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251

The venture capital lifecycle: the role of foreign venture capital in a developing startup scene in China

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Abstract

Purpose – This study aims to examine the venture capital (VC) industry, which is critical for supporting startups and typically dominated by individuals with startup experience. Recognizing the challenges faced by catching-up economies, this research seeks to understand the successful development of the VC industry in China, thereby addressing the classic "chicken or the egg" problem.

Design/methodology/approach – Using a comprehensive data set from the TechCrunch database, this paper conducts both descriptive and empirical analyses. Based on theoretically grounded observations, seven hypotheses are formulated and tested using multiple linear regression.

Findings – The findings indicate that foreign VC has played a significant role in establishing the VC industry in China. These foreign investors tend to lead the market and co-invest with local partners, facilitating knowledge transfer. In addition, the investment preferences of foreign VCs differ markedly from those of their local counterparts.

Research limitations/implications – This study offers valuable insights for policymakers and enhances strategy development for VC firms. It also highlights potential areas for future research, further exploring the intricacies of VC in emerging markets.

Originality/value – While considerable literature exists on the rise of startup funding in the USA and Europe, studies focusing on emerging economies are scarce. By using a comprehensive, yet underused data set, this research illuminates fundamental dynamics within the VC industry in these regions.

Keywords Venture capital, Startup ecosystems, Foreign investment, Knowledge transfer, Investor bias, China, Regression analysis, Economic policy, Entrepreneurship, Industry lifecycle

Paper type Research paper

1. Introduction

Entrepreneurial ventures are crucial to a country's economic success (Carree and Thurik, 2005; Doran *et al.*, 2018; Neumann, 2021). Startups in more developed nations enhance

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market dynamics. In the US, for instance, startups contribute positively to the labour market and help the nation excel across many economic indicators (Schindehutte *et al.*, 2008; Neumann, 2021).

As the impact of startup ecosystems becomes clearer, policymakers across different countries are attempting to emulate the startup surge seen in the US with varying results (Doran *et al.*, 2018). Concurrently, the surge in interest has spurred a growing body of research on how startups integrate into economic frameworks. Researchers investigate factors influencing startup location decisions (Kolympiris *et al.*, 2015), psychological factors in entrepreneurship (Feng and Chen, 2020) and the concept of *business clusters* and their role in creating *startup hubs* (Kerr and Robert-Nicoud, 2020). A lot of research deals with the financing of startups, as investment is one of the key enablers of entrepreneurship (Bollaert *et al.*, 2021).

In their formative years, startups typically have a minimal impact on the economy. As a result, funding and exits are used as primary indicators of a country's *startup ecosystem*. Policymakers often prioritise enhancing access to funding over developing *startup hubs* infrastructure or altering *startup culture*, as it yields quick results (Kollmann *et al.*, 2016; Ács *et al.*, 2018). Venture capital (VC), a crucial startup funding source, involves high-risk, high-return investments, often preferred over traditional financing like bank loans, which are unsuited to the risk profiles of startups (Ács *et al.*, 2018; Neumann, 2021).

Over the past 25 years, China has successfully developed a VC industry and an effective *startup ecosystem*. Recognizing the startup industry's role in achieving sustainable growth and driving innovation, the Chinese government has intensified its policy support for innovation, particularly in response to a challenging geopolitical environment (Poon *et al.*, 2024) Apart from few early pioneers, policies introduced in 1998 in China created an industry inception. With government support and a deep talent pool the country developed the VC industry to a mature state today (Malkin, 2021). This makes China an ideal case study for this research, as it encapsulates the entire growth trajectory of the VC industry within a short period of time.

Using a data set on startup funding rounds in mainland China, this study analyses the behaviour of Chinese VC funds and their international counterparts from 1999 to 2023 within the nascent Chinese VC market. The research reveals that a significant portion of VC investments in China originated from international investors. This spurred the creation and expansion of Chinese VC funds, leading to intense competition, although foreign investment remained important (*H1*.1 and *H1*.2). The findings indicate that international funds are more inclined to co-invest compared to local funds, a tendency that diminishes as the market matures (*H2*.1). Also, foreign funds take the lead in disproportionate number of funding rounds (*H2*.2). There is no empirical evidence suggesting that international investors prefer later-stage startups over early-stage ones, unlike their Chinese counterparts (*H2*.3). Also, it could not be confirmed that non-Chinese investors predominantly invest in startups located in major hubs such as Beijing, Shanghai and Shenzhen (*H3*.1). In a maturing startup scene in China, foreign VCs increasingly focus on niche industries, whereas local VCs initially favour these niches, but increasingly dominate the mainstream over time (*H3*.2). The study observes how investment shifts from infrastructure and business services to advanced sectors, whereas foreign VCs increasingly favour startups that match their own agenda.

These patterns, common in traditional industries, have not been thoroughly explored in the VC sector. This study underscores the pivotal role of foreign venture capitalists in shaping the Chinese startup ecosystem and highlights their initial preference for co-investments and concentration in major urban agglomerations. These findings corroborate traditional market growth theories and challenge the notion that the VC industry is uniform.

The paper is structured as follows: Section 2 begins with a review of existing research and the definition of key concepts. Section 3 develops hypotheses based on descriptive analysis and theoretical foundations. Section 4 presents the regression model used to test these hypotheses, followed by a discussion of the results in Section 5. The paper concludes with a forward-looking perspective in Section 6.

2. Theoretical background

2.1 Venture capital and domestic industry lifecycles

Industries are categorised based on similar production processes, products or business models, each experiencing a lifecycle driven by innovation (Audretsch and Feldman, 1996a; Cucculelli and Peruzzi, 2020). At the microeconomic level, during the introduction phase, industries experience scant competition fdue to the low profitability and small market size, attracting only firms that can navigate the high-risk, high-reward scenario. As the industry progresses to the growth stage, market awareness and competition surge as new entrants vie for market share. This dynamic shifts as the industry reach maturity, focusing on cost efficiency and culminate in a consolidation phase through mergers and market exits. The lifecycle may repeat afterwards, driven by innovation (Klepper, 1997; Cucculelli and Peruzzi, 2020).

When China saw its first VC investments, a mature VC industry existed in the US already. Yet, scholars agree that even in the more dynamic financial sector, industry stages in the lifecycle model differ from country to country. Although theoretically, a new industry could simultaneously develop globally, practical constraints like transfer costs (capital mobilization, travel, shipping, information transfer and legal costs) often shape diffusion and growth (Oster and Quigley, 2017; Torres de Oliveira *et al.*, 2022). Consequently, some national markets may not develop due to high transactional costs and different regulatory environments. Conversely, when policy makers reduce these barriers, a national industry can rapidly form following the lifecycle curve. The growth of this market can be accelerated if similar markets in other countries are already established, benefiting from enhanced customer understanding and product refinement. This way foreign investments not only add capital, but also knowledge to an economy (Malerba and Lee, 2021).

VC plays a critical role in financing startups, often delivering returns through equity investments in high-risk startups, with profits realised typically through sales of shares during an initial public offering (IPO) or to other investors (Gompers and Lerner, 2001). Venture capitalists include individuals, corporations and specialised funds, with these funds often achieving significant returns compared to traditional stock markets (Gompers and Lerner, 2001; Lerner and Nanda, 2020).

