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Contesting coercion: U.S.-China strategic competition, the middle technology trap, and Chinese government-guided funds

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Abstract

This study examines the possible emergence of a Middle Technology Trap (MTT) in U.S.-China strategic competition through the lens of the Global Financial Network (GFN) and the Global Innovation Network (GIN). By conducting doctrinal analysis, theoretically informed case studies, and in-depth interviews, we offer a granular study into how the U.S. has been weaponizing its leading position in the GFN to affect China's level of participation in the GIN. Our findings reveal three U.S. tactics to induce the MTT with China: first, leveraging U.S. private equity and venture capital (PEVC) to enhance its technology advantage over China; second, pushing U.S. investors to withdraw from China's PEVC market, thereby restricting Chinese access to American capital; and third, inducing Advanced Business Services (ABS) supporting innovation and global business to cease or reduce their operations in China, thereby increasing intermediation costs for innovation. Although Chinese government-guided funds (GGFs) have managed to partially mitigate the "funding gap" from the departure of American PEVCs, they have yet to assume the brokerage role previously played by American PEVCs in both the GFN and the GIN. As such, our study contributes to a better understanding and theoretical advancements of the MTT by linking up the scholarship of innovation and finance with financial statecraft.

Keywords: U.S.-China strategic competition, Government-guided fund, Middle technology trap, Global financial network, Global innovation network

Introduction

Over the past year, a growing body of literature dealing with the phenomenon of the Middle Technology Trap has emerged in China (Zheng 2023). This concept is partially extended from the well-known hypothesis of the "Middle Income Trap" to the new front of technology (Kharas and Kohli 2011; Frey, 2019). The argument is that China has rapidly advanced up the global value chain through the global relocation of technology production in mature sectors. This process, often described as moving from "1 to n", involves "taking" foreign core technologies, "transacting" external critical components, and "making" global scientific communities (Kennedy 2018). However, for China to achieve the next level of technological superiority, it must shift its focus from "simply adding more"

of “what already knows elsewhere” (e.g. U.S.) to pioneering “creation of something for the first time”, a process known as moving from “0 to 1” (Thiel and Masters 2014).

While this concept of “Middle Technology Trap” does not explicitly mention the role of the United States, it implicitly points to the “choke points” that the U.S. may exert in the “new era of great-power competition” with China (Allison 2020). This concern points to a bi-partisan determination to maintain the absolute lead of the U.S. in emerging technologies and cutting-edge sectors, leading to hardline measures that weaponize its leading position in the Global Financial Network – GFN (Brenner et al. 2013) to deter private capital investments in Chinese technology companies and startups within the Global Innovation Network—GIN (Lai 2018). These actions may further induce the “Middle Technology Trap” for China, potentially preventing it from progressing beyond mid-tech industries and achieving breakthroughs in cutting-edge technologies (The White House 2022).

The detrimental effects of financial barriers on innovation is well documented in the current literature of finance and innovation (Aizenman and Kendall 2012; Chen and Wang 2021). Classical literature by Hall and Lerner articulates the contribution of private equity and venture capital (PEVC) to research and development (R&D), with the number of patents as a key measurement (Hall and Lerner 2010). This subsequently led to a debate among scholars regarding the causal relationship between PEVC and innovation—whether PEVC induces more innovation or innovation spurs demand for PEVC (Hirukawa and Ueda 2011; Popov and Rosenboom 2012; Faria and Barbosa 2014). More recent studies have moved beyond this argument by introducing a third dimension of “growth”, considering the collective impact that financing constraints may have on a nation’s economic development (De Mel et al. 2009; Ang 2010). Built on this school of thoughts, Agénor and Canuto articulated the “lack of finance” as a source of the Middle-Income Trap, highlighting the role of technology, innovation, and finance in the discourse (Agenor and Canuto 2017). The narrative is particularly well-received in China, given the nation’s move into “innovated in China” from “made in China” (Wei et al. 2017). Scholars widely agree that the persistent misallocation of resources centred around state-owned firms, poses a structural impediment to China’s newly pursuit of high-quality growth (Rithmire et al. 2023). Xu further provided a China specific topology for the government guided funds (GGFs), breaking down into return-driven and policy-driven (Xu 2024). Yuen and others have also supported these findings, highlighting the GGFs’ lack of quality private and public partnerships, challenges in anticorruption campaigns and frequent leadership turnover, and difficulties in evaluating their performance (Wei et al. 2023). However, a significant gap in the existing literature lies in the under-exploration of a geopolitical dimension of China’s financing of innovation, especially considering that a substantial portion of return-driven PEVC in China originates from a nation that regards China as an adversary (Fuest et al. 2024).

