0.90) | (0.90) | (1.06) |
| Supported | -4.71$^{***}$ | -4.37$^{***}$ | -4.35$^{***}$ | -4.35$^{***}$ | -4.33$^{***}$ | |
| | (0.49) | (0.51) | (0.50) | (0.47) | (0.46) | |
| Post | 2.17$^{*}$ | | | | | |
| | (1.24) | | | | | |
| Company Age | | -1.32$^{***}$ | -1.32$^{***}$ | -1.31$^{***}$ | -1.31$^{***}$ | |
| | | (0.08) | (0.08) | (0.07) | (0.08) | |
| Year FE | | Yes | Yes | Yes | Yes | Yes |
| Sector FE | | | Yes | | Yes | |
| Province FE | | | | Yes | Yes | |
| Company FE | | | | | | Yes |
| Observations | 418,966 | 418,966 | 418,966 | 418,933 | 418,933 | 409,624 |
| $R^2$ | 0.004 | 0.038 | 0.039 | 0.039 | 0.039 | 0.095 |

**Panel B: Opposed vs the Rest**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | | | I.VC×100 | | | |
| Opposed × Post | -1.62$^{**}$ | -1.89$^{***}$ | -1.90$^{***}$ | -1.83$^{***}$ | -1.84$^{***}$ | -2.18$^{***}$ |
| | (0.65) | (0.59) | (0.59) | (0.60) | (0.60) | (0.49) |
| Opposed | 0.98$^{***}$ | 1.63$^{***}$ | 1.61$^{***}$ | 1.72$^{***}$ | 1.70$^{***}$ | |
| | (0.26) | (0.34) | (0.34) | (0.37) | (0.37) | |
| Post | 4.67$^{***}$ | | | | | |
| | (1.00) | | | | | |
| Company Age | | -1.32$^{***}$ | -1.32$^{***}$ | -1.31$^{***}$ | -1.32$^{***}$ | |
| | | (0.08) | (0.08) | (0.07) | (0.07) | |
| Year FE | | Yes | Yes | Yes | Yes | Yes |
| Sector FE | | | Yes | | Yes | |
| Province FE | | | | Yes | Yes | |
| Company FE | | | | | | Yes |
| Observations | 418,966 | 418,966 | 418,966 | 418,933 | 418,933 | 409,624 |
| $R^2$ | 0.002 | 0.037 | 0.037 | 0.037 | 0.038 | 0.093 |

**Table 5   Extensive Margin Effect of ChiNext Launch on VC/PE investments (Supported, Opposed, and the Rest)**

This table reports the difference-in-difference results on the impact of the introduction of ChiNext on VC and PE deals on the extensive margin (new investments in a given year). We compare companies doing business activities in "especially supported" categories and in "cautiously opposed" categories with all other companies. The dataset is a portfolio company-year panel of 81,909 companies during the period of 2006 to 2013 (both included). For each portfolio company, the first year in the panel is the minimum of the founding year and 2006. The 81,909 companies are portfolio companies that have at least one VC/PE deal in the period 2006 -2013. The dependent variable *VC* is a dummy variable that equals one if the company has at least one VC round in the observation year. The independent variables *Supported* and *Opposed* are dummies that are equal to one if the company is doing business activities in the nine "especially supported" and seven "cautiously opposed" categories respectively. *Post* is a dummy that equals to 1 if the year is after 2010 (included). Controls for *Company Age*, *Sector* (large classification in NECIPS), *Province* and *Company* fixed effects are indicated in each column. Standard errors are clustered at the sector level and are in parentheses. $^{*}\ p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | | | | VC | | |
| Supported × Post | 9.02$^{***}$ | 8.74$^{***}$ | 8.75$^{***}$ | 8.82$^{***}$ | 8.84$^{***}$ | 10.28$^{***}$ |
| | (1.05) | (1.07) | (1.07) | (1.07) | (1.07) | (1.36) |
| Opposed × Post | 1.84$^{***}$ | 1.45$^{**}$ | 1.45$^{**}$ | 1.53$^{**}$ | 1.52$^{**}$ | 1.76$^{**}$ |
| | (0.67) | (0.63) | (0.63) | (0.63) | (0.63) | (0.74) |
| Supported | -5.25$^{***}$ | -4.40$^{***}$ | -4.39$^{***}$ | -4.47$^{***}$ | -4.45$^{***}$ | |
| | (0.64) | (0.59) | (0.57) | (0.54) | (0.53) | |
| Opposed | -1.04$^{**}$ | -0.06 | -0.08 | -0.09 | -0.10 | |
| | (0.38) | (0.35) | (0.35) | (0.36) | (0.36) | |
| Post | 1.22 | | | | | |
| | (1.18) | | | | | |
| Company Age | | -1.32$^{***}$ | -1.32$^{***}$ | -1.31$^{***}$ | -1.31$^{***}$ | |
| | | (0.08) | (0.08) | (0.07) | (0.08) | |
| Year FE | | Yes | Yes | Yes | Yes | Yes |
| Sector FE | | | Yes | | Yes | |
| Province FE | | | | Yes | Yes | |
| Company FE | | | | | | Yes |
| Observations | 418966 | 418966 | 418966 | 418933 | 418933 | 409624 |
| $R^2$ | 0.004 | 0.038 | 0.039 | 0.039 | 0.039 | 0.095 |