Like conventional investment funds, VC funds typically operate within a defined investment universe, choosing to focus on particular industries, markets, regions or stages of a startup's lifecycle. The stage of investment often depends on the amount of capital the VC can raise from investors and its own assets, with later stages requiring larger investments (Lerner and Nanda, 2020).

VCs are crucial for startup financing, as traditional bank financing is generally inefficient for the sector. Unlike bank loans, which rely on long investment cycles, experience, trust and personal relationships, VC investments are more opportunistic, short-term, and based on data, technology and knowledge transfer (Gompers and Lerner, 2001). It has been demonstrated that VC-backed firms have a higher survival rate, particularly in the early stages of development (Jeong *et al.*, 2020), underscoring the vital role of VCs within the startup ecosystem. As VCs seek new opportunities, they may not only expand into different industries, but also into new regions and new countries.

Businesses assess market entry based on the risk-return ratio, influenced by varying competition intensities across different stages of the industry lifecycle. When a new national economy opens its market, companies face distinct choices influenced by factors such as investment requirements and distribution capabilities (Holtbrügge and Baron, 2013). Factors like international business experience, immigration effects, service requirements and market size play crucial roles in determining a firm's market entry strategy (Li *et al.*, 2019). Timing is also critical, especially in emerging markets: early entrants bear the costs of market development amidst uncertain demand, whereas later entrants struggle with the costs associated with catching up to established players (Freeman *et al.*, 1983; Li *et al.*, 2019). Upon market opening, domestic companies also compete, posing challenges to foreign firms at multiple levels. Foreign firms often face disadvantages related to cultural, political, legal and market intelligence aspects. However, they typically hold advantages in technology, infrastructure and experience, which initially may lead to superior product offerings (Audretsch and Feldman, 1996b). These effects may be observed looking at the development of the startup funding industry in China as well.

While a lifecycle may be observed in a domestic VC industry, regional differences may occur. This too, is the case in the US, where the scene revolves around *innovation clusters* or *startup ecosystems*. Significant research centres on Silicon Valley, analysing the effects of its infrastructure, demand for new products and special access to financing (Audretsch, 2021). More recently, studies have begun incorporating psychological factors to explain regional variations in entrepreneurship and startup activity (Feldman, 2014; Hueso *et al.*, 2021; Sevilla-Bernardo *et al.*, 2022). A local VC scene is tied to local startup cluster and follows its lifecycle.

2.2 The mechanics of growing venture capital investment

VC activity is influenced by government policies and regulatory environments (Da Rin *et al.*, 2006; Poon *et al.*, 2024). Despite common perceptions, growth in gross domestic product (GDP) and market capitalization are not directly correlated with startup investment activities. Instead, factors such as supportive legislation for pension funds and favourable conditions for IPOs can boost VC funding, particularly at later stages. Early-stage investments are more closely associated with flexible labour market policies and access to human capital.

Legal frameworks for establishing VC funds are critical, as investment funds are heavily regulated based on the associated risk levels (Pugh and Yermo, 2008). Many countries have strict regulations that limit high-risk investments, including VCs, often due to increased agency costs. Effective policy adjustments might include relaxing certain regulations to encourage VC development, such as modifying financial disclosure and auditing requirements, ensuring sustainable cost structures and defining loss limitation mechanisms. This creates windows of opportunity for established foreign VCs, whenever a potentially attractive market switches to favourable regulations (Bradley *et al.*, 2019).

VCs must also have viable exit strategies. These typically involve selling their shares directly to another entity or through the stock market if the startup is publicly listed (Lerner and Nanda, 2020). Stock markets play a crucial role due to their liquidity and accessibility, underlining the importance of supportive policies that promote listing requirements, the visibility of startups and the development of a robust stock culture. Previous studies even concluded that the access to efficient stock markets is the single most important factor in VC industry creation (Metrick and Yasuda, 2021).

Policymakers can significantly impact the startup ecosystem by fostering both the quantity and quality of new companies, enhancing returns and attracting investors. Initiatives such as educational programs focusing on technology, entrepreneurship and business

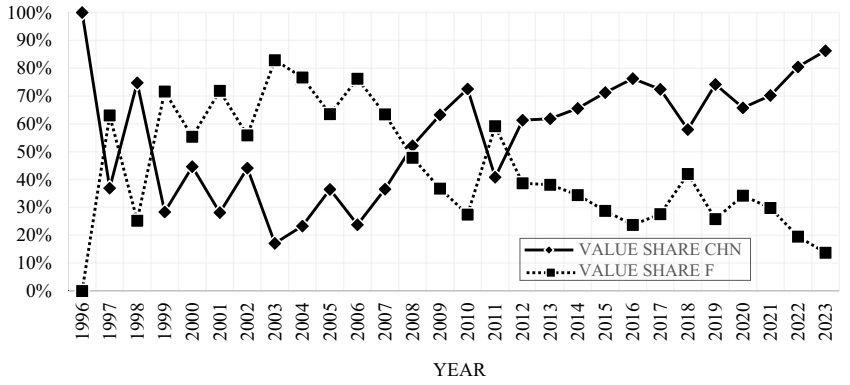
fundamentals have been shown to boost startup activity and quality. Moreover, integrating skills like critical thinking, personal responsibility and creativity into the broader education system can have long-term positive effects on entrepreneurial activity (Boh *et al.*, 2016). Policymakers can mitigate the risks for entrepreneurs by implementing safety nets or providing financial support during the initial stages of founding a company (Cumming *et al.*, 2014). Encouraging foreign investment in local startups, akin to foreign direct investment, can also bolster the domestic VC and startup scene. Attracting foreign VCs can lead to knowledge transfer, increased capital and the gradual development of the local VC market (Schnitzer and Watzinger, 2022).

As noted above, foreign investors consider several key factors when selecting a country for investment. These include economic and political stability, as well as the factors discussed in the previous sections. Generally, larger and rapidly growing markets offer more substantial opportunities. Infrastructure quality, access to capital and a skilled labour force also play significant roles. Finally, technological readiness and cultural factors can influence the ease of doing business and integration into the local market. These are all issues to address, when trying to attract foreign VC investment (Buchner *et al.*, 2018).

3. Observations and hypotheses

3.1 Market opening

As the Chinese economy opened up, it followed the industry lifecycle model previously outlined. In 1995, while the USA had a developed VC industry, China lacked an efficient funding system for new risky ventures. The Torch Program, implemented in 1988 failed to seed a VC industry, this was due to a lack of funding but also due to regulatory insecurity. Even though the Chinese free market economy was still in its infancy at the time, many ventures were found successfully even without the aid of traditional VC. In 1998, policymakers introduced a legal framework for VC funds in China. This started an influx of foreign funds and the creation of local ones, which was driven by the dot-com bubble as well (Malkin, 2021). As shown in Figure 1, the VC sector gained momentum in 1999 and 2000, with funds aiming at listing Chinese company shares on foreign exchanges bypassing the still underdeveloped financial markets in China (Zhang and King, 2010). While traditional



Source: Figure by author

Figure 1. Share of money invested by origin created in Microsoft Excel

industries in China were still dominated by state-owned enterprises (SOEs), startups were able to exploit new opportunities and newly forming markets.