The aim of this article therefore is to examine the impact of U.S. financial statecraft (Steil and Litan 2006) to keep China in the “middle technology trap”, which aims to discourage American private funds flowing into Chinese tech companies, and assess the potential mitigating effects of China’s GGFs in addressing the departure of U.S. PEVC from China. These include sanctions on listed Chinese companies with dual-use technology in capital markets, congressional restrictions on U.S. private investments in

emerging tech sectors, and denial of market access for Chinese unicorns. We argue that the non-financial advantages offered by U.S. PEVC, such as the brokerage role played by U.S. PEVC in the GIF and the GIN are as just crucial as the fund itself. While China's GGFs may be able to fill the immediate funding gap, they nevertheless fall short in assuming the brokerage role currently held by U.S. PEVC. Therefore, the concept of the "Middle Technology Trap" contributes significantly to the study of innovation and finance by highlighting the geopolitical aspect (Farrell and Newman 2023).

The article is structured as follows. This study first conceptualizes how the "Middle Technology Trap" is situated within the context of geopolitics and its interplay with financial statecraft. It then examines PEVC investments in Chinese tech companies, particularly focusing on the role of China's GGFs before and after the U.S. coercive policy. Finally, the article concludes by presenting main findings about China's efforts to escape the "Middle Technology Trap".

The rise of the middle technology trap in U.S.-China strategic competition

Technology as a new geopolitical battlefield

Technology has emerged as a defining element of American latest strategic competition with China, linking many facets of the great-power rivalry in the new era (Allison et al. 2021; Schmidt 2023; Chen et al. 2020). Looking back to the U.S.—China bilateral relationship, technology, along with trade and investment, was once considered a ballast of the relationship, providing a steady foundation for cooperation and mutual benefit (Wu, 2010, Zhang and Xu 2019). The U.S.-China Science and Technology Agreement was the first bilateral deal signed in 1979 after the U.S. and the PRC formally recognized each other in diplomatic relations, a longtime symbol of cooperation in the relationship (Wagner and Simon 2023). As part of the U.S. strategy to build ties with China in countering Soviet influence, the agreement served as a significant channel for collaboration, academic exchange, joint innovation, and economic interdependence. Through technology transfers, shared research, and market access, both countries leveraged their strengths to their respective advantage. During the Obama administration, the scope of science and technology cooperation between the two countries expanded to more frontier fields, such as climate, health, and energy (IF12510 2023).

In recent years, however, the landscape of U.S.-China scientific cooperation has shifted dramatically, especially concerning the "high technology" (Petry 2024). The congressional criticism and subsequent hurdles around the renewal of the U.S.-China S&T agreement have highlighted a fundamental departure from the earlier decades of scientific collaboration and engagement, underscoring the deepening mistrust and recalibration of priorities on both sides. Traditionally, the U.S. has been viewed as the global hub of innovation, especially in advanced technology sectors. However, China has demonstrated considerable progress as a first mover in several areas, challenging the long-standing American technological hegemony. The first shift was observed in China's rapid development and global deployment of 5G technology, a subject area that could give China considerable leverage in matters of global communications and data flow.

