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Leading or facilitating? —— The appropriate role of governmental venture capital in China

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ABSTRACT

This paper examines the influence of syndicated investments involving governmental venture capital (GVC) and private venture capital firms (PVC) on the success of innovative companies in China. By analysing a comprehensive dataset of small and medium-sized firms in China's third-tier equity market, the National Equities Exchange and Quotations (NEEQ), we demonstrate that compared to the syndicated investment led by GVC, those GVCs playing a facilitating role have a more significant effect on boosting innovation firms' success in NEEQ. We identify three ways syndications help firms graduate to main stock markets: improving resource allocation, enhancing innovation quality, and lowering agency risk. Further investigation based on a quasi-natural experiment indicates that GVC-facilitating syndication impacts are more pronounced after adopting the Government Investment Regulation in 2018.

1. Introduction

The increasing prominence of governmental venture capital (GVCs) in numerous countries has attracted considerable attention from researchers seeking to evaluate their performance and impacts (Lerner, 1999; Gompers and Lerner, 2004; Bottazzi et al., 2008; Guerini and Quas, 2016; Zhang and Mayes, 2018; Dong et al., 2021). While there is a well-established rationale for GVCs to address market failures by bridging the "funding gap" for entrepreneurial start-ups and innovative firms (Alperovych et al., 2020), the empirical evidence regarding the performance and impact of GVCs remains mixed. Prior research sheds light on inefficiencies when government participation extends into economic activities and financial markets (Sapienza, 2004; Bai et al., 2006). In parallel, a substantial body of literature underscores the advantages arising from political associations (Khwaja and Mian, 2005; Faccio, 2006) while simultaneously addressing the drawbacks, such as corruption (Colonnelli and Prem, 2022).

GVCs' efficacy in driving firm success is debated. On the one hand, portfolio companies backed by GVCs often underperform compared to those supported by private venture capital (PVC), highlighting limitations in GVC contributions to firm performance. Furthermore, controversy has been expressed concerning the effectiveness of governmental initiatives in cultivating venture capital (VC) sectors and augmenting firm efficiency, in particular, in Canada and Europe (Cumming and Macintosh, 2006; Grilli and Murtinu, 2014; Cumming et al., 2017).On the other hand, research documents instances where GVCs have successfully promoted local VC markets and stimulated corporate innovation, as exemplified by the Small Business Investment Company in the United States and the

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Yozma Program in Israel (Lerner, 1999; Gompers and Lerner, 2004).

Since debates and the mixed function of GVCs exist, scholars have focused on the syndication between GVCs and PVCs. Notably, VC syndication has been empirically demonstrated to yield value for entrepreneurial entities, augmenting their positioning in product and financial market domains. This collaborative syndication approach is instrumental in nurturing an environment conducive to innovation and enhancing operational outcomes after the IPO phase, consequently heightening the prospects of achieving favourable venture exits.

A strand of scholarly analysis highlights GVC's pivotal role in enhancing investment efficiency and success when participating in syndicates with PVCs. The infusion of capital originating from both GVCs and PVCs contributes substantively to heightened investment flows toward beneficiary enterprises, thereby underscoring a symbiotic relationship between GVC and PVC funding paradigms (Bertoni and Tykvová, 2015; Brander et al., 2015; Bertoni et al., 2019). Advocates argue that collaborative investments involving GVCs and PVCs enable the effective harnessing of their respective strengths (Cumming et al., 2017; Alperovych et al., 2020).

While the literature accentuates the heightened efficacy associated with collaborative syndication involving GVCs and PVCs compared to solitary investments, the contribution of GVCs within this framework remains ambiguously defined. China's venture market, characterised by its state capitalism and distinctive institutional features, is well-documented in the literature (Lazzarini, 2015; Li et al., 2015; Bardhan, 2016; Sun and Cao, 2018; Lazzarini et al., 2020). Though misallocating innovation resources is uncommon, the Chinese government plays a crucial role in directing industrial and innovation policies (Boeing, 2016; Wei et al., 2017). Despite concerns in developed economies about the adverse effects of government-sponsored VC investments (Wallsten, 2000; Cumming and Macintosh, 2006; Grilli and Murtinu, 2014; Alperovych et al., 2020), China has actively cultivated GVCs since 1997, with a significant focus post-2009. Government capital has increasingly shifted from subsidies to VC, making China the most prominent global government investor in VC since 2019.

Brander et al. (2015) define a VC firm as a GVC if a government entity wholly owns it or has any limited partners or large investors wholly owned by a government entity. Bertoni et al. (2019) define GVC as a government-owned investment vehicle structured like a venture capital (VC) fund. Suchard et al. (2021) emphasise the need to distinguish the proportion of governmental funding and the level of government in VCs. The above literature emphasises the government's controlling or directing role in VCs. Our study aligns with these previous studies on GVCs, which define GVCs as governmental venture capital firms established, governed, and directed by state mechanisms. Based on this line of prior research, our paper defines a venture capital firm in China as a GVC if it meets the following criteria: first, the funding resource of the VC firms, when established, is mainly from local governments, and the decision of further funding is also dependent upon local government; second, the VC firms are under the supervision of State-owned Assets Supervision and Administration Commission of the State Council (SASAC).

China's GVCs, guided by state innovation and industrial directives, aim to build domestic technological capabilities through partnerships with private firms or by supporting key portfolio companies to bridge global technological gaps. However, like state-owned enterprises, GVCs face challenges such as inefficiencies in resource allocation, risk aversion, and agency problems, which can lead to suboptimal performance compared to private counterparts (Ke and Wang, 2020; Dong et al., 2021). Our study aligns with the prevailing framework and defines GVCs as governmental entities established, governed, and directed by the state characterised by several distinct features.

Despite the significant policy attention toward the function of GVCs, a conspicuous gap is evident in the empirical examination of the influence exerted by GVCs on the innovative pursuits and operational performance of small- and medium-sized enterprises (SMEs) in China. According to data from the Chinese Ministry of Industry and Information Technology, SMEs contributed as much as 60 % of the GDP and played a pivotal role in 70 % of technological advancements in 2020. However, innovative SMEs face heightened obstacles in securing external financing, including information asymmetries, dearth of collateral, and uncertainties linked to innovation endeavours (Lerner, 1999, 2002; Alperovych et al., 2020). Hence, exploring the efficacy of GVC investments in SMEs holds significant policy implications for innovation and economic growth.

Further research efforts are necessary to understand GVCs' implications on the overall performance of SMEs within the Chinese market. Some important research questions have not been explored well. For instance, what factors underlie the superior performance witnessed in syndication arrangements? Since syndication is exceptional, we want to investigate its optimal structure. Which kind of syndications, GVC-leading or facilitating, works better? Our investigation aims to address this critical research gap in the existing literature.

Our dataset comprises 13,475 firms listed on China's National Equities Exchange and Quotations (NEEQ) market from 2007 to 2021. The distinctive institutional characteristics of the NEEQ, often referred to as the New Third Board, provide a unique opportunity for exploring the dynamics and impact of Venture Capital (VC) syndication. Originating as an over-the-counter equities market in Beijing, the NEEQ has emerged as China's third-largest equity trading platform, trailing only the Shanghai and Shenzhen stock exchanges regarding trading volume. This platform has progressively invigorated SMEs' financial and innovative landscape, offering refined trading mechanisms, infrastructural support, increased market fluidity, and enhanced information disclosure, among other benefits. More importantly, the NEEQ's focus on SMEs makes it an ideal environment to assess the importance of VC syndication. The market's structure and supportive policies towards SMEs underscore the critical role of syndicated VC investments in providing these firms with access to larger capital pools, risk sharing, and a wealth of resources and expertise.

Given the NEEQ firms' characteristic need for substantial investment, particularly in innovative ventures, and their inherent risk profiles, the collective strength of VC syndicates offers financial backing, strategic guidance, market validation, and a network of industry connections. The complex institutional dynamics and the relationships between GVCs and PVCs significantly impact the growth trajectory of SMEs in China's NEEQ market. Consequently, examining VC syndication within the NEEQ context allows for a more nuanced understanding of its benefits, including how it aids in overcoming the financial and operational challenges faced by

SMEs, facilitates their growth and innovation trajectories, and enhances their potential for successful graduations to main stock markets. The NEEQ, with its emphasis on SMEs and innovation, then provides an optimal backdrop against which the multifaceted impact of VC syndication can be assessed, highlighting its significance in bolstering the prospects of SMEs in China's vibrant but competitive market landscape.

We employ a commonly utilised proxy to gauge the favourable culmination of investments in portfolio companies and the achievement of IPOs, signifying their progression to the primary stock market. This transition corresponds to venture capitalists' profitability pinnacle (Chen et al., 2010; Ewens and Rhodes-Kropf, 2015). The successful elevation of NEEQ-listed enterprises presents a distinct occasion to probe the influence of GVCs on the innovation and performance of SMEs. We find that syndicated investments facilitated by GVCs have a more significant, positive impact on firm innovation and graduation from the NEEQ to the main stock markets than those led by GVCs. This baseline result is robust for Propensity Score Matching (PSM) methods, which help balance the covariates between treatment and control groups to address endogeneity concerns and further support our main hypotheses. Furthermore, to enhance the robustness of our findings, we explore alternative definitions of our dependent and key explanatory variables. The main results remain consistent across these alternative specifications.

We then consider three plausible channels: the resource allocation channel, the innovation quality channel, and the agency cost channel. We find that there are significant mediating effects among these channels. The GVC facilitating position brings more sales than the leading position. Those market resources ultimately promote the success of firms in the NEEQ market. At the same time, GVC-facilitating syndication earns more novelty in innovation, reflecting a higher quality of innovation, and it reduces agency costs. Those factors also significantly influence the financial success of NEEQ firms and help them to graduate to the main stock market.

This study further leverages an exogenous shock stemming from an innovation policy and investigates its repercussions on the investment conduct and outcomes of GVCs. The Chinese government implemented a new framework of Government Investment Regulations on September 5, 2018. The new regulation framework provides comprehensive guidelines for the prudent utilisation of public funds, covering investment direction, planning, execution, monitoring, and associated responsibilities. It prioritises non-commercial projects in public sectors where market resource allocation is inefficient, employing periodic evaluation for optimisation. It thus constitutes an exogenous policy shift focusing on enhancing the investment performance of state funds. This renders it an intriguing policy experiment for evaluating how GVCs respond to overarching national regulation policies, alongside their subsequent implications for firm performance.