Post-2000, further policy milestones include China's accession (2001) to the World Trade Organization (WTO), the Renminbi Fund Introduction in 2005, as well as new State Council Guidelines on offshore VC investment entities (2008). These changes improved market access, access to capital and further incentivised the creation of local VC funds (Malkin, 2021). Apart from research and development (R&D) subsidies, more recent policy measures focus on improving exit opportunities for VCs, highlighted by a growing stock market with 5,346 companies listed by 2024 and the creation of specialised boards for startup investments (Pan and Yang, 2019; Lin, 2017; National Bureau of Statistics of China, 2024). This development comes accompanied by rising investments into education, improving the labour pool for startups. Enhanced enforcement of private and intellectual property rights in recent years further incentivise high-tech startups in China, highlighting the increased attention of Chinese policymakers to nurture innovation locally. This creates a market environment increasingly similar to those in western countries, lowering the opacity of the market for foreign investors. Another particularly effective measure has been the great firewall, which acts as a trade barrier protecting the Chinese online service sector (Liu, 2010).

Investment tanked in the aftermath of the new economy bubbly burst and the 2001 economic crisis. Despite this setback and the outbreak of SARS, startup funding increased drastically in 2003. As regulations took effect, growth commenced steadily until 2018, only with contractions in 2009 due to the world financial crisis and 2013 amid a slowing Chinese economy and anti-corruption campaigns. From 2018 onwards investments stagnated with souring China–US relations and the COVID pandemic heavily affecting China from 2020 (Nye, 2023).

Excluding the unreliable numbers before 1999 due to a small sample size, foreign investors outspend Chinese all the way until 2008. After that, the share of foreign investment dropped steadily, reflecting a typical trend as the market matures and among other challenges. Similar movements can be found in other maturing industries such as car manufacturing. As noted in Section 2, these developments can be attributed to a transfer of knowledge and buildup of capital. While foreign investors start off with a resource advantage, expertise and capital get transferred until foreign investors inevitably fall behind due to a transaction-cost disadvantage (Gompers and Lerner, 2001; Malerba and Lee, 2021). Furthermore, as market liberalization efforts show results, the financial position of SOEs deteriorates at the time, rendering investments into other asset classes ever more attractive and creating opportunities for startup companies.

Notable is that while the SARS crisis led to a comparative surge in outside investments, the same did not happen during the COVID pandemic. The numbers also show that Chinese investors were not affected by the world financial crisis as foreign investors were. Investment activities also demonstrated that while foreign funds made fewer monetary contributions over time, they participated in a relatively high number of deals, a strategy to mitigate risk by trusting on the in-depth market knowledge of local VCs. This highlights how the entire industry turned around as the market and local investors mature.

For empirical validation, further analysis is needed to determine if:

H1.1. A maturing startup ecosystem leads to dropping shares of funding from foreign investors.

H1.2. A maturing startup ecosystem leads to a decreasing proportion of investments from foreign investors.

3.2 Market position

Initially, investments in Chinese startups by foreign venture capitalists were larger than those made by Chinese VCs, reflecting a market and industry development mode by the foreign VCs in the late 1990s. With a perceived superior product and greater financial power, foreign VCs likely focused on high-margin businesses and could dominate the market, as noted earlier (Lerner, 2022).

The VC industry, characterised by its long-term, knowledge-based nature, places high importance on reputation, making the costs of underperformance significant. VCs typically invest in 10–20 startups per fund, with outcomes apparent only years later, thus incurring high learning costs. Given these dynamics, foreign VCs tended to cooperate with Chinese investors rather than investing solo. Early Chinese VCs, in contrast, appeared to have better access to lucrative single investments, especially during the industry's introduction phase from 1996 to 2009, though this disparity diminished over time. One important factor in this development is the access to attractive IPO-markets. Scholars highlight, that especially in the early years, foreign VCs are inclined to participate in many funding rounds for the prospect of increased returns in an exit event on markets abroad. While inefficient and largely focused on SEOs and large multinational companies in the 2000's, the Chinese stock markets only improved slowly over time (Humphery-Jenner and Suchard, 2013; Metrick and Yasuda, 2021).

According to Chahine *et al.* (2021), startup companies are inclined to choose well known VC funds as lead investors. This increases a startups visibility among investors and potential new hires leading to greater chances of success for the venture. As noted above, foreign VCs, American VCs in particular, may have a better reputation and track record than newly formed Chinese funds. The data supports these claims, as foreign investors tend to lead funding rounds comparatively more often than their Chinese counterpart throughout most of the observed timeframe (see Figure 3). Building trust is an important element in Chinese business culture and bringing on an established foreign VC as lead investor at a funding round, may just give more legitimacy to all parties involved. Excluding the early years, this holds true for the entire timeframe except for the years after the world financial crisis, where foreign funding dried up, as seen before.

In the VC sector, high-margin business typically involves investing in startups at later stages of their lifecycle, where business models, management teams and technology are more proven, reducing investment variance and risk. However, such investments require significant capital and a solid reputation, privileges typically reserved for established VCs (Gompers and Lerner, 1999; Gompers, 2022). Initially, Chinese VCs are unable to compete in this high-stakes market segment, but by 2011 and 2012, they begin to catch up, a process delayed by the time needed to build trust and prove long-term success (see Figure 4).

To conclude this section, three hypotheses are formulated, to be tested further:

H2.1. Foreign investors have a decreasing bias towards co-investments as a startup ecosystem matures.

H2.2. Foreign investors are an overly popular choice as lead-investors, even as a startup ecosystem matures.

H2.3. Foreign investors have a decreasing bias for later stage investments as a startup ecosystem matures.

3.3 Funding preferences

The startups examined, like those on the NEEQ board, are predominantly located in Beijing, Shanghai, Shenzhen and nearby cities (see Figure 5). From 1996 to 2020, these areas

attracted 66% of all investments, with an initial concentration of 72% from 1995 to 2007, decreasing slightly thereafter (Pan and Yang, 2019). Notably, investment distribution occasionally broadened to other cities during spikes in overall VC funding in China.

Beijing, Shanghai and Guangdong province have become hubs for generating patents and world-class research, further supported by national policy emphasizing innovation in successive Five-Year Plans (Pan and Yang, 2019; Liu *et al.*, 2017). These hubs all offer advanced financial infrastructure, industry, research, political power and foreign trade, enhancing these cities' international visibility as well as the efficiency of local markets (Chen and Yan, 2018). As can be seen in Figure 6, during the observed timeframe the gap narrowed overall, reaching close to no difference in 2023. One factor may be market reforms and increased market liberalization amidst a fading dominance of SOEs. Developments that first occurred in certain areas aided by special local policies but have spread across the entire country over time. Also, the overall investment concentration dropped significantly starting from 2020. Recent studies could attribute this to decreasing barriers in funding far-away companies as the funding processes moved online, driven by COVID constraints (Gompers *et al.*, 2021). This seems to hold true for the Chinese VC sector as well.