In assessing the degree of expansion from rising power, the arena of quantum computing is a battleground where nations that achieve a breakthrough in this field first may gain access to unprecedented computing power, affecting everything from cryptography

to complex systems modeling, with profound implications for national security and economic competitiveness (Lee 2022). Similarly, biotechnology is another field where the race is on the verge of dominance. As seen in the COVID-19 pandemic, these advances in biotechnology could translate into massive public health benefits and economic gains, and potential military applications. Competition extends to the clean energy domain. With the global shift toward sustainability, leadership in clean energy technology, such as electric cars, not only generates economic benefits but also shapes energy policies and dependencies worldwide. In each sector, the U.S. and China are not only competing to dominate the technological landscape but are also racing to set international standards and norms. The outcome of this rivalry may determine the future direction of global innovation, economic power structures, and geopolitical alliances (Gertz and Evers 2020).

First, the articulation of technology in the U.S.-China strategic competition reflects pre-emptive actions for a potential Cold War 2.0, in which AI, quantum computation, and microchips are considered the new generation of nuclear power that set the scene for the original cold war. This perspective is observed with the selective step-up of U.S. containment on Chinese technology, which thus far targets only the most advanced and pivotal sectors. This strategic maneuvering of a “small yard and high guard” aims not to completely decouple technological ties across all sectors but to curtail China’s pivot to most critical, high-impact areas while still allowing for engagement and potential collaboration in other established fields, including intellectual property transfer (Schindler et al. 2023).

Second, the dual-use nature of technology underscores its untapped potential, not only for national security but also for driving economic growth, thus enjoying a multiplier factor that nuclear does not have. Consequently, the quest for technological leadership transcends a strategic imperative. For example, the emergence of artificial intelligence is a case of this duality: on the one hand, it propels advancements in production efficiency to spur economic advantage; on the other hand, it equips nations with sophisticated capabilities in autonomous weapon systems and surveillance, extending their military reach and reshaping defense strategies (Capri 2024; Evans 2020).

Third, the competition in technology is closely linked to a test of governance models and, to a certain degree, an ideological struggle over the future direction of the global order, with both nations investing heavily not only in development but also in shaping global norms and standards that will govern the use of technology (Segal 2020; Zhao et al. 2021). A further concern is the political China Shock, which pulls the U.S. from the liberal model in the technology sector (Gräf and Schmalz 2023). As illustrated by Anu Bradford, the rise of techno-nationalism and the bifurcation of the global tech landscape threaten to undo the prevailing norms of international cooperation and market liberalism, ushering in a new era of “geo-technological rivalry” (Kennedy 2019; Lilkov 2020; Malkin 2020; Polyakova and Meserole 2024). From this perspective, technological innovation has split into separate empires, deducing into a zero-sum game and reorganizing the prevailing rules governing capitalism (Bradford 2023).

Lastly, the U.S.-China Technological Rivalry extends to private multinational tech giants with Chinese roots, with far-reaching effects. From a push perspective, Chinese tech giants have the capability to leverage their platforms and social media to influence

democratic discourse, bolster surveillance, and disseminate propaganda both domestically and internationally (Feldstien 2023). On the other hand, from the pull perspective, the increasingly blurred line between Chinese tech firms and state-led capitalism has led to a growing trust deficit and international backlash (Pearson et al. 2022; Shirk 2022).

Placing PEVC in the GIN

The geopolitical implications of PEVC activities have only recently come to light, particularly in the context of the U.S.-China power rivalry (Coe et al. 2014). As PEVC firms increasingly act as investment vehicles for disruptive technology and cutting-edge innovation, their influence extends beyond economics to include international relations and national security. The decision for PEVC from a leading techno hub to allocate funding to an emerging nation extends beyond mere market forces, affecting national policies, international collaborations, and ultimately the balance of power in the global technological arena. Thus, the influence of such investments extends beyond economic space to geopolitics.

Over recent decades, globalization has fostered the creation of three intertwined networks: the global production network (GPN), dedicated to manufacturing; the GIN, aimed at technological advancement; and the GFN, which finances the first two (MacKinnon, 2011; Rudd, 2018). The GIN originated from the international expansion of research and development by multinational corporations, which began by dividing innovative activities among the corporations themselves but has since evolved to include collaboration between multiple firms coordinated and governed by multinational corporations (MNCs).