This paper contributes to several critical areas of academic inquiry. First, it advances the theoretical and empirical discourse on the efficacy of government support in driving success within developing economies (Ke and Wang, 2020; Wang and Wu, 2020; Dong et al., 2021). The prevailing literature describes the pivotal role of government support in nurturing and fostering the success trajectory of enterprises, particularly within the realm of burgeoning innovative ventures (Zhou et al., 2017; Wang, 2018; Alperovych et al., 2020). Nonetheless, there exists an absence of evidence of the impact of GVCs on corporate performance in China. Our study addresses this gap by analysing the efficacy of government support in the form of GVC investments, thereby enriching the literature by examining China's distinctive equity market landscape.

Second, our research augments the comprehension of VC syndication dynamics. Echoing the findings of established investigations such as Tian (2012), Kovner and Lerner (2015), Cumming et al. (2017), and Alperovych et al. (2020), we present compelling empirical evidence affirming the existence of positive syndicated VC investment externalities that reverberate across SMEs, propelled by three cogent conduits: resource allocation, innovation cultivation, and mitigation of agency risks. Thus, our contribution aligns with the research investigating the interplay between public and private VC collaborations and the eventual attainment of firm success.

Third, our study is relevant to the strand of the literature on VC exits. Our empirical findings have policy implications and underscore a nuanced role for GVCs in the trajectory of SMEs in China. Notably, GVCs emerge as enablers rather than primary drivers of SME success. The creation of value through GVCs materialises primarily when they are syndicated alongside PVCs, channelling their impact through mechanisms encompassing resource allocation, innovation cultivation, and agency cost mitigation (Milosevicet et al., 1997; Leleux and Surlemont, 2003; Sorensen, 2007; Bottazzi et al., 2008; Mason and Brown, 2013; Hochberg et al., 2014). Our empirical analyses are relevant to contemporary trends observed within China's VC market and the simultaneous policy interventions.

The remainder of this paper is structured as follows. Section 2 reviews the literature and formulates the hypotheses. Section 3 outlines our sample and the methodological approach. Section 4 describes the main empirical findings. Section 5 describes the three channels through which GVCs wield influence. Section 6 presents the robustness checks. Finally, the Section 7 concludes.

2. Background, literature, and conceptual framework

This section provides a concise overview of the contemporary evolution within China's VC industry. We then formulate theoretical underpinnings concerning the influence of GVCs on firm performance, delving into the experimental framework underpinning the 2018 GVC-related policy. Furthermore, we contend that the syndication of GVCs and PVCs can engender effects through multiple channels.

2.1. GVCs in China

Since the inception of its economic reform policy in 1978, China has experienced four decades of rapid economic growth and industrial advancement, leveraging factors such as advantageous low-wage conditions and demographic dynamics. However, China is grappling with formidable challenges, including upward wage pressures and a diminishing labour force. As a result, China is compelled to transition toward a growth model rooted in innovation, thereby embracing a shift toward a more innovation-driven economy (Wei

et al., 2017). On a global scale, governmental support for innovation manifests through a diverse array of mechanisms encompassing state ownership, dedicated institutions, information provisioning, government procurement, registration facilitation, regulatory frameworks, and provision of tax incentives, loans, grants, education, and training (Guan and Yam, 2015; Zhou et al., 2017).

GVC firms in China that meet the criteria we set include those established by the local governments, the Bureau of Finance in the local government, the Bureau (or Commission) of Science and Technology in the Local State-owned Asset Supervision and Administration Commissions, Asset Management companies set up by local SASAC, City construction and development companies set up by the local governments, Local Economic Development Zone Management Committees, and so on. China's GVC has several key characteristics.

Firstly, it is vital to differentiate between GVC firms and governmental funds when examining the attributes of GVC entities and the impact of governmental financial assistance on the venture capital sector. Governmental funds are primarily sourced from state coffers but can be administered by various venture capital entities. A portion of governmental VC funds operate similarly to subsidies for private venture capital firms, fundamentally facilitating their capital accumulation efforts. This is evident in programs such as the Israeli Yozma program, the American Small Business Innovation Research Scheme, and the New Zealand Seed Investment Fund, as documented by Lerner (2009). In these cases, governments take on the role of capital contributors instead of participating actively as stakeholders. In contrast, GVC firms are initiated and overseen by governmental bodies and embrace a proactive policy stance, with governmental units deeply engaged in the strategic investment decision-making processes.

Secondly, GVCs in China are principally financed through local government budgets, a resource pool that often surpasses the economic capacity of many European countries. A prevalent trend among GVCs is the integration of provincial or city names with terms such as "high-tech venture capital," underscoring the strong ties between GVCs and local governments. These entities are primarily tasked with directing investments locally to stimulate regional economic growth, with their deep understanding of local market dynamics and networks giving them a competitive edge in accessing regional resources.

Lastly, GVCs' defining trait is their state ownership, adhering to regulatory guidelines relevant to state-owned assets. Much like other state-owned organisations, GVCs are supervised by regional State-owned Asset Supervision and Administration Commissions, mandated to fulfil the annual performance objectives set by these regulatory entities. China has used an array of policy instruments to amplify its corporate innovation endeavours, and the government plays a substantial role in driving firm-level research and development (R&D) and innovation activities (Guan and Yam, 2015; Guo et al., 2016). Amidst this array of policy instruments, GVCs have gained attention and a heightened strategic significance in the last several decades.

China's engagement in GVCs started with its initial foray into the VC market in 1997. GVCs exhibited heightened investment vigour from 2009 onwards (Fig. 1). Drawing upon data sourced from China's Zero2IPO data provider, GVC investments exhibited a more assertive trajectory since 2009. In 2008, GVC investments in China amounted to a mere 16.023 billion RMB, comprising approximately 14 % of the overall VC investment total of 117.90 billion RMB. This proportion increased to 29 % in 2009, reaching 45.017 billion RMB out of a total VC investment of 157.839 billion RMB. By 2020, GVC investments reached 312.226 billion RMB, constituting 35 % of the total VC value of 901.298 billion RMB.

An overview of the data summary statistics, as presented in Table 1, shows that as of the close of 2020, there were approximately 7222 GVCs operational within China, constituting around 20 % of the total VC landscape. The cumulative count of investment transactions attributed to GVCs is about 34,000, approximately 20 % of the entire VC transaction volume. Furthermore, the aggregate

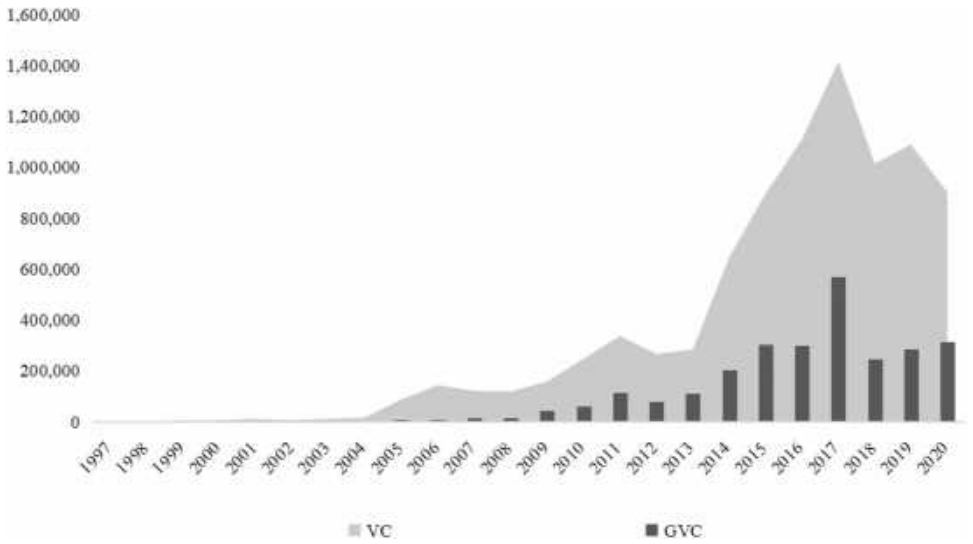

Fig. 1. The total value of GVC and VC investments in China (millions). This figure presents the total values of GVC and VC investments in China between 1997 and 2020. The highest investment amounts for GVC (568.22 billion RMB) and VC (1414.65 billion RMB) occurred in 2017. The GVC investment amount increased from 0.31 billion RMB in 1997–312.23 billion RMB in 2020, and the VC investment amount rose from 1.39 billion RMB in 1997–901.30 billion RMB in 2020. The x-axis shows the investment year. The y-axis displays the investment value in millions.

Table 1
Overview of GVC and VC investments in China.

Panel A: Institutions, Deals and Amount	GVC	VC	Percentage
No. of Institutions	7222	35,999	0.20
Total Investment Deals	34,341	120,509	0.28
Total Investment Amounts (Million)	2671,300	8882,657	0.30
Panel B: Investment Rounds	GVC	VC	Percentage
Seed	2266	11,871	0.19
A	14,860	50,781	0.29
B	5727	21,605	0.27
C	2504	10,354	0.24
D	1017	4357	0.23
E	395	1783	0.22
F	139	757	0.18
G	86	359	0.24
Pre-IPO	4627	10,953	0.42
Panel C: Investment Stages	GVC	VC	Percentage
Seed Stage	3245	16,323	0.20
Initial Stage	5696	26,587	0.21
Expansion Stage	14,578	49,873	0.29
Mature Stage	10,469	25,794	0.41

Notes: This table provides an overview of GVC and VC investments in China. Panel A reports the cumulative number, deals, and amounts of GVC and VC investments in 2020. Panel B reports the deals of GVC and VC investment in different investment rounds between 1984 and 2020. Panel C reports the deals of GVC and VC investment in different investment stages between 1984 and 2020. The percentage represents the ratio of GVC to VC in the category.

investment value attributed to GVCs is a substantial 2771,300 million, nearly 30 % of the total VC value. GVCs tend to channel investments toward pre-IPO firms or well-established enterprises and have comparatively limited participation in the seed stage of entrepreneurial ventures.

Notably, the mean individual investment value within the GVC cohort (366.33 million) surpasses that of conventional venture capitalists (246.75 million). This trend aligns with Dong et al. (2021), who suggest that managers overseeing Chinese GVCs are bound by fixed remuneration structures and are held accountable for potential losses or failures stemming from GVC investments, engendering a natural inclination toward risk aversion in portfolio management. Consequently, GVCs tend to allocate investments toward later-stage funding rounds.

Alperovych et al. (2020) show that the strategic thrust of GVC policy endeavours in numerous nations often centres on targeting specific sectors, notably high-tech ventures, where R&D expenditure and time-to-market considerations tend to be substantial. Our collected data show that in comparison to PVCs, GVCs within China exhibit a pronounced inclination toward funnelling investments into sectors such as Raw Chemical Materials and Processing, Machinery Manufacturing, Energy and Minerals, Semiconductor and Electronic Equipment, and Clean Technology. Conversely, their presence is less pronounced within the Internet, Education and Training, and Finance sectors, as illustrated in Table 2. Furthermore, our analysis reveals that Chinese GVCs tend to originate transactions within local markets or may have a mandate.