As expected, foreign venture capitalists tend to invest in different sectors compared to their Chinese counterparts. Over time, the focus of these investments has shifted from traditional business infrastructure towards more advanced industries. Between 1999 and 2023, sector diversification has increased significantly (see Figure 7). Initially, Chinese VCs favoured niche sectors, but by 2014, they had caught up with foreign VCs and eventually pushed them into more niche areas in subsequent years. Overall, foreign VCs appear to favour asset-light, service-oriented industries, whereas local VCs take a more opportunistic approach, actively supporting domestic industries and infrastructure. Notably, the Chinese National Government started to introduce Startup-Funds to co-invest along VCs in 2015 and was soon followed by provincial- and city-level governments (Pan *et al.*, 2020). These funds may have contributed to the expansion in investment in domestic industry and infrastructure observable in 2019 and 2023.

In the 1990s, early VC investments focused on mainstream industry startups such as E-Commerce, Internet, Software, Curated Web and Games. Between 1995 and 2008, the top ten industries received 39% of all investments, with this share being slightly higher in the early years (48% from 1996 to 2003) and then dropping to 25–35% post-2003. After 2018 the trend changed, with a rising concentration in investments. Only during a COVID the gap widened again, this time with Chinese investors focusing on mainstream sectors whereas foreign VCs exhibited more diversified preferences.

In conclusion, it shall be examined, whether:

H3.1. Foreign investors have a decreasing bias towards investing in startup hubs as a startup ecosystem matures.

H3.2. Foreign investors are decreasingly biased towards mainstream industries as a startup ecosystem matures.

4. Empirical testing

4.1 Methods, review of the data and pre-testing

To analyse the causal relationship between the variables listed, multiple regression analysis is used. Initially, variables necessary to test the hypothesis are identified, with their computation rules defined and potential confounders noted. The source of the data is the TechCrunch database, a leading platform tracking startup companies and providing

intelligence, especially to startups and startup investors. Notably, this source excludes undisclosed investments, which are common in the startup sector, as noted by Lamb *et al.* (1998).

The data collected from TechCrunch includes all recorded startup funding rounds as well as related information. The data set consists of 42,349 funding rounds comprising 79,166 investments. This funding was collected by 23,591 Mainland-China based startups before 2024. Information on 19,540 different investors such as VC funds, banks, angel investors and mature companies responsible for these funding rounds were collected as well. Data from Taiwan, Hong Kong and Macau are excluded due to their different policies, economic and infrastructural contexts.

All hypotheses theorise a relationship towards a *maturing startup ecosystem*. For practicability, the primary variable to express this in all models is *Startup funding*, which measures the amount of funding received by startups, calculated in RMB prices adjusted for inflation. It includes both equity and debt financing up to the point of exit via acquisition or IPO, excluding post-IPO equity sales and share trades among venture capitalists, as these do not directly benefit the startup. The excluded categories are deemed insignificant compared to the total observed funding activities.

To test Hypothesis *H1*.1, *Capital share F* is used, representing the percentage of capital from non-Chinese investors in total startup funding for the year, adjusted to 2023's RMB value. This variable is the dependent variable in Model 1.1, hypothesised to be influenced by startup funding. For Hypothesis *H1*.2, *Investment share F* measures the percentage of total annual investments made by non-Chinese investors and serves as the dependent variable in Model 1.2.

To analyse the tendency of foreign investors to co-invest (*H2*.1), *Co-investing bias F* is calculated using the percentage of co-investments relative to total investments, with negative values indicating a predominance of foreign co-investing. This variable is the dependent variable in Model 2.1. *Lead Preference F* tests the preference of foreign investors to lead funding rounds (*H2*.2) and is indicated by deviations from zero, with negative values showing a foreign bias. Similarly, *Later stage bias F* for *H2*.3 quantifies stage-specific investment preferences annually, where negative values suggest a foreign preference for later-stage investments. This variable is dependent in Model 2.3.

For regional investment preferences (*H3*.1), *Hub bias F* compares investment proportions in major startup hubs (Shanghai, Shenzhen, Beijing and their respective regions) to other areas, serving as the dependent variable in Model 3.1, with negative values indicating a foreign investor bias. Finally, *Industry bias F* for *H3*.2 assesses sector-specific investment preferences by analysing annual differences in investment shares between Chinese and non-Chinese investors in the top ten industries, also as the dependent variable in Model 3.2.

To account for variations, several independent variables are included alongside *Startup funding* in all models for uniformity and comparative analysis. The first additional variable, *R&D Spending*, aggregates all expenditures on R&D in China. R&D is a critical component in all Startup ecosystem models, influencing the quality and quantity of startups and potentially affecting investor decisions. This variable is expressed in 2023 RMB prices to align with other monetary metrics in the models. Next, *Policy uncertainty* (Baker *et al.*, 2016) measures the unpredictability of new legislation in China, especially those affecting economic support and market freedoms. Data for this index is sourced from the South China Morning Post, with lower scores indicating less uncertainty. This factor is crucial as public policy significantly impacts VC operations, especially for foreign investors. *Shares issued* is another variable reflecting the volume of new securities on Chinese stock exchanges (Shanghai and Shenzhen). Stock market conditions, indicated by this variable, are pivotal for

VC investments as favourable conditions often attract both companies and VCs to issue new stocks. In addition, the *NASDAQ* variable represents the Nasdaq composite index, which predominantly lists technology companies, including international ones. The performance of this American stock index can influence foreign investor behaviour towards Chinese startups due to its reflection of the tech sector's health. Table 1 lists all variables used.

When comparing the total startup funding in China from the data set with figures from other sources, the data quality appears satisfactory, although there are discrepancies in the absolute funding amounts, as can be seen in Figure 8. The time series shows similar trends across different sources. Variations in earlier years may stem from differing definitions of VC investments; for example, Jingdata includes funding rounds through the NEEQ, which are not covered by the Crunchbase data used in this study. The substantial difference in the number of investments suggests that the Crunchbase data may not be entirely representative due to its crowdsourced nature, which can introduce biases related to the source and level of engagement. Consequently, this study's findings might not fully represent the entire Chinese VC industry.

The data set contains gaps in both the amounts of funds contributed to investments and the headquarters locations of the investing venture capitalists. The former is a common issue in this research field, with funding amounts frequently undisclosed (Piazza *et al.*, 2023), affecting 24.7% of the total VC investments recorded. The latter gap, concerning the origins of the VCs, is more critical to the hypotheses tested, as the origin of the investors is integral to both dependent and independent variables. In cases where only the name of the VC was available, additional information was manually added using accessible channels. For the 59,597 investments analysed, the VC's location could be identified in 93.1% of cases. Data for the independent variables in this study come from various sources and, unlike the primary data set, do not share the same quality issues.

While the overall data set provides a robust sample size suitable for analysis, the early years show insufficient investment activity for reliable assumption (see Figure 9). Due to the low volume and number of investments during these early market years, only data from 1996 is included in the descriptive analysis, whereas only the years after 1998 are included in the statistical analysis. The years from 1999 onwards range are characterised by significant VC activity, kickstarted by the dot-com bubble.