More recently, the concept of GINs has been broadened to encompass early-stage startups. In this expanded network, PEVC has increasingly assumed the role traditionally held by MNCs, acting as the brokerage role of co-innovation across international borders (Lee et al. 2000). This involves not only the creation but also the capture and transfer of value in a global context, indicating a shift in the dynamics of global technological advancement and commercialization. Prior research also found that U.S. PEVC, especially those in Silicon Valley, has a distinctive brokerage role in innovation through its interaction with other institutions, places, and actors through complex social networks.

In the same vein, the strategic role of U.S. PEVCs for China is built on a networked approach to financing and innovation, allowing Chinese tech companies to directly integrate into the GIN without being subsidiaries of MNCs. On the one hand, PEVCs require Chinese manufacturing capabilities in the GIN to benefit their prospective American startups. On the other hand, PEVCs can apply their knowledge of the innovation cycle to bring successful U.S. startup models into the Chinese market, albeit with necessary adaptations. This leads to a cycle in which knowledge creation, advanced manufacturing, and capital flows between the countries.

The strategic emphasis of PEVC on high-risk, high-return investments can spur innovation in disruptive technologies, which can have wide-ranging socioeconomic effects. These outcomes have not gone unnoticed by policymakers in China and the U.S. Concerns arise from the trajectory of U.S. investments into Chinese companies that, after growing and innovating with the aid of American capital, seek to realize their value through exits in U.S. capital markets. This cycle creates a complex web of

interdependencies and vulnerabilities, reflecting the interconnected nature of the global innovation economy. The potential for such investments to influence not just market trends but also broader geopolitical dynamics has led to heightened scrutiny of cross-border PEVC activities and their long-term implications.

U.S. financial statecraft to contain high technology of China

Acknowledging the pivotal role of PEVC within the GIN, the Biden Administration has put into action a series of strategic measures to contain cross-border investment flows with China. These actions are tailored in a way not just to counter the emerging challenges posed by Chinese technological expansion but also to maintain America's leadership and competitive stance in global technological innovation (Farrell and Newman 2019).

In terms of U.S. outbound investment, the Executive Order named "Addressing United States Investments in Certain National Security Technologies and Products in Countries of Concern" (hereinafter as the Executive Order or the Order) establishes a regulatory framework for monitoring and reporting investment deals with the purpose to limit U.S. funding into advanced technology development in China. With an aim to stop "exploiting U.S. investments" to product "sensitive technologies critical to military modernisation", this Order instructs the Treasury Department to target three key sectors, namely semiconductors and microelectronics, quantum information technologies, and certain artificial intelligence systems (U.S. Department of the Treasury 2021).

Compared to the Executive Order "Addressing the Threat from Securities Investments That Finance Communist Chinese Military Companies" under the Trump Administration, there are three notable shifts (Swanson 2020). First, it broadens the scope of scrutiny from portfolio investments in capital markets to funding and investments in private markets (Hanemann et al. 2022). Second, the Order explicitly distinguishes investment with a high possibility of "intangible benefits" from U.S. PEVC funds, especially around resources extended to Chinese start-ups in the GIN. Passive financial investments through index funds, mutual funds, and exchange-traded funds are currently exempted from scrutiny. This approach explicitly recognizes the brokerage role PEVCs have brought to Chinese start-ups and implicitly decouples China from the GIN. Third, the Order broadened the target of investment restrictions to include not just mature dual-use technologies and the nascent wave of innovative technologies. This approach is intended to restrain the influx of U.S. funding into Chinese companies, particularly smaller firms striving to commercialize groundbreaking technologies. By focusing on these emerging entities and private funding avenues, the restrictions on U.S. outbound investments not only aim to maintain the U.S.'s technological lead over China but also to strategically increase the gap by containing the growth of Chinese startups from the outset.