2.2. Main hypotheses

The literature describes the specialized role of venture capitalists in addressing the issues of information asymmetry and elevated uncertainty through their financial backing, managerial guidance, and vigilant oversight (Chemmanur et al., 2011; Kaplan and Stromberg, 2001, 2003, 2004). Further research examines the pivotal contribution of venture capitalists in supporting portfolio firms, transcending the provision of mere risk capital to encompass active engagement in management and operational oversight of invested

Table 2
Summary of VC investment in NEEQ firms and the effect on graduation.

Panel A: NEEQ Firms	No. of Firms	Percentage
VC-backed firms:	4433	0.33
Syndication-backed firms	1794	0.13
Pure PVC-backed firms	1686	0.13
Pure GVC-backed firms	953	0.07
Non-VC backed firms	9042	0.67
Total NEEQ firms	13475	1.00
Panel B: NEEQ Graduates	No. of Firms	Percentage
Syndication backed firms	218	0.55
Pure PVC-backed firms	61	0.15
Pure GVC-backed firms	35	0.09
Non-VC firms backed firms	85	0.21
Total	399	1.00

companies (Kortum and Lerner, 2000; Chemmanur et al., 2011). Specifically, venture capitalists can enhance firms' innovation outcomes by providing executive support for innovative endeavours, fostering a pro-innovation environment, enacting incentive structures, anticipating technological advancements, and discerning promising innovative undertakings (Bernstein et al., 2016).

VC investments are a significant source of finance for entrepreneurial ventures (Gorman and Sahlman, 1989; Gompers and Lerner, 2001). However, the discussion about VC is not solely confined to GVC or PVC. In the Chinese context, IPO financing represents a constrained resource that is subject to oversight by the Chinese Securities Regulatory Commission, a central government entity akin to the Securities and Exchange Commission in the United States (Wang and Wu, 2020). Consequently, GVCs often cultivate stronger political ties, affording them greater avenues for resource allocation toward their portfolio entities, thereby heightening the prospects of IPO approval for their investees. Nevertheless, a salient challenge encountered by many Chinese GVCs is the fact that a substantial proportion of their capital stems from government sources, rendering them subject to scrutiny from governmental entities at the central and local levels. This context often nurtures a risk-averse posture among the top management, which can be attributed to fixed remuneration structures that entail accountability in capital losses or project failures (Zhang and Mayes, 2018; Dong et al., 2021; author interview). The modus operandi of GVCs mirrors that of state-owned enterprises and is susceptible to the agency predicaments associated with government ownership. Ke and Wang (2020) posit that Chinese GVCs are more likely to align with political agendas, a phenomenon that potentially impinges upon managerial incentives within GVCs. Evidence from Western experiences indicates that independent GVC investments exhibit comparatively subdued performance in terms of the likelihood of achieving a successful IPO exit relative to PVC activities (Kovner and Lerner, 2015; Cumming et al., 2017).

Another strand of literature emphasizes the role of PVCs in facilitating the development of firms. Samila and Sorenson (2010) find the complementary relation of PVC with public funds in fostering innovation and the creation of new firms. Alperovych et al. (2020) address the important role of PVCs in constructing VC syndication in growth and innovation outcomes. The GVCs take advantage of attracting extra funds in the further round of VC investment (Alperovych et al., 2020), while the PVCs enjoy the differential benefit of allowing more flexibility for funded firms (Dushnitsky and Yu, 2022).

An additional stream of research casts a spotlight on the pivotal role of VC syndication within the value creation framework (Chemmanur et al., 2014; Tian, 2012; Kovner and Lerner, 2015; Cumming et al., 2017). Tian (2012) posits that VC investors are marked by their disparate skills, informational reservoirs, industry acumen, and networks, and thus engender a scenario where co-investments among distinct VC entities furnish a broader spectrum of inputs to beneficiary firms. Particularly noteworthy is the discerned positive impact of syndication, especially within the ambit of GVCs and PVC funds, on the innovation and exit performance of ventures (Kovner and Lerner, 2015; Cumming et al., 2017; Alperovych et al., 2020).

Bertoni and Tykvová (2015) show that syndicated innovation emanating from the concerted alignment of GVCs and PVCs engenders a more potent nurturing environment for innovation endeavours compared to instances where these actors engage in solitary investment pursuits. They argue that GVCs are not an effective substitute for PVCs but an effective complement to private funding. Brander et al. (2015) present empirical findings that co-investment collaborations between GVCs and PVCs render portfolio enterprises more likely to achieve successful exits than standalone PVC or GVC investments. Cumming et al. (2017) posit that GVC–PVC partnerships yield diversified and independent networking channels, thereby affording entrepreneurial firms an expanded avenue for growth, surpassing the purview of a PVC-only syndicate.

Concerning prior research on GVCs, PVCs, and syndicated investments, we confirm that the combined impact of GVCs and PVCs goes beyond the individual effects of the two types of VC. Further, we ask whether the GVC leads or facilitates the syndicated investment and impacts the syndicate's efficiency. In particular, we conjecture that the positive effects of a facilitating role of GVCs are more significant than that of a leading role in the syndication structure. Thus, we hypothesise as follows:

H1a: Ceteris paribus, the syndication of GVC and PVC funds significantly increases the graduation success of innovative SMEs in the NEEQ market compared to sole GVC or PVC investments.

H1b: Compared to syndicated investments in which GVCs play a leading role, those in which GVCs play a facilitating role have a more positive impact on promoting the graduation of NEEQ firms.

2.3. Influencing mechanisms

The collaborative investments undertaken by GVCs and PVCs offer substantial potential to engender value creation in support of entrepreneurial initiatives and innovative undertakings. A substantial body of research is into the causal mechanisms underpinning the relationship between syndicated VC investments and their corresponding financial outcomes. However, the evidentiary base about the influence of GVC–PVC alliances on the IPOs of portfolio firms remains comparatively limited. Within this section, we explore three conceivable conduits through which the positive impact of VC syndication could be transmitted to the likelihood of graduation of NEEQ firms, particularly amidst an environment characterised by heightened uncertainty. These channels are resource allocation, innovation quality, and agency risk considerations.

The first channel is resource allocation. The literature indicates that VC plays a crucial role in enhancing the fundraising capabilities of entrepreneurs with limited access to traditional sources of capital (Dushnitsky and Lenox, 2006). Notably, GVCs, with a longer-term horizon and a strong orientation toward invention, are more inclined to allocate resources to risky exploratory activities that foster the generation of novel inventions. Conversely, compared to their governmental counterparts, PVCs may possess better networks, incentives, and skills to provide companies with essential resources and support (Bottazzi et al., 2008). These PVCs are adept at identifying promising ventures, leveraging their network connections to facilitate resource allocation, and offering valuable managerial expertise to the invested companies. Their nimble and market-driven approach allows them to respond swiftly to market dynamics and changing business conditions, leading to efficient resource utilisation.

Furthermore, the synergy created by syndication can enhance the resource allocation process. By combining the strengths of GVCs and PVCs, firms may benefit from a more diverse pool of resources and expertise. The GVC's focus on long-term value creation aligns with the PVC's ability to offer timely and targeted support, thus providing investees with a comprehensive array of resources to navigate the challenging innovation landscape. This complementary collaboration between GVCs and PVCs enhances the overall resource allocation efficiency, fostering a conducive environment for innovation-driven firms to thrive and progress toward graduation from the NEEQ to the main stock markets in China.

GVCs and PVCs possess access to distinct networks of contacts, exhibit different skills and experiences, and provide varying degrees of support to their portfolio companies. GVCs are inclined to pursue long-term development strategies, while PVCs offer high expertise and marketing resources. As a result, the collaboration between GVCs and PVCs in syndicated investments may lead to a highly efficient investment process by leveraging their complementary strengths. Given the existing evidence of the benefits and drawbacks of GVCs and PVCs, it is reasonable to assume that the networks and expertise brought by GVCs could enhance the effectiveness of GVC-facilitated syndicates (Lerner, 2002; Alperovych et al., 2020).

The disadvantages embedded in GVC investment also affect the impact when the syndicated investment is led by the GVC. This suggests that GVC-facilitated syndicates may exert a more favourable effect on firms, benefiting from the additional resources and support offered by GVCs. Conversely, in GVC-led syndicates, there may be a trade-off as GVCs tend to allocate resources to long-term developmental programs. Thus, there is a possibility that some advantages and resources brought by PVCs may not be fully realised within GVC-led syndicates. We propose the resource allocation hypothesis as follows:

H2a. *Resource allocation is an influencing channel through which GVC-facilitated firms increase the likelihood of graduation success.*

The second channel is the innovation nurturing mechanism. Early-stage investments are believed to have a higher risk and, thus, a lower possibility of going public (Sorensen, 2007; Bottazzi et al., 2008; Hochberg et al., 2014). Innovation, which adds to the competitiveness of firms, is one of the processes that face the most risks. Empirical evidence has consistently highlighted the catalytic role of VC in fostering innovation within firms. Alperovych et al. (2020) emphasise the significance and diversity of GVCs in driving innovation and provide a nuanced perspective on the merits and limitations of GVC investments. The variations in GVCs' impacts are attributed to their geographic location, industry focus, and degree of independence. Consequently, the effects of such investments exhibit discernible nuances. While some empirical analyses reveal the relatively weaker performance of GVCs compared to PVCs (Grilli and Murtinu, 2014; Bertoni and Tykvová, 2015; Cumming et al., 2017), it has been demonstrated that GVCs possess distinctive advantages and syndication can further amplify the innovation output (Hochberg et al., 2007; Bubna et al., 2020).

GVCs' efficacy in fostering innovation is supported by their strategic positioning and focus on long-term value creation (Bertoni and Tykvová, 2015). Their willingness to tolerate higher levels of risk and invest in exploratory endeavours that may lead to breakthrough innovations contributes to their advantage in enhancing innovation quality. Additionally, the collaborative nature of syndicated investments brings together the diverse expertise of GVCs and PVCs, resulting in a potent synergy that propels firms' innovation activities.

Despite variations in performance, the consensus is that GVCs, owing to their unique attributes and collaborative ventures, play a vital role in stimulating innovation within invested firms. Recognising the advantages and the potential of enhancement through syndication, policymakers and investors can strategically harness GVCs' impact to foster a more innovative entrepreneurial landscape. This, in turn, contributes to the broader understanding of the multifaceted dynamics of VC's influence on firm-level innovation.