**Table 6    Intensive Margin Effect of ChiNext Launch on VC/PE investments: Number of Investors**

This table reports the difference-in-difference results on the impact of the introduction of ChiNext on VC and PE deals on the intensive margin (number of investors in a given year). We compare companies doing business activities in "especially supported" categories and in "cautiously opposed" categories with all other companies. The dataset is a portfolio company-year panel of 81,909 companies during the period of 2006 to 2013 (both included), but contains only portfolio company-year observations for which there is a VC/PE investment into the company in that year (21% of all observations). For each portfolio company, the first year in the panel is the minimum of the founding year and 2006. The 81,909 companies are portfolio companies that have at least one VC/PE deal in the period 2006 -2013. The dependent variable *VC* is the number of investors that invest in the company in the observation year. The independent variables *Supported* (Panel A) and *Opposed* (Panel B) are dummies that are equal to one if the company is doing business activities in the nine "especially supported" and seven "cautiously opposed" categories respectively. *Post* is a dummy that equals to 1 if the year is after 2010 (included). Controls for *Company Age*, *Sector* (large classification in NECIPS), *Province* and *Company* fixed effects are indicated in each column. Standard errors are clustered at the sector level and are in parentheses. $^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$.

**Panel A: Supported vs the Rest**

|  | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
|  |  |  | Number of Investors×100 |  |  |  |
| Supported × Post | 5.45$^{***}$ | 5.48$^{***}$ | 5.26$^{***}$ | 3.43$^{***}$ | 3.12$^{***}$ | 15.26$^{***}$ |
|  | (1.63) | (1.53) | (1.54) | (1.16) | (1.13) | (3.92) |
| Supported | 4.74$^{***}$ | 4.23$^{***}$ | 4.25$^{***}$ | 0.09 | 0.12 |  |
|  | (0.78) | (0.67) | (0.67) | (0.72) | (0.69) |  |
| Post | 7.93$^{***}$ |  |  |  |  |  |
|  | (0.82) |  |  |  |  |  |
| Company Age |  | 0.82$^{***}$ | 0.83$^{***}$ | 0.40$^{***}$ | 0.37$^{***}$ |  |
|  |  | (0.13) | (0.12) | (0.09) | (0.09) |  |
| Year FE |  | Yes | Yes | Yes | Yes | Yes |
| Sector FE |  |  | Yes |  | Yes |  |
| Province FE |  |  |  | Yes | Yes |  |
| Company FE |  |  |  |  |  | Yes |
| Observations | 88035 | 88035 | 88035 | 88029 | 88029 | 14317 |
| $R^2$ | 0.005 | 0.009 | 0.011 | 0.070 | 0.072 | 0.594 |