In addition to limiting outbound investments into Chinese technology, the Bureau is also controlling inbound investment in American technology firms from China, especially in sectors critical to national security. By enhancing the Committee on Foreign Investment in the United States (CFIUS)'s purview, the Executive Order "Ensuring Robust Consideration of Evolving National Security Risks by CFIUS" now explicitly includes the consideration of "sensitive technologies and intellectual property" potentially transferred to or controlled by Chinese entities in its review of foreign investments.

This order, the first since CFIUS's inception to offer presidential guidance on transaction review risks, has twofold implications. It explicitly delineates "protecting U.S. technological leadership" in fields such as microelectronics, AI, biotechnology, quantum computing, and clean energy as a matter of national security. Moreover, this underscores the need to consider cybersecurity risks, industry investment trends, and the risks to Americans' sensitive data when conducting foreign investment assessments.

Moreover, it should be noted that Hong Kong and Macau, two special administrative regions of China, are also included along mainland China as the "Countries of Concern" under this Executive Order, limiting further leverage of Hong Kong's super connector role in the GFNs to break the technological wall. For Hong Kong, this measure marks a deny of Hong Kong's differential treatment from mainland China, despite the Department of State 2023 Investment Climate Statements still consider Hong Kong as an international financial center with non-interventionist economic policies, complete freedom of capital movement and a well-understood regulatory and legal environment. This measure reflects part of the Biden administration's comprehensive strategy to contain China's catch-and-lead into advanced technology, deploying every available resource, including a cut-off from global financial and innovation networks.

Apart from offensive statecraft in crowding out investments from China's tech sectors, the National Defense Authorization Act in 2023, also reflected U.S. increased attention the U.S. paid to leverage defensive statecraft in crowding out new private investment into sectors in which U.S. is competing with China. On the one hand, the NDAA specifically request U.S. intelligence community through the Intelligence Authorization Act to increase the oversight of "China's investments in artificial intelligence, next-generation energy technologies, and biotechnology" among others. On the other hand, the Office of Strategic Capital (OSC) within the Department of Defense (DoD) was mandated to leverage U.S. comparative advantage in capital markets to attract and scale private capital investment into 14 component-level critical technology essential for national security.

In accordance with Sec. 901, the OSC shall devise capital strategies, among others, to attract and scale private capital investments into critical technology areas essential for national security. This move underscores American strategic effort to leverage its comparative advantages in capital markets to support the critical technology supply chains required by the DoD. The key financial tools are to leverage government capital allocation such as loans and loans guarantees to lower the cost of capital, extend the repayment or liquidity timeline, and provide credit enhancements to support the commercialization of earlier critical component technology and scaling production of later critical component technology, both focusing on transitioning technology into military capacities. Through a partnership with the U.S. Small Business Administration (SBA) through the Small Business Investment Company program, Critical Technology funds are eligible for loan guarantees for early-stage investments in identified critical technologies.

In short, these legislation and executive orders not only challenge China's ambition in the high-tech ambition but also constrict its technological progress by reshaping global capital flows. This underscores a more assertive shift in an attempt to "crowd out" Chinese tech firms from accessing investment opportunities. Concurrently, it "crowds in" U.S. private capital, thereby reinforcing American innovation and market share. For China, such legislative developments signal a tightening squeeze in the technological