Based on these prior efforts, we expect that the syndication between GVCs and PVCs will lead to higher efficacy than either one alone. Given the empirical evidence of the long-term horizons and risk-taking of GVCs, we anticipate that GVC-led syndicates underperform compared to GVC-facilitated syndicates. Thus, we formulate the following hypothesis:

H2b. *Innovation nurturing an influencing channel through which GVC-facilitated firms increase the likelihood of graduation success.*

The third possible channel is that of agency risk. The distinct internal governance structures of GVCs and PVCs contribute to a pronounced agency problem in GVC investments (Milosevicet et al., 1997; Leleux and Surlemont, 2003). The agency problem arises due to differences in objectives and priorities between investors and entrepreneurs, potentially leading to conflicts of interest and inefficient decision-making. Specifically, GVCs may be required to invest in industries aligned with explicit political or social aims that diverge from the profit orientation of the invested firms (Mason and Brown, 2013), thus creating conflicts of interest between GVCs and the entrepreneurial ventures they support.

In contrast, syndicated investments in which GVCs and PVCs collaborate can potentially mitigate agency problems with entrepreneurs (Admati et al., 1994). Through syndication, the interests of multiple investors are combined, thereby fostering a shared sense of responsibility for the venture's success. The participation of PVCs in syndicated investments brings expertise in entrepreneurial support, complementing the political and societal objectives of GVCs with profit-driven market knowledge. This collaborative approach can enhance alignment between investors and entrepreneurs, thus reducing the agency costs associated with GVC investments.

The agency problem becomes more apparent in GVC-led syndicates, as GVCs' specific policies or societal interests may take precedence over profit maximisation for the entrepreneurial ventures involved. This dominance of GVCs in decision-making may lead to suboptimal resource allocation and investment strategies, potentially hindering the growth and innovation potential of the invested firms. In contrast, syndicates facilitated by GVCs offer the opportunity for more market-oriented decision-making, where the focus remains primarily on maximising returns and fostering innovation. Here, we propose a third influencing channel, that is, agency cost mitigation by GVC-facilitating syndicated investment, and our hypothesis is as follows:

H2c: Agency cost reduction is an influencing channel through which GVC-facilitated firms increase the likelihood of graduation success.

3. Data, sample selection, and variables

3.1. Data and sample

The sample construction starts with a comprehensive list of companies directly listed in the Chinese NEEQ market between 2007 and 2021. Due to changes in accounting standards, utilising financial data from companies before 2007 may lead to unforeseeable results. Thus, we do not include data from before 2007. We obtained the company fundamentals data from the Wind and firm-level patent data from the Incopat databases. Financial firms were excluded from our sample data. Then, using the stock symbol, we matched VC investment data with firm graduation data and other related company fundamentals data. All variables of the sample, containing 39,634 observations, are winsorised, except for indicator variables, at the 1st and 99th percentiles to mitigate the influences of outliers Table 3.

We collect data for VC investments in companies listed on the NEEQ market from 2007 to 2021 through manual extraction from annual reports and legal opinions. Due to the absence of a specialised database providing systematic information on VC investments in NEEQ-listed firms, we meticulously compiled detailed information concerning investment events involving VC companies and their portfolio firms. Information related to VC companies includes their names, ownership structures, nationalities, locations, establishment times, and reputation rankings. Data on portfolio firms include investment timing, industry classification, number of employees, location, VC investment fund amount, investment round and stage, currency used, and investment approaches like syndication and staging, among other relevant factors.

Following methodologies employed in previous studies (Grilli and Murtinu, 2014; Bertoni and Tykvová, 2015; Guerini and Quas, 2016), we constructed several dummy variables. The *GVC_Entry* dummy variable is set to 1 if a firm exclusively obtains support from a GVC (including standalone GVCs and GVCs in a syndicate with other GVCs); otherwise, it is set to 0. Similarly, the *PVC_Entry* dummy variable is set to 1 if a firm exclusively obtains support from a GVC (including standalone PVCs and PVCs in a syndicate with other PVCs); otherwise, it is set to 0. The *SYN_Entry* dummy variable is assigned a value of 1 if a firm receives syndicated investment involving both GVCs and PVCs; otherwise, it is set to 0. We further divide the *SYN_Entry* dummy into two different variables: *GVC_Led* and *GVC_Facilitated*. To distinguish between these two dummies, we employed the initial financing round data of the companies. The *GVC_Led* dummy is assigned a value of 1 when a syndicate-backed company receives its first financing round from a GVC and subsequently secures financing from PVCs. On the other hand, the *GVC_Facilitated* dummy is set to 1 when a syndicate-backed company receives its first financing round from a PVC and subsequently obtains financing from GVCs.

The theoretical logic behind the definition is that the literature emphasises the critical role of first-round VC financing. Kaplan and Strömberg (2004) suggest that first-round venture capital investments can significantly influence various aspects of a startup, including management team formation, strategic guidance, financial contract structuring, post-investment monitoring, risk assessment, corporate governance, subsequent financing activities, and exit strategy planning. Bertoni et al. (2011) underscore the substantial positive impact of first-round venture capital financing on the growth of high-tech start-ups, particularly in employment expansion, with the treatment effect being immediate and significant following the initial round of funding. The first round of VC financing is under considerable uncertainty and navigates significantly larger impacts on firms.

Our primary dependent variable is the firms' graduation from NEEQ to the main stock market. It is a dummy variable that equals 0 for the period before firms successfully graduate to the senior stock market and equals 1 for the period after this graduation. This dependent variable captures the successful graduation of firms in the NEEQ market. It is the critical stage in which SMEs get public funds and significant development. This is quite important for SMEs. To enhance the robustness of our findings, we account for a comprehensive set of firm-level variables that may be associated with the success of companies graduating to senior markets. These variables were identified based on previous research into corporate innovation or VC investments. Detailed definitions of our main variables are in Appendix Table A1.

3.2. Summary statistics

The summary statistics presented in Table 4 reveal notable trends. Approximately one out of every 91 firms graduate from the NEEQ to the stock markets. There were similar numbers of syndicate-backed and pure PVC-backed firms and around half the number of pure GVC-backed firms. Furthermore, over 10 % of NEEQ firms graduated following syndicate or PVC investments, while the graduation rate after GVC investment is 5 %. On average, the amount of syndication investment is approximately 0.621, roughly three times that of GVC investments and twice that of PVC investments. Other variables are consistent with the existing literature.

Table 3
Summary of VC investment in NEEQ firms.

NEEQ Firms	No. of Firms	Percentage
VC-backed firms:	4433	0.33
GVC backed firms	1686	0.13
PVC backed firms	953	0.07
Syndication backed firms	1794	0.13
Non-VC backed firms	9042	0.67
Total NEEQ firms	13475	1.00

Table 4
Summary Statistics.

Variable	Obs	Mean	Min	Max	Std. dev.
Graduate	39,634	0.011	0	1	0.103
GVC_Entry	39,634	0.060	0	1	0.238
PVC_Entry	39,634	0.107	0	1	0.310
SYN_Entry	39,634	0.130	0	1	0.337
GVC_Led	39,634	0.104	0	1	0.305
GVC_Facilitated	39,634	0.141	0	1	0.348
GVC_Led_Amount	39,634	0.214	0	7.688	0.812
PVC_Facilitated_Amount	39,634	0.341	0	7.588	0.992
Size	39,634	4.843	0	7.196	1.069
Age	39,634	2.588	0	2.833	0.177
Leverage	39,634	0.423	0	0.971	0.216
ROA	39,634	0.056	−0.389	0.374	0.141
RD intensity	39,634	0.047	0	0.754	0.108
Tangibility	39,634	0.160	0	0.984	0.157
CapEx	39,634	0.049	0	2.102	0.072

Notes: Table 4 reports summary statistics for the primary variable of Chinese NEEQ firm observations. The sample contains 68,612 observations between 2007 and 2021 (excluding financial firms). The variables are defined in Table A1. Descriptive statistics are the key variables' number, mean, minimum, median, maximum, and standard deviation. Variables are described in Appendix A.

4. Main results

4.1. Baseline regression

To test our hypotheses in a multivariate setting, we first use the dummy variable of graduation, which equals 0 for the period before firms graduate to a senior stock market and 1 for the period after graduation. We begin by documenting the influence of the characteristics of VC investors at the firm level. Our approach involves assessing the strength of the association between the government, private, and syndicate VC investments and the likelihood that a NEEQ firm graduates to a senior stock market. A challenge in estimating the effect of VC on any measure of a firm's graduation is to capture the heterogeneity from different types of VC. Thus, we introduce several time-varying VC-related dummies to indicate various types of VC investment activities. The GVC_Entry identifies

Table 5
Different VC investments impact on graduation performance of NEEQ firms.

	(1) Graduate	(2) Graduate	(3) Graduate
GVC_Entry	−0.362 * ** (−6.81)		
PVC_Entry		0.381 * ** (2.89)	
SYN_Entry			1.075 * ** (5.55)
Size	2.215 * ** (15.93)	2.210 * ** (16.71)	2.083 * ** (14.53)
Age	8.356 * ** (3.09)	8.342 * ** (3.16)	8.524 * ** (3.28)
Leverage	−5.965 * ** (−12.37)	−5.990 * ** (−12.00)	−5.668 * ** (−11.27)
ROA	0.967 (0.96)	0.954 (0.94)	1.434 (1.48)
RD intensity	−1.234 (−0.36)	−1.339 (−0.39)	−1.428 (−0.48)
Tangibility	−2.629 * * (−2.17)	−2.563 * * (−2.13)	−2.467 * (−1.92)
CapEx	2.149 * ** (6.42)	2.093 * ** (6.20)	2.005 * ** (5.27)
N	39,634	39,634	39,634
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
R^2	0.448	0.449	0.466

Notes: This table uses the logit model to examine the effects of different types of VC on the success rate of NEEQ-listed firms graduating from senior stock markets. The dependent variable is the dummy variable of graduation, which equals 0 for the period before firms graduate to the senior stock market and 1 for the period after graduation. We control for year-fixed effects and industry-fixed effects in all regressions. See Table A1 for definitions of all variables. T-statistics are presented in parentheses. * , * *, and * ** indicate statistical significance at the 10 %, 5 %, and 1 % levels, respectively.

GVC-backed companies and is equal to 1 after a company has received a financing round from a standalone GVC. The PVC_Entry identifies PVC-backed companies and is equal to 1 after a company has received a financing round from a standalone PVC. The SYN dummy identifies GVC–PVC syndicate–backed companies and is equal to 1 after a company has received a financing round from a GVC–PVC syndicate.

In Table 5, we regress the dependent variable on our set of two basic controls: industry and time-fixed effects. These fine-grained fixed effects absorb roughly half of the persistence observed in the models over time. All coefficient estimates are statistically significant at the 1 % significance level and have the expected signs. Column 1 of Table 5 shows a negative and statistically significant association between GVC investments and the probability that the firms will successfully graduate from the NEEQ market. Consistent with prior research in the China A-share stock market (Bertoni and Tykvová, 2015; Brander et al., 2015; Bertoni et al., 2019), we find that GVCs have a significant negative influence when they invest in a company alone. In contrast, Column 2 of Table 5 shows that PVC-backed firms are more likely to graduate than GVC-backed firms, which is consistent with the prior literature.