**Panel B: Opposed vs the Rest**

|  | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
|  |  |  | Number of Investors×100 |  |  |  |
| Opposed × Post | -3.82$^{***}$ | -3.35$^{***}$ | -3.40$^{***}$ | -0.58 | -0.60 | -12.17$^{**}$ |
|  | (0.98) | (1.01) | (0.99) | (0.85) | (0.85) | (5.19) |
| Opposed | -2.18$^{***}$ | -2.54$^{***}$ | -2.49$^{***}$ | 0.40 | 0.39 |  |
|  | (0.77) | (0.78) | (0.77) | (0.73) | (0.70) |  |
| Post | 11.09$^{***}$ |  |  |  |  |  |
|  | (1.17) |  |  |  |  |  |
| Company Age |  | 0.85$^{***}$ | 0.85$^{***}$ | 0.40$^{***}$ | 0.37$^{***}$ |  |
|  |  | (0.14) | (0.13) | (0.09) | (0.09) |  |
| Year FE |  | Yes | Yes | Yes | Yes | Yes |
| Sector FE |  |  | Yes |  | Yes |  |
| Province FE |  |  |  | Yes | Yes |  |
| Company FE |  |  |  |  |  | Yes |
| Observations | 88035 | 88035 | 88035 | 88029 | 88029 | 14317 |
| $R^2$ | 0.004 | 0.008 | 0.010 | 0.070 | 0.072 | 0.594 |

**Table 7  Intensive Margin Effect of ChiNext Launch on VC/PE investments: Investment Amount**

This table reports the difference-in-difference results on the impact of the introduction of ChiNext on VC and PE deals on the intensive margin (total amount of all investments (RMB) in a given year). We compare companies doing business activities in "especially supported" categories and in "cautiously opposed" categories with all other companies. The dataset is a portfolio company-year panel of 81,909 companies during the period of 2006 to 2013 (both included), but contains only portfolio company-year observations for which there is a VC/PE investment into the company in that year (19% of all observations). For each portfolio company, the first year in the panel is the minimum of the founding year and 2006. The 81,909 companies are portfolio companies that have at least one VC/PE deal in the period 2006 -2013. The dependent variable *VC* is the total amount of all investments (RMB) in the company in the observation year. The independent variables *Supported* (Panel A) and *Opposed* (Panel B) are dummies that are equal to one if the company is doing business activities in the nine "especially supported" and seven "cautiously opposed" categories respectively. *Post* is a dummy that equals to 1 if the year is after 2010 (included). Controls for *Company Age*, *Sector* (large classification in NECIPS), *Province* and *Company* fixed effects are indicated in each column. Standard errors are clustered at the sector level and are in parentheses. $^{*} p < 0.10$, $^{**} p < 0.05$, $^{***} p < 0.01$.

Panel A: Supported vs the Rest

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Investment Amount (Billion RMB) | | | | | |
| Supported × Post | -12.02 | -11.92 | -11.07 | -11.44 | -10.75 | -6.70 |
| | (9.00) | (8.96) | (8.67) | (8.93) | (8.68) | (6.81) |
| Supported | 9.09 | 8.76 | 9.36 | 9.64 | 9.73 | |
| | (8.93) | (8.72) | (8.75) | (9.05) | (8.97) | |
| Post | 1.97 | | | | | |
| | (1.27) | | | | | |
| Company Age | | 0.41 | 0.45 | 0.37 | 0.43 | |
| | | (0.27) | (0.28) | (0.26) | (0.27) | |
| Year FE | | Yes | Yes | Yes | Yes | Yes |
| Sector FE | | | Yes | | Yes | |
| Province FE | | | | Yes | Yes | |
| Company FE | | | | | | Yes |
| Observations | 79471 | 79471 | 79471 | 79466 | 79466 | 10757 |
| $R^2$ | 0.000 | 0.000 | 0.002 | 0.004 | 0.006 | 0.548 |

Panel B: Opposed vs the Rest

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Investment Amount (Billion RMB) | | | | | |
| Opposed × Post | 7.13$^{**}$ | 7.27$^{**}$ | 6.79$^{**}$ | 7.07$^{**}$ | 6.71$^{*}$ | 12.66 |
| | (3.26) | (3.36) | (3.26) | (3.43) | (3.35) | (12.00) |
| Opposed | -4.30 | -4.45 | -4.33 | -4.58 | -4.25 | |
| | (3.10) | (3.19) | (3.11) | (3.43) | (3.35) | |
| Post | -3.38 | | | | | |
| | (3.05) | | | | | |
| Company Age | | 0.41 | 0.46 | 0.38 | 0.43 | |
| | | (0.28) | (0.29) | (0.27) | (0.28) | |
| Year FE | | Yes | Yes | Yes | Yes | Yes |
| Sector FE | | | Yes | | Yes | |
| Province FE | | | | Yes | Yes | |
| Company FE | | | | | | Yes |
| Observations | 79471 | 79471 | 79471 | 79466 | 79466 | 10757 |
| $R^2$ | 0.000 | 0.000 | 0.002 | 0.004 | 0.006 | 0.548 |