US PE/VC Investments in China

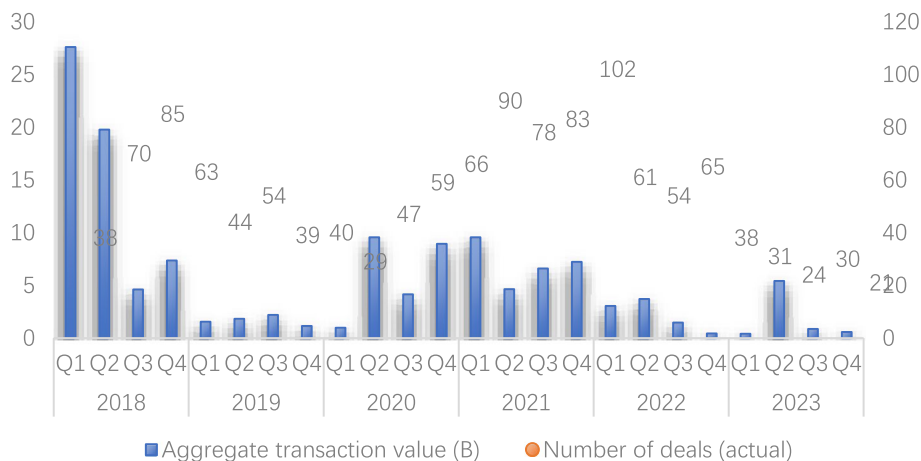


Fig. 1 U.S. PEVC investments in China (2018–2023). Analysis from S&P Global Market Intelligence data compiled on 7February 2024, including global whole-company acquisitions, minority stake acquisitions, asset acquisitions and rounds of funding announced between 2018 and 2023, where the target is headquartered in China and the buy/investor is or includes a private equity or venture capital firm headquartered in the U.S.; <https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/private-equity-investment-in-china-in-5-year-decline-80536405>

arena, prompting a need for strategic recalibration to safeguard its interests and maintain its trajectory toward becoming a global leader in science and technology.

China’s pivot to government-guided funds

The U.S. retreat investors and ancillary services providers in China

The above-mentioned economic coercion has substantially disrupted China’s PEVC market, as evidenced by the pullback of U.S. investments. Historically, the U.S. PEVC accounts for one-third of global investment inflows into China’s PEVC market, in terms of aggregate transaction volume and deal numbers. However, such funding in 2022 has dropped 72% from its peak in 2018, accounting for less than 10% of global allocation in China.¹ Early indicators have also revealed that this drop will be further reduced to 1% of the Chinese PEVC market in 2024, as illustrated in the Fig. 1.

This shift is partly because U.S. PEVC investments in China have recently focused heavily on advanced technologies. These sectors, such as artificial intelligence, big data, biomedicine, and robotics, have faced restrictions from the Biden Administration. Similar investment patterns can be seen in Chinese PEVC stakes in AMERICAN startups, which also target high-tech industries. These changes can be attributed to rising costs associated with regulatory compliance, stricter government oversight and a worsening political relationship between the two countries.

The high-profile release of executive orders targeting deterring no other nation but China also generates a ripple effect or generates psychological fear that affects investors’ assessment of compliance risk and changes the fundamental risk appetite of a wider

¹ Private equity investment in China in 5-year decline, <https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/private-equity-investment-in-china-in-5-year-decline-80536405>, 28 February 2024.

Fund Raising Trend in China's Equity Investment Market, 2012-2022 (including early stage investment, VC, and PE)

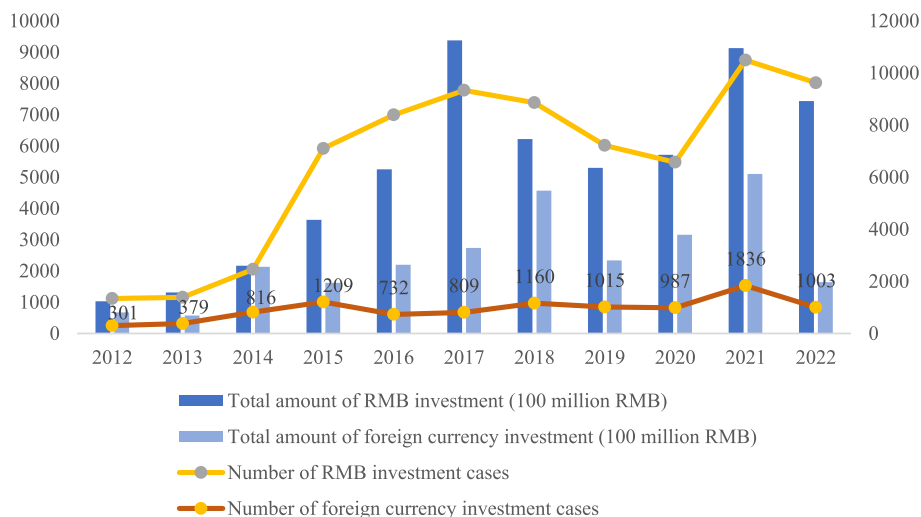


Fig. 2 China equity market fund raising trends over the years. Source of data for Figs. 2 and 3: China Equity Investment Market Research Report 2022 by Zero2IPO Research Center