A linear regression model requires that the relationships it describes are linear (Urban and Mayerl, 2018). This was assessed graphically, revealing that the data were not linear. To address this, a logarithmic transformation was applied to linearise the data. To assess the suitability of the data set for regression analysis further tests are carried out. Stationarity was tested using the *augmented Dickey-Fuller test* (ADF), (see Table A1 in the Appendix) with variables requiring at least one out of three positive results for weak stationarity. Five out of the 12 variables are found to be not stationary at all, requiring further transformation to satisfy the models criteria. Norm-distribution was tested using the Shapiro-Wilk test (see Table A2 in the Appendix). Almost all variables show Shapiro–Wilk values above 0.9. Only five items fall into the 0.75–0.9 range. Overall, these results are highly confident, except for two results that score a p-value of 0.13 and 0.11. For practicality reasons these results are deemed satisfactory as support for norm deviation in the underlying data. The Durbin–Watson test is used to check for autocorrelation within residuals; it finds no issues for all variables except for *Industry bias F* (see Table A3 in the Appendix). This issue is addressed through further transformation of the affected variable. Homoscedasticity is assessed using Levene's test in three variations, all of which indicate similar variability and yield significant results, confirming that the homoscedasticity requirement is met (see Table A4 in the Appendix).

4.2 Correlation and regression analysis

The correlation test yields highly significant results for most variables. Notably, many timeseries are found to have strong correlations. *Capital share F* has high negative coefficients for *R&D Spending*, *Shares issued* and *Industry bias F*. Further strong positive correlations are found among *R&D Spending*, *NASDAQ* and *Shares Issued*. The *NSADAQ* is the least problematic, as it reflects the state of the US-economy and the US-tech-industry which have little direct influence on China. R&D Spending and Share Issuances have been proven to be unrelated in before (Chen *et al.*, 2020). Therefore, both shall be included in the regression, despite their high correlation within this sample. *Later stage bias F* and *Hub bias F* have very low correlation coefficients with all other variables and almost all of these are not significant.

Even though, with only 25 datapoints for each variable, the correlation coefficients for most variables show high levels of confidence. Due to the small sample size, correlations are starting from a 90% confidence level are marked on the table as well. The requirement to avoid multicollinearity appears to be met, as the higher correlations found are argued to be unrelated.

The correlation findings also lend support to the hypotheses tested by the model. For instance, startup funding shows a negative relationship with *Capital Share F* and *Investment Share F*, whereas correlation positively with *Co-investing bias F*, *Later stage bias F*, *Hub bias F* and *Industry bias F*, all aligning with hypothesised trends.

Overall, the correlation results provide robust evidence supporting the rejection of the null hypothesis for the hypotheses formulated. Continued investigation using a regression table is warranted to determine if causal relationships exist among the variables, further supporting the possibility of rejecting *H0* based on the model's findings.

Before conducting the regression analysis, the data set is normalised. It is then incorporated into various model configurations for analysis. Given the small sample size, *p*-values from below 10% are marked in the table.

Model 1.1 reveals highly significant causal relationship between *Capital Share F* and all independent variables except *NSADAQ*. The model shows high R^2 values, indicating strong model quality. In addition, the regression constant suggests low error margins, enhancing the model's reliability. The next setup, Model 1.2 shows a mediocre R^2 value of 0.77. Highly significant regression coefficients show of towards all independent variables except for *NSADAQ*. Model 3.2 identifies highly significant relations between *Industry bias F*, *Startup funding* and *Shares issued*. Yet the overall model reliability is similarly low with a R^2 score of 0.78.

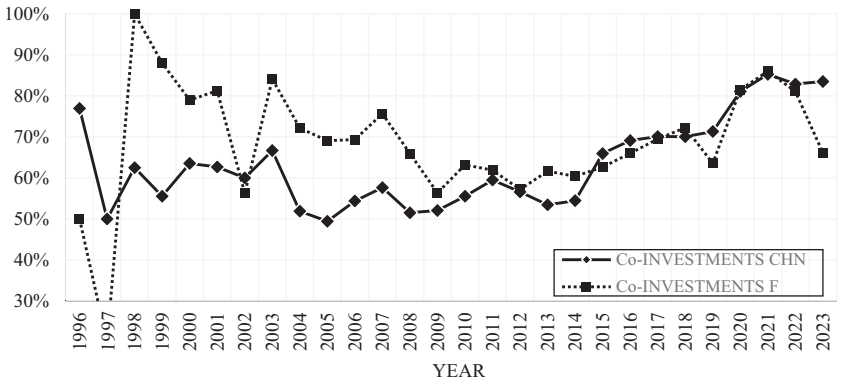
All other model configurations demonstrate very low confidence levels, rendering them ineffective for forecasting future trends. These include the models for *Co-Investing bias F*, *Lead Preference F*, *Later stage bias F* and *Hub bias F*. Still, some significant relationships within these models are identified. Model 2.1 showed highly significant coefficients between the *Co-Investing bias F* and *R&D Spending* as well as *Shares issued*. Model 2.2 produced very low *p*-values towards *Policy uncertainty* and *Shares issued*. For *Later stage bias F*, the same holds true towards all variables except *Startup funding*. The last model, testing for the *Hub bias F*, yielded the lowest R^2 value of 0.37. Only *R&D Spending*, *Policy uncertainty* and *NSADAQ* produced coefficients at significance levels below 10%.

Because the Models 2.1, 2.2, 2.3 and 3.1 have extremely low R^2 values, these models shall not be discussed further. In the remaining models, the direction of the regression coefficients may appear misleading due to the calculation of variables, where positive and negative were reversed.

The F-value serves as another quality metric for model configurations, assessing whether the model with independent variables predicts better than one without them. Higher F-values signify a model's higher predictive quality. For the models analysing *Capital share F*, *Investment share F* and *Industry bias F*, the F-values indicate robust model performance.

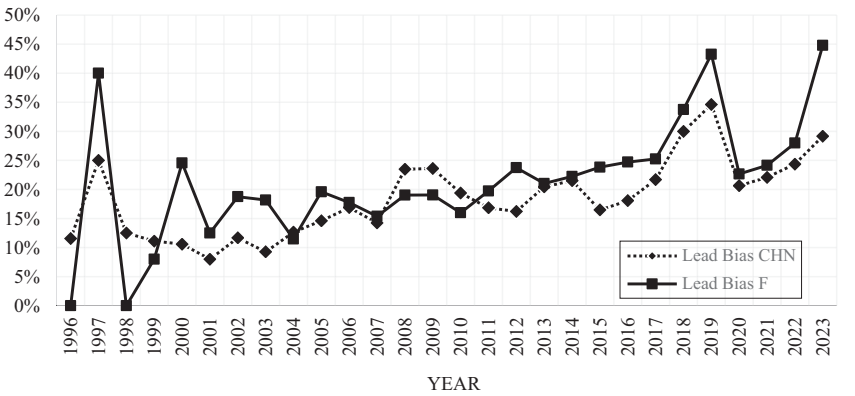
5. Discussion

According to the results of the regression analysis (see Table 3), rising startup funding leads to a greater share of funding from foreign entities. This result is contrary to the data shown in Figure 2 as well as the correlation results shown in Table 2. This false result may be due to the current model configuration, as the overall trend of *Capital share F* seems to be absorbed by *Shares issued*. Based on the results of the correlation analysis however, the null hypotheses for *H1*.1 may still be rejected. The next model suggests that rising startup funding levels, growing policy uncertainty as well as a rise in shares issued lead to a falling number of investments by foreign VCs comparatively. Both growing domestic R&D spending as well as a strong NASDAQ may lead to a rise in foreign investments. These results are closer to expectations as foreign VCs will