**Table 8   Intensive Margin Effect of ChiNext Launch on VC/PE investments: Share of Investors**

This table reports the difference-in-difference results on the impact of the introduction of ChiNext on VC and PE deals on the intensive margin (total shares of equity acquired by investors in a given year). We compare companies doing business activities in "especially supported" categories and in "cautiously opposed" categories with all other companies. The dataset is a portfolio company-year panel of 81,909 companies during the period of 2006 to 2013 (both included), but contains only portfolio company-year observations for which there is a VC/PE investment into the company in that year (20% of all observations). For each portfolio company, the first year in the panel is the minimum of the founding year and 2006. The 81,909 companies are portfolio companies that have at least one VC/PE deal in the period 2006 -2013. The dependent variable *VC* is the total shares of equity acquired by investors in the company in the observation year. The independent variables *Supported* (Panel A) and *Opposed* (Panel B) are dummies that are equal to one if the company is doing business activities in the nine "especially supported" and seven "cautiously opposed" categories respectively. *Post* is a dummy that equals to 1 if the year is after 2010 (included). Controls for *Company Age*, *Sector* (large classification in NECIPS), *Province* and *Company* fixed effects are indicated in each column. Standard errors are clustered at the sector level and are in parentheses. $^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$.

**Panel A: Supported vs the Rest**

|  | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
|  |  |  | Total Share of Equity Issued |  |  |  |
| Supported × Post | -4.09$^{***}$ | -3.99$^{***}$ | -3.86$^{***}$ | -2.65$^{**}$ | -2.49$^{**}$ | -0.38 |
|  | (1.12) | (1.10) | (1.13) | (1.01) | (0.98) | (1.45) |
| Supported | -10.81$^{***}$ | -10.55$^{***}$ | -10.48$^{***}$ | -4.32$^{***}$ | -4.28$^{***}$ |  |
|  | (0.85) | (0.81) | (0.79) | (0.63) | (0.63) |  |
| Post | -0.08 |  |  |  |  |  |
|  | (0.58) |  |  |  |  |  |
| Company Age |  | -0.61$^{***}$ | -0.62$^{***}$ | -0.38$^{***}$ | -0.37$^{***}$ |  |
|  |  | (0.09) | (0.09) | (0.05) | (0.05) |  |
| Year FE |  | Yes | Yes | Yes | Yes | Yes |
| Sector FE |  |  | Yes |  | Yes |  |
| Province FE |  |  |  | Yes | Yes |  |
| Company FE |  |  |  |  |  | Yes |
| Observations | 81866 | 81866 | 81866 | 81861 | 81861 | 11311 |
| $R^2$ | 0.022 | 0.030 | 0.033 | 0.116 | 0.119 | 0.828 |

**Panel B: Opposed vs the Rest**

|  | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
|  |  |  | Total Share of Equity Issued |  |  |  |
| Opposed × Post | 3.98$^{***}$ | 3.59$^{***}$ | 3.48$^{***}$ | 1.65$^{*}$ | 1.59$^{*}$ | -0.57 |
|  | (1.01) | (1.01) | (1.01) | (0.83) | (0.80) | (1.37) |
| Opposed | 4.77$^{***}$ | 5.10$^{***}$ | 5.02$^{***}$ | 0.52 | 0.53 |  |
|  | (0.69) | (0.66) | (0.65) | (0.58) | (0.57) |  |
| Post | -3.29$^{***}$ |  |  |  |  |  |
|  | (0.90) |  |  |  |  |  |
| Company Age |  | -0.67$^{***}$ | -0.66$^{***}$ | -0.40$^{***}$ | -0.38$^{***}$ |  |
|  |  | (0.10) | (0.10) | (0.05) | (0.06) |  |
| Year FE |  | Yes | Yes | Yes | Yes | Yes |
| Sector FE |  |  | Yes |  | Yes |  |
| Province FE |  |  |  | Yes | Yes |  |
| Company FE |  |  |  |  |  | Yes |
| Observations | 81866 | 81866 | 81866 | 81861 | 81861 | 11311 |
| $R^2$ | 0.009 | 0.018 | 0.022 | 0.113 | 0.116 | 0.828 |