group of investors regarding China.² Although the United States’ regulatory limitations for outbound investments to China are specific to certain sectors, the overall sentiment among U.S. institutional investors has been affected by the geopolitical tensions and subsequent regulatory responses from Beijing. As a result, their overall investment appetite in China declined sharply, falling to a historical low of 3% from a peak of 58% in 2018.³ Similar trends can be observed through the lens of China’s equity investment market, where the data demonstrate a steady increase in equity investments and fundraising in the RMB and a decline in equity investments and fundraising in foreign currencies, i.e., the U.S. dollar, as unveiled in Figs. 2 and 3.

Furthermore, the prohibition or mandatory notification of outbound investments through U.S. Persons has triggered a wave of spin-off of U.S. PEVC firms from their Chinese business. Two of the five U.S. VC firms investigated by the U.S. Congress, have taken the lead in splitting up their operations. Sequoia Capital split up its operation with U.S. team held onto its brand and the China operation as Hongshan, the Chinese spelling of Sequoia in mandarin.⁴ GGV Capital, another U.S. PEVC firms focusing on AI technologies, went one step further to abandon both of its U.S. and Asia brand names, recreating Granite Asia in Singapore and Notable Capital in the U.S., after being name

² On file with authors, Interview with leading PEVC firm data base provider and Chief Investment Officers.

³ As China woes mount, investment banks brace for more Asia job cuts, February 9, 2024, <https://www.reuters.com/world/asia-pacific/china-woes-mount-investment-banks-brace-more-asia-job-cuts-2024-02-09/>; Bank of America cuts 20 staff in Asia, China-focused bankers affected most- sources, <https://www.reuters.com/business/finance/bank-america-cuts-20-investment-bankers-asia-sources-2024-01-23/>; Morgan Stanley Weighs Cutting 7% of Asia Investment Bank Jobs, May 16, 2023, <https://www.bloomberg.com/news/articles/2023-05-16/morgan-stanley-weighs-cutting-7-of-asia-investment-bank-jobs>

⁴ Neil Shen plots global expansion for Sequoia’s China spin-off, Financial Times, 13 October 2023, <https://www.ft.com/content/6e3b6905-0b0f-4215-80a4-4082cb899966>

Currency Distribution of Fund Raising in China's Equity Investment Market, 2012-2022 (Including Early Stage Investment, VC, and PE)

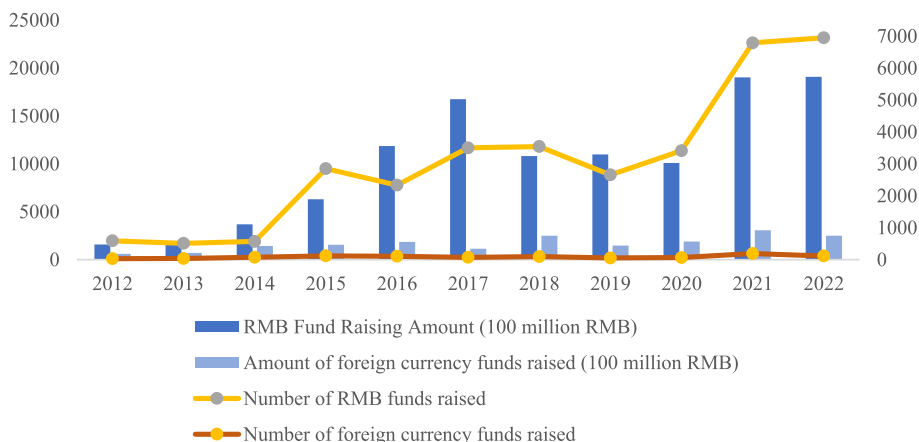


Fig. 3 China equity market fund investment trends over the years. Source of data for Figs. 1 and 2: China Equity Investment Market Research Report 2022 by Zero2IPO Research Center