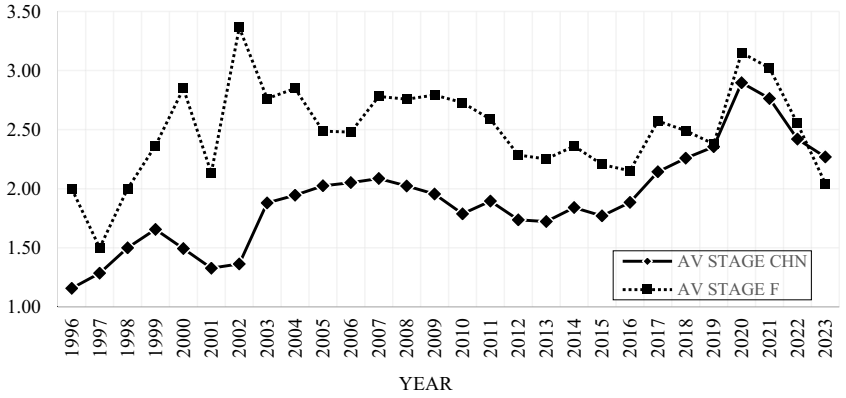
Source: Figure by author

Figure 2. Share of co-investments per year by VC origin created using Microsoft Excel



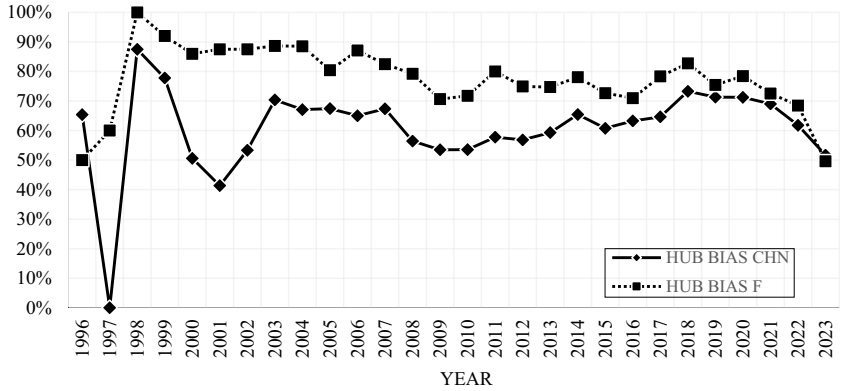
Source: Figure by author

Figure 3. Percentage of investments as lead investors by source created using Microsoft Excel



Source: Figure by author

Figure 4. Average investment stage for VCs in China created using Microsoft Excel



Source: Figure by author

Figure 5. Share of VC's investments in the leading clusters created using Microsoft Excel

act more aggressively in rising markets and may be attracted by investment into research and development, while being deterred by policy uncertainty. In an overall growing market with more activity on the local stock markets, foreign VCs lose the edge, as discussed in Sections 2 and 3 as well as formulated in *H1*.2, which null hypothesis is rejected.

For *H2*.1, *H2*.2 and *H2*.3, the regression models do not yield robust results. The model's coefficients are largely unreliable while the overall configurations do not allow for causal interpretation or trend prediction. When only considering the correlation results, *H0* for *H2*.1 is rejected, because the inverted co-investing bias correlates positively with *Startup funding*. This indicates that rises in funding actually coincide with larger differences in the preference for co-investments, rendering the observations from the descriptive analysis as false. A positive correlation coefficient for *Lead Preference F* and *Startup Funding* is found. This translates to a growing preference for lead investments by foreign VCs as the market

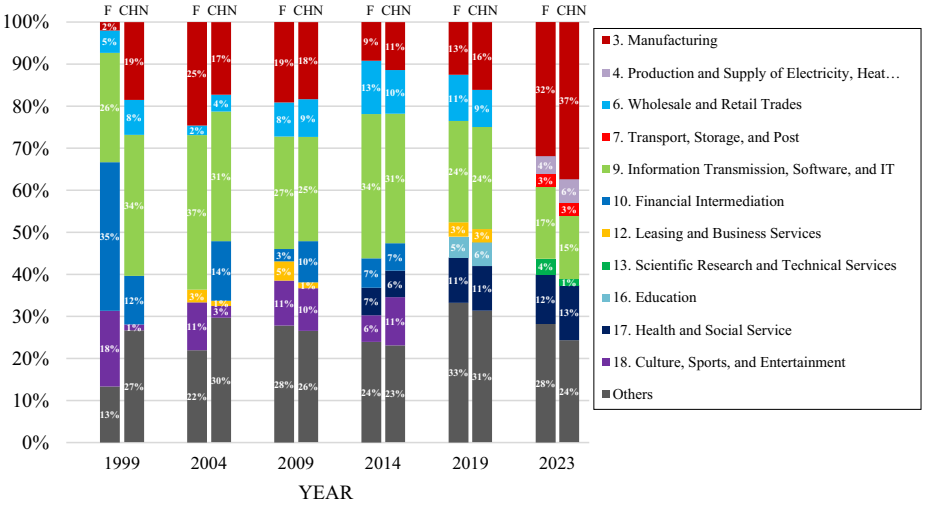


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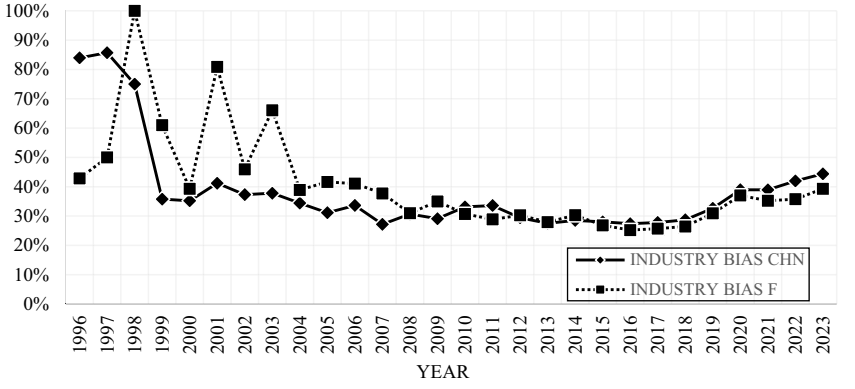
Figure 6. Investments by sector according to those currently used by China Statistics Press, made using Microsoft Excel