Next, we document GVC–PVC syndicate–backed targets and test how syndication may influence firms' graduation to senior stock markets. Our approach involves assessing the syndication between GVCs and PVCs. An alternative approach would treat syndication as multiple venture capitalists jointly investing in the same company. For example, Nguyen and Vu (2021) examine the impact of VC syndication on mergers and acquisitions (M&As) and find that syndicate-backed targets receive higher premiums in M&As compared to individual-backed targets and outperform them in terms of operating efficiency and stock returns in the long term. Their approach has the advantage of capturing the general influence of VC syndication, but it is hard to estimate the roles of GVCs in syndicates. Column 3 of Table 5 reveals that the syndication of GVCs and PVCs can significantly improve the likelihood of a firm graduating from the NEEQ. Compared to single GVC- or PVC-backed targets, firms with both GVC and PVC investments are expected to demonstrate better performance.

Following the baseline analysis of the influence of syndication between Government Venture Capitals (GVCs) and Private Venture Capitals (PVCs), we delve deeper into the specific roles of GVCs within these syndicates. GVCs often face scrutiny due to several perceived drawbacks. Critics argue that government intervention in VC markets can introduce inefficiencies and heightened bureaucracy. Additionally, there are concerns about potential rent-seeking behaviour and the political pressures that may accompany government involvement in VC activities. To address these concerns and better understand the distinct contributions within syndicates, we introduced two specific dummies in our analysis: *GVC_Led* and *GVC_Facilitated*, as detailed in the data section.

In Table 6, we present the regression results that specifically analyse the role of GVCs in influencing the success of firms in graduating senior stock markets. The results from Column 1 suggest that the positive correlation previously observed between syndication entry (*SYN_Entry*) and graduation success does not predominantly stem from GVC-led initiatives, as the coefficient is not statistically significant. This finding prompts a re-evaluation of the effectiveness of GVC leadership in these syndicates. Conversely, the

Table 6
The role of GVCs in syndicates.

	(1) Graduate	(2) Graduate
GVC_Led	0.156	
	(0.91)	
GVC_Facilitated		0.554 * **
		(5.49)
Size	2.204 * **	2.174 * **
	(15.62)	(16.43)
Age	8.373 * **	8.556 * **
	(3.24)	(3.54)
Leverage	−5.950 * **	−5.865 * **
	(−12.88)	(−12.80)
ROA	0.954	1.139
	(0.96)	(1.11)
RD intensity	−1.426	−1.598
	(−0.40)	(−0.46)
Tangibility	−2.582 * *	−2.552 * *
	(−2.08)	(−2.08)
CapEx	2.085 * **	2.012 * **
	(6.32)	(6.20)
N	39,634	39,634
Year FE	Yes	Yes
Industry FE	Yes	Yes
R^2	0.448	0.452

Notes: This table uses the logit model to examine the effects of different roles of GVCs in syndicates on the success rate of NEEQ-listed firms graduating to senior stock markets. The dependent variable is the dummy variable of graduation, which equals 0 for the period before firms graduate to senior stock markets and 1 for the period after graduation. We control for year-fixed effects and industry-fixed effects in all regressions. See Table A1 for definitions of all variables. T-statistics are presented in parentheses. * , * *, and * ** indicate statistical significance at the 10 %, 5 %, and 1 % levels, respectively.

results reported in Column 2, which focus on the impact of GVCs in a facilitating role, are statistically significant at the 1 % level. This suggests that GVCs are more effective when they support rather than lead syndication efforts. The positive and statistically significant coefficient indicates that GVCs, when acting as facilitators, substantially increase the likelihood of firms graduating to senior stock markets. This role likely leverages GVCs' unique capabilities in navigating government regulations and accessing public resources, which can be critical in supporting firms through their transition phases.

This distinction between leading and facilitating roles highlights the nuanced contributions of GVCs in venture capital syndicates. The economic implications are significant, as they suggest that the optimal involvement of GVCs in venture capital syndicates is not in direct leadership but in a supportive, enabling capacity. Such insights are crucial for policymakers and investors as they shape strategies to enhance the effectiveness of GVC involvement in fostering firm growth and facilitating successful transitions to more established markets. This nuanced understanding helps strategise the deployment of public funds and design regulatory frameworks that maximise the economic impact of government-supported venture capital initiatives.

4.2. Endogeneity

To eliminate the endogeneity problem from the sample selection, we adopt the PSM approach to control the potential selection bias of different VC syndicates with matching elements, including Size, Age, Leverage, ROA, Tangibility, Capex, industry indicators, and year indicators. A significant body of literature utilises Propensity Score Matching (PSM) to address selection bias in observational studies where random assignment to treatment and control groups is not feasible (Heckman et al., 1997; Smith and Todd, 2005). PSM is a statistical method designed to create a set of treated and untreated units that are comparable based on observed characteristics, enabling a more accurate estimation of treatment effects.

In our paper, we apply PSM to match the treated and untreated samples based on similar covariates. By rerunning our regression analysis on these matched subsamples, we eliminate differences in firms' quality (as measured by covariates), thus isolating the effects of our key independent variables. For instance, if GVC facilitation tends to select firms with higher ROA, PSM ensures that both groups have similar ROA, thereby mitigating potential selection bias related to ROA in the subsequent regression analysis. We adopt a PSM method with 1–3 neighbours, and after matching, new sub-samples are obtained with 17,727 GVC_led and 21,621 GVC_facilitated observations, respectively.

Columns 1 and 2 of Table 7 present the results of logit regressions of GVC_Led and GVC_Facilitated and the success of firms' graduation using the PSM method. Columns 3 and 4 of Table 7 present the results using the Heckman selection model. Columns 5 and 6 of Table 7 and Fig. 2 present the results using the survival analysis model (Weibull). All these results are consistent with the baseline regressions in Table 6.

We perform several additional analyses to check the robustness of our results. First, in Table 8, we change the measurement of independent variables. Following the prior literature, we use the amount of VC investments to represent the potential influence of different VC instead of the dummy variable of VC entry. Thus, the first independent variable is GVC_Led_Amount, defined as the total amount a syndicate-backed company receives from a GVC in its first financing round. The second independent variable is GVC_Facilitated_Amount, defined as the total amount a syndicate-backed company receives from a GVC in its second financing round after a PVC invested in the first round.

There is a potential concern that subsequent round investors, especially those who join at a more mature stage and hold a significant portion of the company's shares, may indeed exert a more substantial influence on the company's decisions. To address this potential concern, we also enhance our robustness check by alternative definitions, GVC_share and PVC_share, which measure the

Table 7
The role of GVCs in syndicates (PSM, Heckman selection, Survival analysis).

	(1)	(2)	(3)	(4)	(5)	(6)
	Graduate PSM	Graduate PSM	Graduate Heckman selection	Graduate Heckman selection	Graduate Survival analysis	Graduate Survival analysis
GVC_Led	0.177		0.114		−0.0493	
	(1.16)		(0.66)		(0.150)	
GVC_Facilitated		0.55 * **		0.506 * **		0.291 * **
		(5.42)		(4.58)		(2.73)
IMR			−2.408 * **	−2.269 * **		
			(−4.51)	(−4.90)		
N	17,727	17,727	39,634	39,634	6086	6086
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2/ Likelihood	0.418	0.421	0.453	0.456	−393.835	−396.179

Notes: This table uses the logit model to examine the effects of different roles of GVCs in syndicates on the success rate of NEEQ-listed firms graduating to senior stock markets using the methods of PSM, Heckman selection, and Survival analysis. We employ 1–3 nearest neighbours with a 0.05-caliper PSM method. The dependent variable is the dummy variable of graduation. The independent variables are dummy variables that equal 0 for the period before firms graduate to senior stock markets and 1 for the period after graduation. We control for year-fixed effects and industry-fixed effects in all regressions. See Table A1 for definitions of all variables. T-statistics are presented in parentheses. * , * *, and * ** indicate statistical significance at the 10 %, 5 %, and 1 % levels, respectively.

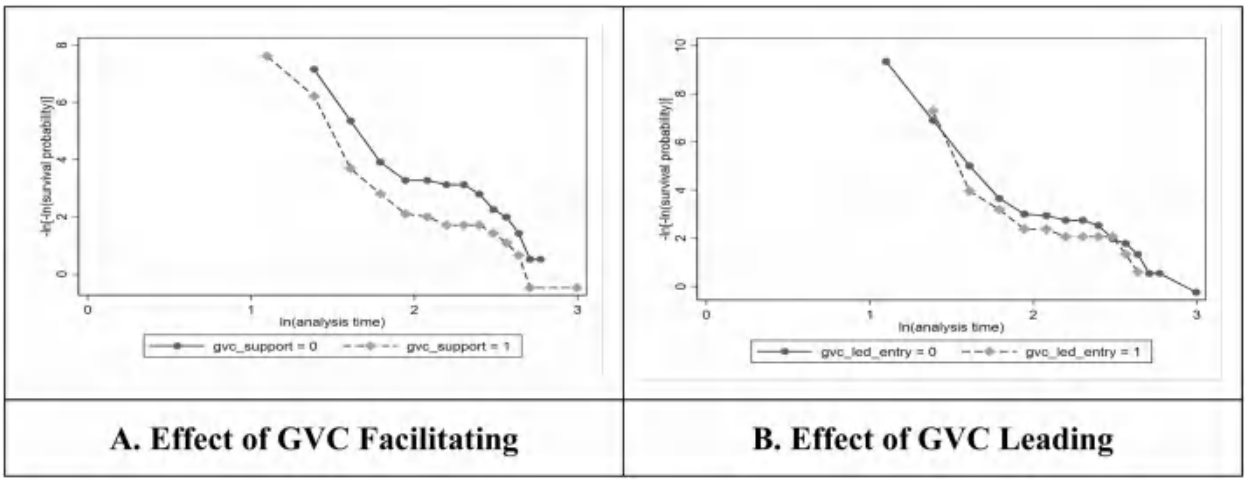

Fig. 2. Log-minus-log survival plot in survival analysis. This figure represents log-minus-log survival plots, commonly used to check the proportional hazards assumption in survival analysis. It contrasts the survival experiences of two groups over a transformed time scale, with one group having gvc_support = 0 and the other gvc_support = 1 in panel A and gvc_led = 0 or 1 in panel B. The y-axis displays the negative log of the survival probability, which helps in assessing if the survival curves are parallel over time—a necessary condition for the proportional hazard assumption. The x-axis represents the natural log of the analysis time.

Table 8
Alternative definitions of GVC roles in syndication.