**Table 9   Effect of ChiNext Launch on VC/PE investments: Duration Until Exit**

This table reports the difference-in-difference results on the impact of the introduction of ChiNext on VC and PE deals on the duration until exit since the first investment (in months). We compare companies doing business activities in "especially supported" categories and in "cautiously opposed" categories with all other companies. The dataset is a portfolio company-year panel of 81,909 companies during the period of 2006 to 2013 (both included), but contains only portfolio company-year observations for which there is a VC/PE investment into the company in that year and where there is an exit until 2021 (6.1% of all observations). For each portfolio company, the first year in the panel is the minimum of the founding year and 2006. The 81,909 companies are portfolio companies that have at least one VC/PE deal in the period 2006 -2013. The dependent variable *VC* is the duration in months (days/30) from the first investment date to the exit date (last exit date in the data), by taking the mean across investors who invest in the same year in the company. The independent variables *Supported* (Panel A) and *Opposed* (Panel B) are dummies that are equal to one if the company is doing business activities in the nine "especially supported" and seven "cautiously opposed" categories respectively. *Post* is a dummy that equals to 1 if the year is after 2010 (included). Controls for *Company Age*, *Sector* (large classification in NECIPS), *Province* and *Company* fixed effects are indicated in each column. Standard errors are clustered at the sector level and are in parentheses. $^{*}\,p < 0.10$, $^{**}\,p < 0.05$, $^{***}\,p < 0.01$.

**Panel A: Supported vs the Rest**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | | | Duration in Months from First Investment to Exit | | | |
| Supported × Post | -5.29*** | -5.24** | -4.50** | -4.55** | -4.14** | -14.67*** |
| | (1.85) | (1.91) | (1.89) | (1.72) | (1.75) | (4.04) |
| Supported | 3.59* | 4.54*** | 4.62*** | 6.06*** | 5.81*** | |
| | (1.78) | (1.60) | (1.64) | (1.56) | (1.66) | |
| Post | -31.28*** | | | | | |
| | (4.22) | | | | | |
| Company Age | | -0.82*** | -0.64*** | -0.76*** | -0.59*** | |
| | | (0.15) | (0.16) | (0.12) | (0.14) | |
| Year FE | | Yes | Yes | Yes | Yes | Yes |
| Sector FE | | | Yes | | Yes | |
| Province FE | | | | Yes | Yes | |
| Company FE | | | | | | Yes |
| Observations | 25577 | 25577 | 25577 | 25574 | 25574 | 1638 |
| $R^2$ | 0.154 | 0.232 | 0.291 | 0.243 | 0.300 | 0.740 |

**Panel B: Opposed vs the Rest**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | | | Duration in Months from First Investment to Exit | | | |
| Opposed × Post | 1.55 | 1.27 | 0.81 | 0.82 | 0.60 | 3.43 |
| | (1.29) | (1.25) | (1.33) | (1.32) | (1.37) | (2.80) |
| Opposed | -1.02 | -0.99 | -0.99 | -1.84 | -1.49 | |
| | (1.52) | (1.45) | (1.37) | (1.43) | (1.35) | |
| Post | -33.16*** | | | | | |
| | (4.15) | | | | | |
| Company Age | | -0.82*** | -0.64*** | -0.76*** | -0.59*** | |
| | | (0.14) | (0.16) | (0.12) | (0.14) | |
| Year FE | | Yes | Yes | Yes | Yes | Yes |
| Sector FE | | | Yes | | Yes | |
| Province FE | | | | Yes | Yes | |
| Company FE | | | | | | Yes |
| Observations | 25577 | 25577 | 25577 | 25574 | 25574 | 1638 |
| $R^2$ | 0.153 | 0.231 | 0.291 | 0.242 | 0.299 | 0.737 |

**Table 10    Impact of the Launch of ChiNext on VC/PE investments: SOEs**

This table reports the difference-in-difference results on the impact of the introduction of ChiNext on VC and PE deals on State-Owned enterprises (SOEs). We compare companies doing business activities in "especially supported" categories and in "cautiously opposed" categories with all other companies. The dataset is a portfolio company-year panel of 81,909 companies during the period of 2006 to 2013 (both included). For each portfolio company, the first year in the panel is the minimum of the founding year and 2006. The 81,909 companies are portfolio companies that have at least one VC/PE deal in the period 2006 -2013. Panel A looks at the extensive margin (new investments in a given year). The dependent variable *I.VC* is a dummy variable that equals one if the company has at least one VC round in the observation year. Panel B looks at the intensive margin (total shares of equity acquired by investors in a given year). Panel C looks at the duration until exit. The dependent variable *VC* is the duration in months (days/30) between the first investment date the exit date (last exit date in the data), by taking the mean across investors who invest in the same year in the company. *Post* is a dummy that equals to 1 if the year is after 2010 (included). Controls for *Company Age*, *Sector* (large classification in NECIPS), *Province* and *Company* fixed effects are indicated in each column. Standard errors are clustered at the sector level and are in parentheses. $^*$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$.