Source: Figure by author

Figure 7. Share of investments in the ten most popular industries annually created in Microsoft Excel

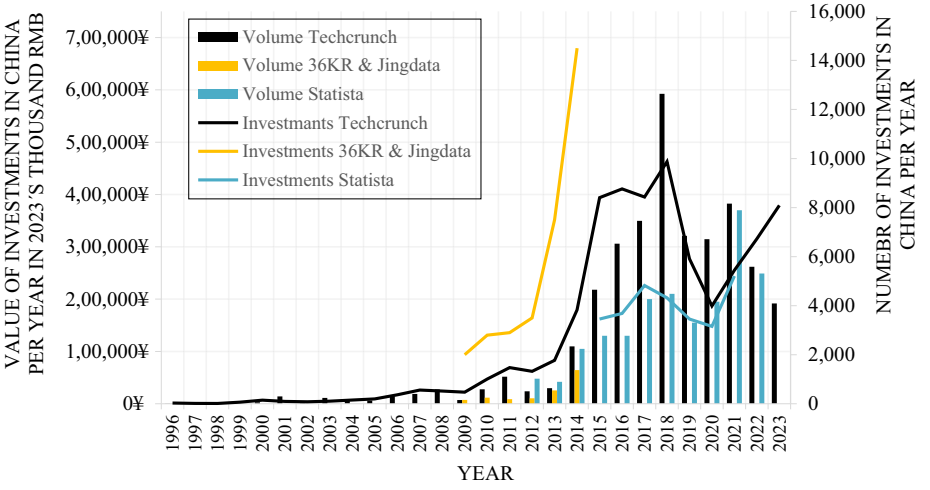
matures, supporting *H2*.2. The hypothesis of *H2*.3 is not supported by the data. Both, the regression as well as the correlation yield indifferent results, not rejecting the *H0*.

The regression coefficient calculated between *Hub bias F* and *Startup funding* is negative, yet the confidence level is insufficient, as for the model's quality overall. The correlation results between the two variables support *H3*.1, but the value is not significant rendering the results for *H3*.1 inconclusive. This may be caused by the variable *startup funding*, because mayor volatility does not coincide with clear movements in the *hub bias* variable resulting in

Table 1. Overview on the variables used in the regression model

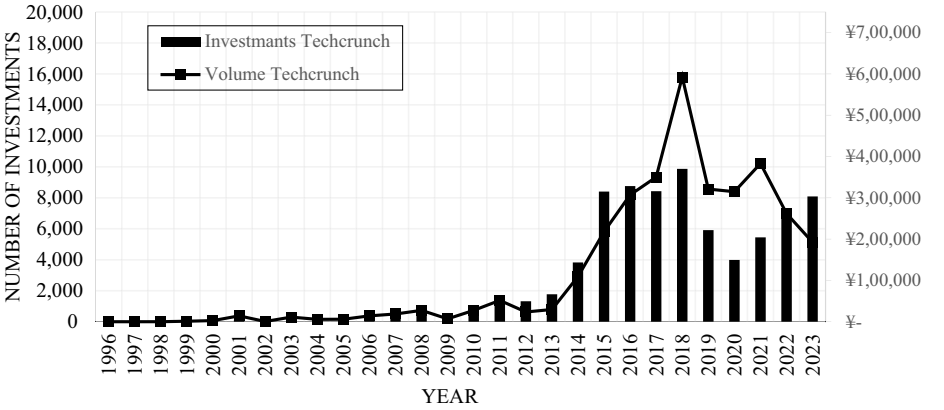
Type	Variable	Measurement
Dependent variables	Capital share F	Share of the funding provided by non-Chinese investors
	Investment share F	Share in the number of investments by non-Chinese investors
	Co-investing bias F	Share of co-investments done by non-Chinese vs Chinese investors
	Lead preference F	Share of funding rounds lead by non-Chinese vs Chinese investors
	Later stage bias F	Average stage invested at by non-Chinese vs Chinese investors
	Hub bias F	Share of investments in Beijing, Shanghai + surroundings and Shenzhen by non-Chinese vs Chinese investors
	Industry bias F	Share of investments in top 70% industries done by non-Chinese vs Chinese investors
Independent variables	Startup funding	Amount of funding received by Chinese startups
	R&D spending	Total spending on research and development in China
	Policy uncertainty	Uncertainty regarding economic policymaking in China
	Shares issued	Number of new shares issued on the Chinese stock exchanges in Shenzhen and Shanghai
	NASDAQ	Value of the American NASDAQ composite index at the end of each year

Source: Table by author



Source: Figure by author

Figure 8. Comparing the data set using Microsoft Excel



Source: Figure by author

Figure 9. Number of investments and funding value created in Microsoft Excel

a non-significant regression between the two. As for the industry bias of foreign investors (*H3*.2), the null hypothesis is rejected. As startup funding and industry bias F regress negatively, foreign VCs increasingly diversify in a maturing startup scene, whereas local venture capitalists exhibit differing preferences. These findings are in line with previous studies and the observations made in this paper as noted in Section 2 and in Section 3.

Although the regression analysis did not yield significant results for some hypotheses, this suggests the potential for further investigation into the behavioural differences between VCs and their influencing factors, perhaps using an alternative regression model to uncover empirical evidence.

6. Conclusion

This study used an extensive data set to examine the differences between foreign and domestic venture capitalists in the Chinese market. Although the findings may not be universally representative of the entire Chinese VC sector, they reveal significant trends within the sample. The development of the VC industry in China has shifting market dynamics. The study correlated these behavioural and market share shifts with the industry's overall progression, visually identifying changes and conducting a thorough regression analysis for deeper insights.

Empirically, part of the models used in the regression analysis is unfit for describing and predicting developments. In case of *H1*.2 and *H3*.2, the regression results support the hypotheses, yet the overall model quality is insufficient. While the models are not configured to make forward facing predictions, they help understand and describe the dynamics of cross-border VC investments. The current configurations confirm, that from 1999 to 2023, increases in startup funding led to a decreasing share of investments from foreign VCs in the funding rounds. Furthermore, these increases in startup funding led to an increasing bias among foreign investors concerning the industries they invest in. The more funding, the more these foreign VCs diversify comparatively. These are valuable insights for both, policymakers nurturing a local VC and startup ecosystems as well as VCs evaluating their cross-border investment strategies.