	(1)	(2)	(1)	(2)
	Graduate	Graduate	Graduate	Graduate
GVC_Led_Amount	0.086			
	(0.81)			
GVC_Facilitated_Amount		0.382 * **		
		(7.73)		
GVCshare			−0.977 * **	
			(−10.32)	
PVCshare				−0.081
				(−0.71)
N	39,634	39,634	39,634	39,634
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
R^2	0.448	0.452	0.431	0.422

Notes: This table presents results for the effects of different roles of GVCs in syndicates on the success rate of NEEQ-listed firms graduating to senior stock markets. The dependent variable is the total amount of the GVC investment instead of the dummy variable of *GVC investment*. The independent variables measure the investment amount of GVCs and PVCs. We control for year-fixed effects and industry-fixed effects in all regressions. See Table A1 for definitions of all variables. T-statistics are presented in parentheses. * , * *, and * ** indicates statistical significance at the 10 %, 5 %, and 1 % levels, respectively.

proportion of investment of GVCs and PVCs of the total VC investment. Table 8 shows that the different measurements of independent variables make no significant difference.

Then, following the approach of Bertoni and Tykvová (2015), in Table 9, we analyse the extent to which our results are robust to sample refinements. In Panel A of Table 9, we re-run our baseline regression on restricted samples. We exclude companies in Beijing, Shanghai, or Shenzhen to check whether the sample cities with the largest VC activities drive the results. In Panel B of Table 9, following the Outline of the National Innovation-Driven Development Strategy, which the State Council of China published, we exclude all companies belonging to high innovation-driven industries to reduce the selection bias from VC further and re-run our baseline regression. All the results in Table 9 are strongly and positively statistically significant; thus, our findings are confirmed.

5. Influencing channels

5.1. Improving market resource allocation

GVCs are observed to be fewer effective substitutes for independent VC investors. Companies backed by independent VC investors tend to exhibit higher levels of innovation than those supported by GVCs, which often lack autonomy from government influences and

Table 9
The role of GVCs in syndicates (sample refinements).

Panel A	(1)	(2)
	Graduate	Graduate
GVC_Led	0.084	
	(1.01)	
GVC_Facilitated		0.621 * **
		(7.40)
N	32,014	32,014
Year FE	Yes	Yes
Industry FE	Yes	Yes
R^2	0.462	0.467
Panel B	(1)	(2)
	Graduate	Graduate
GVC_Led	0.256	
	(0.83)	
GVC_Facilitated		0.738 * **
		(2.95)
N	25,465	25,465
Controls	Yes	Yes
Year FE	Yes	Yes
Industry FE	Yes	Yes
R^2	0.462	0.470

Notes: Panel A of this table presents the regressions with a restricted sample that excludes the firms in Beijing, Shanghai, and Shenzhen. Panel B presents the regressions with a restricted sample that excludes firms from highly innovation-driven industries. The independent variables are dummy variables that equal 0 for the period before firms graduate to senior stock markets and 1 for the period after graduation. We control for year-fixed effects and industry-fixed effects in all regressions. See Table A1 for definitions of all variables. T-statistics are presented in parentheses. * , * *, and * ** indicates statistical significance at the 10 %, 5 %, and 1 % levels, respectively.

have incentive structures that may not optimally motivate skilled investment managers. However, the rationale behind why firms benefit from a dual investment scenario involving GVCs and PVCs regarding graduation performance remains a pertinent inquiry. Furthermore, why does a firm's likelihood of success appear to be heightened when the GVC assumes a facilitating role rather than a leading one?

The resource allocation channel posits that venture capitalists frequently offer services that significantly augment the likelihood of success for their invested firms. These services encompass strategic decision-making support, augmentation of innovation through increased R&D expenditure and patenting activities, enlargement of contact networks within the product market, optimization of management and employee incentives, and assistance in recruiting competent managerial talent (Hellmann, 1998; Kortum and Lerner, 2000; Casamatta, 2003). GVCs, by being responsive to economic policy imperatives set by the public entities that established them, often diverge from the independent financial objectives of purely profit-driven fund providers such as PVCs (Bertoni and Tykvová, 2015).

Consequently, when GVCs assume the leadership role within a syndication arrangement, there may be a propensity to allocate resources to fulfil policy mandates, potentially subordinating profit maximization. This dynamic may erode a company's prospects of successful graduation from the NEEQ market. Conversely, when GVCs adopt a facilitative role, the profit-motivated orientation of PVCs may result in the complete conversion of GVC-brought resources into market-oriented assets, thereby optimizing the interests of the company and its shareholders. This alignment, in turn, could bolster the firm's prospects for successful graduation.

Along with our conjectures about the potential mechanisms, we perform a series of mediation analyses. This methodology is widely used to provide evidence on underlying channels (Lang et al., 2012; Chen et al., 2019; Francis et al., 2021; Conte et al., 2024). To establish the mediation effect in this analysis, three conditions must be met (Francis et al., 2021): (1) The independent variable (*GVC_Facilitated*) should significantly influence the dependent variable (*Graduation*). (2) The independent variable should also significantly influence the mediator (*Sales, Long-term debt, Novelty, Agency_cost*). (3) When regressing the dependent variable on both the independent variable and the mediator, the mediator should be significant, and the effect of the independent variable should diminish. We then apply the Sobel test (Sobel, 1982) to assess the statistical significance of the mediation effect. Following Iacobucci, D. (2012) and Francis et al. (2021). We construct our Sobel Z as:

$$Z_a * Z_b / (Z_a^2 + Z_b^2 + 1)$$

The outcomes of our two-step analysis, as documented in Columns 1–3 of Table 10, reveal a positive association between our market resource measure, Sales, and instances where GVCs assume a facilitating role. This suggests that firms that embrace a facilitating role of the GVC in syndicates may display improved allocation of market resources, potentially augmenting their prospects for graduation success. It is important to note that our analysis also considered the impact of GVC leadership (GVC_led) on these outcomes. However, the findings related to GVC_led were not statistically significant and thus were not included in Table 10 for clarity and

conciseness in the presentation. This decision was made to ensure the table remains focused on the most impactful and significant findings from our analysis.

In Columns 4–6 of Table 10, we present additional evidence to support the conclusions drawn in Table 10. When GVCs play a facilitating role in the syndicate, they help companies access better market resources, manifesting externally as increased market sales and internally as obtaining more long-term loans. Thus, in Table 11, we investigate whether the increase in long-term debt is a potential mechanism through which GVCs enhance the likelihood of a company's successful graduation. The results show that our long-term debt measure is positively associated with GVC_Facilitating and indicate that the target firms may have higher long-term debt, increasing the likelihood of graduation when GVCs play a facilitating role in syndicates. Regarding the subsequent analysis presented in this table, it's pertinent to mention that while the aspect of GVC leadership (GVC_Led) was explored, its influence was insignificant. Consequently, to maintain the focus on pivotal findings, data on GVC_Led has been omitted from this visualisation.

5.2. Promoting innovation quality

The innovation-promoting channel suggests that GVCs play a facilitating role in allocating more resources to their portfolio companies than GVCs in a leading role, thus resulting in a higher number of patents. GVCs focus on exploratory activities that lead to inventions, even though they may be time-consuming, risky, and uncertain for independent VC investors who prefer to invest their resources in turning inventions into commercially viable products. Moreover, GVCs provide additional benefits to their portfolio firms, such as government networks, certification, government subsidies, and access to related industry policies. Unlike PVCs, which operate independently with purely financial objectives, GVCs must align with the economic policy objectives set by the public entity that established them. As a result, GVCs may be interested in fostering invention and innovation and not just maximising their returns on investment like PVCs. This interest may make GVCs more willing to invest resources in exploratory activities that lead to inventions, even if such endeavours involve greater time, risk, and uncertainty, which PVCs may prefer to avoid by focusing on turning inventions into profitable products.

Overall, when the GVC plays a facilitating role in the syndicate, the profit-driven nature of the PVCs can assist GVCs in identifying the direction of innovation and, while ensuring innovation quality, in maximising the enhancement of company value resulting from innovation, thereby significantly increasing the profit of the company and its shareholders and improving the likelihood of graduation. Following Jia et al. (2019), we adopt the measure of *Novelty*, which is defined as the total number of novel patents. Applied for and eventually granted to firms scaled by the number of patents applied for and ultimately granted to firms in a given year to indicate the innovation quality of firms. The results in Table 11 show that our innovation quality measure, *Novelty*, is positively associated with GVC_Facilitated. It indicates that the target firms have better innovation quality, which improves the likelihood of graduation when GVCs play a facilitating role in the syndication and allow the PVC to lead.

5.3. Lowering agency risk

The distinct governance structures of GVCs and PVCs lead to pronounced agency problems in GVC investments. GVCs may face conflicts of interest due to their political or social aims that may diverge from the profit orientation of the invested firms. Syndicated investments involving GVCs and PVCs can mitigate agency problems by combining the interests of multiple investors and fostering shared responsibility for venture success. PVCs' market expertise complements GVCs' objectives, enhancing alignment with entrepreneurs and reducing agency costs. GVC-led syndicates may prioritise policy interests over profit maximisation, while GVC-facilitated syndicates focus on returns and innovation potential.

Table 10
Mediating effects of market resources.

	(1)	(2)	(3)	(4)	(5)	(6)
	Graduate	Sales	Graduate	Graduate	Long-term debt	Graduate
GVC_Facilitated	0.554 * **	0.217 * **	0.287 * **	0.554 * **	0.010 * **	0.495 * **
	(5.49)	(7.22)	(3.25)	(5.49)	(4.22)	(5.45)
Sales			2.215 * **			
			(15.71)			
Long-term debt						3.162 * **
						(6.61)
Sobel Z	3.176			4.177		
N	36,234	36,234	36,234	35,554	35,554	35,554
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.452	0.664	0.533	0.452	0.089	0.459

Notes: This table uses the logit model to examine the effects of VC syndication on the success rate of NEEQ-listed firms graduating from senior stock markets. The dependent variable is the dummy variable of graduation. The independent variable, *GVC_Facilitated*, is a dummy variable that equals 0 for the period before firms graduate to senior stock markets and 1 for the period after graduation. We use two mediators, Sales and Long-term debt. We control industry-fixed effects and year-fixed effects in all regressions. See Table A1 for definitions of all variables. T-statistics are presented in parentheses. * , * *, and * ** indicate statistical significance at the 10 %, 5 %, and 1 % levels, respectively.

Table 11
Mediating effects of innovation.