Panel A: Linear Probability of Gaining VC Funding – Extensive Margin

|  | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
|  | | | I.VC×100 | | | |
| SOE × Post | -6.05$^{***}$ | -5.56$^{***}$ | -5.55$^{***}$ | -5.57$^{***}$ | -5.57$^{***}$ | -3.88$^{***}$ |
|  | (1.38) | (1.19) | (1.19) | (1.18) | (1.19) | (0.91) |
| SOE | 2.03$^{***}$ | 3.73$^{***}$ | 3.53$^{***}$ | 3.76$^{***}$ | 3.48$^{***}$ | |
|  | (0.51) | (0.55) | (0.62) | (0.56) | (0.65) | |
| Post | 4.28$^{***}$ | | | | | |
|  | (1.11) | | | | | |
| Company Age | | -1.32$^{***}$ | -1.32$^{***}$ | -1.31$^{***}$ | -1.31$^{***}$ | |
|  | | (0.08) | (0.08) | (0.07) | (0.08) | |
| Year FE | | Yes | Yes | Yes | Yes | Yes |
| Sector FE | | | Yes | | Yes | |
| Province FE | | | | Yes | Yes | |
| Company FE | | | | | | Yes |
| Observations | 418966 | 418966 | 418966 | 418933 | 418933 | 409624 |
| $R^2$ | 0.003 | 0.037 | 0.037 | 0.037 | 0.038 | 0.093 |

Panel B: Total Equity Shares– Intensive Margin

|  | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
|  | | | Total Shares | | | |
| SOE × Post | 5.78$^{***}$ | 5.87$^{***}$ | 5.89$^{***}$ | 4.63$^{***}$ | 4.64$^{***}$ | -3.07 |
|  | (1.19) | (1.24) | (1.31) | (1.23) | (1.29) | (2.94) |
| SOE | -2.89 | -2.08 | -3.17 | -3.22$^{*}$ | -3.55$^{*}$ | |
|  | (2.06) | (1.95) | (1.93) | (1.87) | (1.79) | |
| Post | -2.07$^{***}$ | | | | | |
|  | (0.72) | | | | | |
| Company Age | | -0.67$^{***}$ | -0.65$^{***}$ | -0.39$^{***}$ | -0.38$^{***}$ | |
|  | | (0.10) | (0.11) | (0.06) | (0.06) | |
| Year FE | | Yes | Yes | Yes | Yes | Yes |
| Sector FE | | | Yes | | Yes | |
| Province FE | | | | Yes | Yes | |
| Company FE | | | | | | Yes |
| Observations | 81866 | 81866 | 81866 | 81861 | 81861 | 11311 |
| $R^2$ | 0.001 | 0.009 | 0.014 | 0.112 | 0.115 | 0.828 |

Panel C: Duration Until Exit

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Duration in Month from First Investment to Exit | | | | | |
| SOE × Post | -2.23 | -1.30 | -1.11 | -1.63 | -1.24 | -11.73 |
| | (5.89) | (5.87) | (5.25) | (5.71) | (5.19) | (7.47) |
| SOE | 9.77* | 10.07* | 10.46* | 9.39 | 9.80* | |
| | (5.53) | (5.72) | (5.14) | (5.66) | (5.02) | |
| Post | -32.32*** | | | | | |
| | (4.47) | | | | | |
| Company Age | | -0.83*** | -0.65*** | -0.77*** | -0.60*** | |
| | | (0.15) | (0.16) | (0.13) | (0.14) | |
| Year FE | | Yes | Yes | Yes | Yes | Yes |
| Sector FE | | | Yes | | Yes | |
| Province FE | | | | Yes | Yes | |
| Company FE | | | | | | Yes |
| Observations | 25577 | 25577 | 25577 | 25574 | 25574 | 1638 |
| $R^2$ | 0.154 | 0.233 | 0.293 | 0.243 | 0.300 | 0.737 |