The initial dominance of foreign investors and subsequent market shifts offer critical insights for policymakers. The results suggest that attracting foreign startup investors can

Table 2. Results of the correlation analysis

Variables	Capital share F	Investment share F	Co-investing bias F	Lead preference F	Later stage bias F	Hub bias F	Industry bias F	Startup funding	R&D spending	Policy uncertainty	Shares issued	NASDAQ
Capital share F	1											
Investment share F	0.74***	1										
Co-investing bias F		−0.52***	−0.21	1								
Lead preference F	0.47**	0.60***	−0.65***	1								
Later stage bias F	−0.05	0.34*	0.29	0.00	1							
Hub bias F	−0.08	0.46**	0.51***	0.12	0.80***	1						
Industry bias F		−0.81***	−0.50**	0.55***	−0.31	0.19	0.28	1				
Startup funding		−0.60***	−0.62***	0.35*	−0.38*	0.20	0.13		0.58***	1		
R&D spending		−0.83***	−0.67***	0.57***	−0.51***	0.32	0.25		0.78***	0.79***	1	
Policy uncertainty	0.64***	0.38*	−0.20	−0.03	−0.32	−0.25			−0.72***	−0.61***		−0.64***
1												
Shares issued		−0.84***	−0.69***	0.56***	−0.50**	0.30	0.23		0.79***	0.82***		0.99***
−0.69**	1											
NASDAQ		−0.67***	−0.52***	0.50**	−0.47**	0.35*	0.28		0.62***	0.74***		0.92***
−0.45***	0.90***	1										

Notes: Variables with *significant at 0,1; **significant at 0,05; ***significant at 0,01
Source: Table by author

Table 3. Regression table

Variables	Capital share F	Investment share F	Co-investing bias F	Lead preference F	Later stage bias F	Hub bias F	Industry bias F
Startup funding*	0.49**	−0.54*	−0.41	−0.33	0.19	−0.52	−0.54*
R&D spending*	0.41***	0.62***	0.18*	0.10	0.37***	0.42***	−0.09
Policy uncertainty	−0.26*	−0.88***	0.25	−0.80***	−0.45**	−0.50*	−0.09
Shares issued	−1.09***	−0.76**	0.77***	−0.48*	−0.48*	0.00	0.93***
NASDAQ	−0.17	0.20	0.18	−0.12	0.38*	0.48*	0.20
_cons	0.86	1.20	0.03	1.47	0.78	0.89	0.38
Number of obs	25	25	25	25	25	25	25
R^2	0.90	0.77	0.55	0.56	0.47	0.37	0.78
Adj. R^2	0.88	0.71	0.43	0.45	0.33	0.21	0.72
F – FCrtitical	35.8***	12.8***	4.7***	4.9***	3.4***	2.2*	13.5***

Notes: Variable with *Significant at $p < 0,1$; **$p < 0,05$; ***$p < 0,01$
Source: Table by author

catalyse the development of a national VC industry, with initial investments potentially yielding long-term benefits for domestic VCs through knowledge spillovers and trickle-down effects. The analysis shows that attracting investment from abroad can support niche industries in the startup sector and kickstart a startup and VC scene. This way foreign VCs play a role in diversifying the startup sector, especially as the overall ecosystem develops. Foreign VC is a paramount instrument for building and nurturing a local startup scene and may lead to the expansion of local VC. This study also draws a positive picture of Chinese government policy, taking effective measures in not-only reaping the benefits of foreign investment, but building up a mature and quasi-competitive VC industry at the same time.

As further hypotheses tested through descriptive analysis do not find empirical support in the used model configurations, the correlation test confirmed the coinciding trends formulated in the remaining hypotheses. Foreign VCs tend to co-invest more often with a declining trend over time, offering further potential for knowledge spillovers. Furthermore, startups prefer more well-known funds to lead investment rounds, even in a developed VC market like China today. While these observations merely confirm previously theorised concepts, they highlight the importance of cross-border VC investments for local startup scenes, that should be taken into account by policymakers.

Further hypotheses developed through descriptive analysis did not find empirical support in the used model configurations. This is the case for an alleged bias among foreign VCs to decreasingly favour startup hubs and later stage ventures in a maturing funding environment.

This research touched on the competitive dynamics between foreign and domestic VCs, noting significant market shifts. Through measures such as knowledge absorption, personal ties, as well as policy enabled operating advantages, they outperform foreign VCs. They were able to outgrow foreign VCs through differing co-investing behaviour and industry preferences. The VC sector presents unique complexities compared to general financial markets, including value-added activities and policy interference, warranting deeper exploration into what drives changes in markets like China's and whether these phenomena are observable elsewhere.

Finally, the quantitative part of this study treated government intervention as a non-direct factor. However, policymakers often enact legislation that profoundly affects VC markets. The third chapter of this paper named some of the policies enacted by the Chinese government and points out the potential effects, that can be observed in the data set. This paper, as well as other scholars suggest that these policies played an important role in developing a VC industry. Future research may examine how these policies compare to those in other countries and may work out guidance for policymakers to follow.

VC remains a multifaceted field with many aspects still to be thoroughly explored. This study has enhanced understanding but also highlighted the need for further research into competitive dynamics and policymaking within the VC industry. Developing a specific industry lifecycle model for VC could greatly benefit future studies, providing a structured framework to aid both policymakers and venture capitalists in their strategic decisions. In the case of China, the role of foreign VC remains an interesting subject for further research as the latest numbers show dramatic levels of volatility (Gao, 2024).

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Appendix

Table A1. Results of the augmented Dickey–Fuller test

Variable	ADF Type 0	ADF Type 1	ADF Type 2	Result
Capital share F	No	No	Yes	Weakly stationary
Investment share F	No	No	Yes	Weakly stationary
Co-investing bias F	Yes	Yes	Yes	Stationary
Later stage bias F	No	Yes	Yes	Stationary
Hub bias F	No	No	No	Not stationary
Industry bias F	Yes	No	No	Weakly stationary
Lead preference F	No	No	No	Not stationary
Startup funding	No	No	No	Not stationary
R&D spending	Yes	Yes	No	Stationary
Policy uncertainty	No	No	No	Not stationary
Shares issued	No	No	No	Not stationary
NASDAQ	No	No	Yes	Weakly stationary

Source: Table by author

Table A2. Results of the Shapiro–Wilk test

Variable	Result	Shapiro–Wilk	*p*-value
Capital share F	Weakly stationary	0.9378136	0.1317656
Investment share F	Weakly stationary	0.9050735	0.0236988
Co-investing bias F	Stationary	0.9072922	0.0265329
Lead preference F	Stationary	0.8948136	0.0141705
Later stage bias F	Not stationary	0.9191216	0.0489285
Hub bias F	Weakly stationary	0.8072284	0.0003008
Industry bias F	Not stationary	0.9345010	0.1104426
Startup funding	Not stationary	0.7782780	0.0001008
R&D spending	Stationary	0.9142662	0.0379892
Policy uncertainty	Not stationary	0.8522997	0.0019480
Shares issued	Not stationary	0.9074528	0.0267515
NASDAQ	Weakly stationary	0.7907115	0.0001598

Source: Table by author

Table A3. Results of the Durbin-Watson test

Model	d	d-upper	d-lower	Autocorrelation
Capital share F	2.323	1.206	1.550	No
Investment share F	1.620	1.206	1.550	No
Co-investing bias F	2.446	1.206	1.550	No
Lead preference F	1.607	1.206	1.550	No
Later stage bias F	2.066	1.206	1.550	No
Hub bias F	1.720	1.206	1.550	No
Industry bias F	3.329	1.206	1.550	Yes

Source: Table by author

Table A4. Overview on the variables used in the regression model

Test	Value	Result
Levene MEAN	0.323	Significant
Levene MEDIAN	0.330	Significant
Levene 10% trimmed MEAN	0.327	Significant

Source: Table by author

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