	(1)	(2)	(3)
	Graduate	Novelty	Graduate
GVC_Facilitating	0.554 * **	0.018 * **	0.543 * **
	(5.49)	(6.43)	(5.37)
Novelty			0.601 * **
			(22.42)
Sobel Z	5.217		
N	39,634	39,634	39,634
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
R^2	0.452	0.233	0.454

Notes: This table uses the logit model to examine the effects of VC syndication on the success rate of NEEQ-listed firms graduating from senior stock markets. The dependent variable is the dummy variable of graduation. The independent variables are dummy variables that equal 0 for the period before firms graduate to senior stock markets and 1 for the period after graduation. We control industry-fixed effects and year-fixed effects in all regressions. See Table A1 for definitions of all variables. T-statistics are presented in parentheses. * , * * and * ** , indicate statistical significance at the 10 %, 5 %, and 1 % levels, respectively.

Following our hypothesis, we adopt the measure Agency_Cost, defined as the total number of management expenses scaled by the total assets of firms in a given year, to indicate the agency cost of firms (Lerner, 1999; Leleux and Surlemont, 2003). There is evidence that as a fund provider, GVCs have a substantial influence on firms' operations, so they might have policy objectives. Venture capitalists contribute to the value of portfolio companies by offering managerial skills and expertise (Hellmann and Puri, 2002) and actively overseeing management practices and outcomes (Lerner, 1995). This results in the agency problems, and the operation manager might have conflicts that benefit from these objectives. Bertoni and Tykvová also confirm that GVCs act as investors, which has a significant effect on firms. This previous literature confirms that GVCs act as stockholders, which is why we use the traditional agency cost measurement.

The results in Table 12 show that our agency risk measure, Agency_Cost, is positively associated with GVC_Facilitated and indicates that the target firms may have lower agency risk, which improves the likelihood of graduation success when the GVC plays a facilitating role in syndicates.

6. Further tests

There could also be a potential reverse causality problem between our mechanism, improving resource allocation, enhancing innovation quality, and lowering agency risk. To address this potential reverse causality issue, we take another empirical method: a quasi-experiment. We emphasise the causal relation by using an external policy shock to design a quasi-experiment in the further analysis section. We use the Chinese government's new framework of Government Investment Regulations released on September 5, 2018, that only impacts the GVC-participated syndications. Furthermore, we also hope to get more insight into the differential effect of policy shocks on GVC-led and GVC-facilitated syndications.

This new regulation framework represents a strategic approach to efficiently manage government investments, optimising the allocation of resources through enhanced regulatory measures. It presents both advantages and disadvantages for government-led syndicated investments, and the policy is expected to substantially strengthen the facilitating role of GVCs in syndicates, thereby fostering the successful graduation of target firms. Consequently, we contemplate that there is a significant positive association between GVC-facilitated syndications and graduation performance of NEEQ firms.

To test the impact of new regulation policy shock, we create two groups: the treatment group consists of syndicate-backed companies that receive the first financing round from a GVC and subsequently obtain financing from PVCs. In contrast, the control group comprises companies that receive the first financing round from a PVC and subsequently obtain financing from GVCs. We employ the PSM approach to address potential selection bias in VC investment points. This method involves matching elements such as Size, Age, Leverage, ROA (Return on Assets), Tangibility, Capex, industry indicators, and year indicators between the treatment and control groups. We utilise the one-to-one PSM methods to ensure robustness in our analysis. The implementation of our quasi-experiment is as follows:

$$\text{Graduates}_{it} = \beta_1 \text{Treat}_{it} * \text{Policy}_t + \beta_2 \text{Controls}_{it} + \mu_t + \gamma_j + \epsilon_{it}$$

Where *i* is the firms' indicator and *t* is the year indicator. $Graduates_{it}$ is the main dependent variable that equals 1 if the firms in NEEQ finally into IPOs for firm *i* in year t and 0 otherwise. *Treat* is the treatment variable that stands for *GVC_Led* and *GVC_Facilitated*. $Policy_t$ is the policy year dummy that equals 1 if the year is in or after the policy year and 0 before the policy year. Controls stand for a set of controlling variables. μ_t is the year fixed effect and γ_j is the industry fixed effect. ϵ_{it} stands for error term. β_1 is the key coefficient of interest that captures the treatment effect.

We perform our policy analysis in a multivariate regression framework and the results are shown in Table 13. In Column 1, as expected, the coefficients on GVC_Led × Policy are insignificant, which is consistent with our main findings. In Column 2, the

Table 12
Mediating effects of agency risk.

	(1)	(2)	(3)
	Graduate	Agency_Cost	Graduate
GVC_Facilitating	0.554 * **	−0.027 * **	0.397 * **
	(5.49)	(−3.11)	(4.82)
Agency_Cost			−10.584 * **
			(−5.80)
Sobel Z	−3.675		
N	35,953	35,953	35,953
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
R^2	0.452	0.456	0.484

Notes: This table uses the logit model to examine the effects of VC syndication on the success rate of NEEQ-listed firms graduating from senior stock markets. The dependent variable is the dummy variable of graduation. The independent variables are dummy variables that equal 0 for the period before firms graduate to senior stock markets and 1 for the period after graduation. We control industry-fixed effects and year-fixed effects in all regressions. See Table A1 for definitions of all variables. T-statistics are presented in parentheses. * , * *, and * ** indicate statistical significance at the 10 %, 5 %, and 1 % levels, respectively.

coefficients on GVC_Facilitated × Policy are statistically significant and positive, indicating that the treatment firms experience a larger likelihood of graduation after the policy shock than the control firms. The results indicate that when GVCs play a facilitating role, the target firms will receive more assistance from GVCs, thereby increasing the likelihood of successful graduation from the NEEQ market.

7. Conclusions

Using a comprehensive set of data for Chinese SMEs listed in a third-tier equity market over 2007–2021, our paper provides clear evidence that syndicated investments involving both PVCs and GVCs lead to higher efficiency in promoting the performance of invested firms compared to separate investments. Our investigation reveals a novel finding: the effectiveness of syndication varies depending on its leadership. Specifically, GVC-facilitated syndicates exert a more significant positive effect than GVC-led syndicates on the success of SMEs. The elucidation of the underlying mechanisms sheds light on the channels driving the differences in performance between syndication structures.

We identify three mechanisms: resource allocation, innovation quality, and agency cost. GVC-facilitated syndication enhances firms' ability to absorb marketable resources, fosters higher innovation quality, and reduces agency risks compared to GVC-led syndication. Furthermore, GVC-facilitated syndicates benefit from the network and expertise brought by GVC while avoiding the disadvantages associated with GVC-led syndicates. The latter prioritizes social benefits over commercial gains, leading to higher internal agency costs and less effective monitoring.

Our findings are robust to introducing external policy shocks that regulate GVC investments. This provides additional support for the inefficiency of syndicated investments in promoting the success of SMEs when led by the GVC. The superior performance of GVC-facilitated collaborations presents a compelling case for policy interventions to foster synergistic partnerships between GVCs and PVCs. Such policy measures will help bolster the support system for SMEs, enhance resource allocation efficiency, and minimize agency costs. Further research could explore other aspects of performance beyond traditional financial metrics.

Table 13
A policy analysis of NEEQ graduation.

	(1)	(2)
	Graduate	Graduate
GVC_Led × Policy	−0.435	
	(−0.90)	
GVC_Facilitated × Policy		0.454 * **
		(2.90)
N	4416	5841
Year FE	Yes	Yes
Industry FE	Yes	Yes
R^2	0.379	0.372

Notes: For the regression, *Treat* × *Policy* is the coefficient from our empirical specification. It is an interaction of the *Syndication* dummy variable and the *Policy* dummy variable. The policy shock began after the Chinese government implemented the Government Investment Regulations on September 5, 2018. The regression includes the same control variables as the baseline and further controls for the industry and year-fixed effects.

CRediT authorship contribution statement

Peng Jiadong: Writing – review & editing, Writing – original draft, Validation, Software, Methodology, Data curation. **Wang Yong:** Writing – review & editing, Validation, Supervision, Investigation, Funding acquisition, Conceptualization. **Hua Xiuping:** Writing – original draft, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Xia Zhoubo:** Writing – review & editing, Writing – original draft, Validation, Methodology, Formal analysis, Data curation.

Declaration of Competing Interest

none.

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Appendix

Table A
Definition of key variables

Variable	Definition
Dependent Variables	
Graduate	Success graduate dummy, equals to 0 for the period before firms graduate to senior stock market successfully, and equals 1 for the period after this graduation.
Key explanatory variables:	
GVC_Entry	A dummy variable, equals to 0 for the period before pure GVC investment is made, and equals 1 for the period after the investment is made.
PVC_Entry	A dummy variable, equals to 0 for the period before pure PVC investment is made, and equals 1 for the period after the investment is made.
SYN_Entry	A dummy variable, equals to 0 for the period before syndication investment of GVC and PVC is made, and equals 1 for the period after the investment is made.
GVC_led	A dummy variable, equals to 1 when a syndicate-backed company receives its first financing round from a GVC and subsequently secures financing from PVCs.
GVC_Facilitated	A dummy variable, equals to 1 when a syndicate-backed company receives its first financing round from a PVC and subsequently obtains financing from GVCs.
Control Variables	
Size	Natural logarithm of the number of employees of firms at the end of fiscal year t.
Age	Natural logarithm of the time between the year of birth of a firm and the given year t.
Leverage	Leverage refers to the leverage ratio of the company, defined as total debt divided by total assets at the end of fiscal year t.
ROA	ROA refers to the profitability of a firm at the end of fiscal year, defined as net profit divided by total assets at the calculated year.
RD intensity	RD expenditures divided by book value of total sales at year t, set to zero if missing.
Tangibility	Tangibility refers to the tangible asset ratio of the company, defined as the value of fixed assets divided by the value of total assets measured at the end of fiscal year t.
CapEx	CapEx refers to the capital investment ratio, measured by capital investment in total assets in given year t.

Data availability

Data will be made available on request.

References

Admati, A.R., Pfleiderer, P., Zechner, J., 1994. Large shareholder activism, risk sharing, and financial market equilibrium. J. Political Econ. 102 (6), 1097–1130.
Alperovych, Y., Groh, A., Quas, A., 2020. Bridging the equity gap for young innovative companies: The design of effective government venture capital fund programs. Res. Policy 49 (10), 104051.
Bai, C.-E., Lu, J., Tao, Z., 2006. The multitask theory of state enterprise reform: Empirical evidence from China. Am. Econ. Rev. 96, 353–357.
Bardhan, P., 2016. State and development: the need for a reappraisal of the current literature. J. Econ. Lit. 54 (3), 862–892.
Bernstein, S., Giroud, X., Townsend, R.R., 2016. The Impact of Venture Capital Monitoring. J. Financ. 71, 1591–1622.
Bertoni, F., Colombo, M.G., Grilli, L., 2011. Venture capital financing and the growth ofhigh-tech start-ups: Disentangling treatment from selection effects. Res. Policy 40 (7), 1028–1043.

Bertoni, F., Colombo, M.G., Quas, A., 2019. The Role of Governmental Venture Capital in the Venture Capital Ecosystem: An Organizational Ecology Perspective. Entrep. Theory Pract. 43 (3), 611–628.
Bertoni, F., Tykvová, T., 2015. Does Governmental Venture Capital Spur Invention and Innovation? Evidence from Young European Biotech Companies. Res. Policy 44, 925–935.
Boeing, P., 2016. The allocation and effectiveness of China's R&D subsidies - Evidence from listed firms. Res. Policy 45, 1774–1789.
Bottazzi, L., Da Rin, M., Hellmann, T., 2008. Who are the active investors? Evidence from venture capital. J. Financ. Econ. 89 (3), 488–512.
Brander, J.A., Du, Q., Hellmann, T., 2015. The effects of government-sponsored venture capital: international evidence. Rev. Financ. 19 (2), 571–618.
Bubna, A., Das, S.R., Prabhala, N., 2020. Venture capital communities. J. Financ. Quant. Anal. 55 (2), 621–651.
Casamatta, C., 2003. Financing and advising: optimal financial contracts with venture capitalists. J. Financ. 58 (5), 2059–2085.
Chemmanur, T.J., Krishnan, K., Nandy, D.K., 2011. How does venture capital financing improve efficiency in private firms? A look beneath the surface. Rev. Financ. Stud. 24, 4037–4090.
Chemmanur, T.J., Loutskina, E., Tian, X., 2014. Corporate venture capital, value creation, and innovation. Rev. Financ. Stud. 27, 2434–2473.
Chen, H., Gompers, P., Kovner, A., Lerner, J., 2010. Buy local? The geography of venture capital. J. Urban Econ. 67 (1), 90–102.
Chen, S., Huang, Y., Li, N., Shevlin, T., 2019. How does quasi-indexer ownership affect corporate tax planning? J. Account. Econ. 67 (2-3), 278–296.
Colonnelli, E., Prem, M., 2022. Corruption and firms. Rev. Econ. Stud. 89, 695–732.
Conte, D., Bussoli, C., Hemmings, D., 2024. Responsible risk-taking and the CSP-financial performance relation in the banking sector: A mediation analysis. Res. Int. Bus. Financ. 69, 102293.
Cumming, D.J., Grilli, L., Murtinu, S., 2017. Governmental and independent venture capital investments in Europe: a firm-level performance analysis. J. Corp. Financ. 42, 439–459.
Cumming, D.J., Macintosh, J.G., 2006. Crowding out private equity: Canadian evidence. J. Bus. Ventur. 21, 569–609.
Dong, W., Li, Y., Lv, X., Yu, C., 2021. How does venture capital spur the innovation of environmentally friendly firms? Evidence from China. Energy Econ. 103, 105582.
Dushnitsky, G., Lenox, M.J., 2006. When does corporate venture capital investmentcreate firm value? J. Bus. Ventur. 21 (6), 753–772.
Dushnitsky, G., Yu, L., 2022. Why do incumbents fund startups? A study of the antecedents of corporate venture capital in China. Res. Policy 51 (3), 104463.
Ewens, M., Rhodes-Kropf, M., 2015. Is a VC partnership greater than the sum of its partners? J. Financ. 70 (3), 1081–1113.
Faccio, M., 2006. Politically Connected Firms. Am. Econ. Rev. 96, 369–386.
Francis, B., Hasan, I., Liu, L., Wu, Q., Zhao, Y., 2021. Financial analysts' career concerns and the cost of private debt. J. Corp. Financ. 67, 101868.
Gompers, P.A., Lerner, J., 2001. The Money of Invention: How Venture Capital Creates New Wealth. Harvard Business Press, Boston, MA.
Gompers, P.A., Lerner, J., 2004. The venture capital cycle. MIT press.
Gorman, M., Sahlman, W.A., 1989. What do venture capitalists do? J. Bus. Ventur. 4 (4), 231–248.
Grilli, L., Murtinu, S., 2014. Government, venture capital and the growth of European high-tech entrepreneurial firms. Res. Policy 43 (9), 1523–1543.
Guan, J., Yam, R.C.M., 2015. Effects of government financial incentives on firms' innovation performance in China: Evidence from Beijing in the 1990s. Res. Policy 44 (1), 273–282.
Guerini, M., Quas, A., 2016. Governmental venture capital in Europe: Screening and certification. J. Bus. Ventur. 31 (2), 175–195.
Guo, D., Guo, Y., Jiang, K., 2016. Government-subsidized R&D and firm innovation: Evidence from China. Res. Policy 45 (6), 1129–1144.
Heckman, J.J., Ichimura, H., Todd, P.E., 1997. Matching as an econometric evaluation estimator: Evidence from evaluating a job training programme. Rev. Econ. Stud. 64 (4), 605–654.
Hellmann, T., 1998. The allocation of control rights in venture capital contracts. Rand J. Econ. 57–76.
Hellmann, T., Puri, M., 2002. Venture capital and the professionalization of start-up firms: empirical evidence. J. Financ. 57, 169–197.
Hochberg, Y.V., Ljungqvist, A., Lu, Y., 2007. Whom you know matters: venture capital networks and investment performance. J. Financ. 62 (1), 251–301.
Hochberg, Y.V., Ljungqvist, A., Vissing-Jørgensen, A., 2014. Informational holdup and performance persistence in venture capital. Rev. Financ. Stud. 27 (1), 102–152.
Jia, N., Huang, K.G., Man Zhang, C., 2019. Public governance, corporate governance, and firm innovation: An examination of state-owned enterprises. Acad. Manag. J. 62 (1), 220–247.
Kaplan, S.N., Stromberg, P., 2001. Venture capitalists as principals: contracting, screening, and monitoring. Am. Econ. Rev. 91, 426–430.
Kaplan, S.N., Stromberg, P., 2003. Financial contracting theory meets the real world: an empirical analysis of venture capital contracts. Rev. Econ. Stud. 70 (2), 281–315.
Kaplan, S.N., Stromberg, P., 2004. Characteristics, contracts and actions: evidence from venture capitalists' analyses. J. Financ. 59 (5), 2177–2210.
Ke, B., Wang, L., 2020. Mixed ownership and firm performance: Evidence from the Chinese venture capital industry. Emerg. Mark. Rev., 100759
Khwaja, A.I., Mian, A., 2005. Do lenders favour politically connected firms? Rent provision in an emerging financial market. Q. J. Econ. 120, 1371–1411.
Kortum, S., Lerner, J., 2000. Assessing the Contribution of Venture Capital to Innovation. Rand J. Econ. 31 (4), 674–692.
Kovner, A., Lerner, J., 2015. Doing well by doing good? Community developmentventure capital. J. Econ. Manag. Strategy 24 (3), 643–663.
Lang, M., Lins, K.V., Maffett, M., 2012. Transparency, liquidity, and valuation: International evidence on when transparency matters most. J. Account. Res. 50 (3), 729–774.
Lazzarini, S.G., 2015. Strategizing by the government: Can industrial policy create firm-level competitive advantage? Strateg. Manag. J. 36 (1), 97–112.
Lazzarini, S.G., Mesquita, L.F., Monteiro, F., Musacchio, A., 2020. Leviathan as an inventor: An extended agency model of state-owned versus private firm invention in emerging and developed economies. J. Int. Bus. Stud. 1–35.
Leleux, B., Surlemont, B., 2003. Public versus private venture capital: seeding or crowding out? A pan-European analysis. J. Bus. Ventur. 18, 81–104.
Lerner, J., 1995. Venture capitalists and the oversight of private firms. J. Financ. 50, 301–318.
Lerner, J., 1999. The government as venture capitalist: the long-run impact of the SBIR program. J. Bus. 72 (3), 285–318.
Lerner, J., 2002. When bureaucrats meet entrepreneurs: the design of effective public venture capital programmes. Econ. J. 112, F73–F84.
Lerner, J., 2009. The Empirical Impact of Intellectual PropertyRights on Innovation: Puzzles and Clues. Am. Econ. Rev. 99 (2), 343–348.
Li, X., Liu, X. and Wang, Y., 2015. A Model of China's State Capitalism. Available at SSRN: ⟨https://ssrn.com/abstract= 2061521⟩.
Mason, C., Brown, R., 2013. Creating good public policy to support high-growth firms. Small Bus. Econ. 40, 211–225.
Milosevicet, D., Shleifer, A., Vishny, R., W., 1997. A Survey of Corporate Governance. J. Financ. 52 (2), 737–783.
Nguyen, G., Vu, L., 2021. Does venture capital syndication affect mergers and acquisitions? J. Corp. Financ. 67, 101851.
Samila, S., Sorenson, O., 2010. Venture capital as a catalyst to commercialization. Res. Policy 39 (10), 1348–1360.
Sapienza, P., 2004. The effects of government ownership on bank lending. J. Financ. Econ. 72, 357–384.
Smith, J.A., Todd, P.E., 2005. Does matching overcome LaLonde's critique of nonexperimental estimators? J. Econ. 125 (1-2), 305–353.
Sobel, M.E., 1982. Asymptotic confidence intervals for indirecteffects in structural equation models. Sociol. Methodol.
Sorensen, M., 2007. How smart is smart money? A two-sided matching model of venture capital. J. Financ. 62 (6), 2725–2762.
Suchard, J.A., Humphery-Jenner, M., Cao, X., 2021. Government ownership and venture capital in China. J. Bank. Financ. 129, 106164.
Sun, Y., Cao, C., 2018. The evolving relations between government agencies of innovation policymaking in emerging economies: A policy network approach and its application to the Chinese case. Res. Policy 47 (3), 592–605.
Tian, X., 2012. The Role of Venture Capital Syndication in Value Creation for Entrepreneurial Firms. Rev. Financ. 16 (1), 245–283.
Wallsten, S.J., 2000. The effects of government-industry R&Dprograms on private R&D: the case of the Small Business Innovation Researchprogram. RAND J. Econ. 82–100.
Wang, J., 2018. Innovation and government intervention: A comparison of Singapore and Hong Kong. Res. Policy 47, 399–412.
Wang, R., Wu, C., 2020. Politician as venture capital: politically-connected VCs and IPO activity in China. J. Corp. Financ. 64, 1–31.

Wei, S., Xie, Z., Zhang, X., 2017. From "Made in China" to "Innovated in China": Necessity, Prospect, and Challenges. J. Econ. Perspect. 31 (1), 49–70.
Zhang, Y., Mayes, D.G., 2018. The performance of governmental venture capital firms: A life cycle perspective and evidence from China. Pac. -Basin Financ. J. 48, 162–185.
Zhou, K.Z., Gao, G.Y., Zhao, H., 2017. State ownership and firm innovation in China: An integrated view of institutional and efficiency logics. Adm. Sci. Q. 62 (2), 375–404.