shamed by a Congressional leader.⁵ This private decoupling in term cut off U.S. investors and Chinese start-ups into two parallel investment logics—U.S. arms for U.S. funds to invest in ex-China start-ups with U.S. capital market IPOs as a primary exit route, and Chinese arms for Chinese funds to invest in non-U.S related start-ups with Singapore and Hong Kong IPOs as the primary exit routes.⁶

These reputational and deterrence effects induced by the financial “iron curtain” not only implicate targeted PEVC firms but may also generalize to broader categories, such as ancillary firms that share similar business portfolios and coverage scope as American PEVC, illustrated in Table 1. The collateral damage from the U.S. investment bans and screening goes further to law firms, investment banks, and accounting firms that support the investors. In accordance with the data collected throughout 2023 to the 1Q24, law firms focusing on capital markets and financial sectors are negatively impacted, with multiple firms deciding to close their offices across Shanghai, Beijing, and Hong Kong, with some firms moving to reduce staffing or downsizing their firms. Although the Big 4 accounting firms are less affected as a whole, staff have undergone unpaid leave due to a shortage of overseas-originated businesses, with purely domestic business often directed to local firms.

Rising homegrown VC market and government-guided funds in China

The evolution of China’s venture capital market is marked by three stages over the past three decades, starting with state-led initiatives to embracing foreign investment and

⁵ GGV Capital is no more, as partners announce two separate brands, 1April 2024, <https://techcrunch.com/2024/03/31/ggv-capital-is-no-more-as-partners-announce-two-separate-brands/>

⁶ Select Committee Launches Investigations into U.S. Venture Capital Firms Funding Problematic PRC Companies, <https://selectcommitteeontheccp.house.gov/media/press-releases/select-committee-launches-investigations-us-venture-capital-firms-funding>

Table 1 Impact on downstream U.S. professional services in China^d

Location	Impacted downstream U.S. professional and services in China Closure Staff Reduction* Office Downsizing**		
	Investment Banks ^a	Law Firms ^b	Accounting Firms ^c
Shanghai	Norges Bank Investment Management Vanguard	Latham and Watkins, Perkins Coi Orrick Weil Sidley Austin Ropes Grey* Kirkland* Linklaters*	Deloitte (Unpaid Leave)
Beijing	Lazard Warburg Pincus*	Weil Proskauer Rose Akin Gump	Deloitte (Unpaid Leave)
Hong Kong	Ontario Teachers' Pension Plan Trikon Asset Management Ltd Private Capital Bank of America* UBS* Goldman Sachs* Morgan Stanley* JP Morgan* Citi*	Winston & Strawn Orrick Kirkland & Ellis* Dechert* Norton Rose Fulbright* Mayer Brown* Deacon** DLA Piper**	KPMG (legal affiliate) EY (legal affiliate) PricewaterhouseCoopers (Unpaid Leave)

^a Vanguard dismantles last China team, November 3, 2023, <https://chinaeconomicreview.com/vanguard-dismantles-last-china-team/>

^b Hong Kong Law Firms Cut Office Space in Blow to Business Hub, 4 March 2024, <https://www.bloomberg.com/news/articles/2024-03-04/hong-kong-law-firms-cut-office-space-in-new-blow-to-business-hub>; Kirkland Lays Off Capital Markets Lawyers in Greater China; 4 March 2024, <https://www.law.com/international-edition/2024/03/04/https://www.law.com/radar/card/kirkland-lays-off-capital-markets-lawyers-in-greater-china-378-241414/>; China Dealmaking Slump Leads to Layoffs at International Law Firms, <https://super.news/en/articles/2024/03/13/china-dealmaking-slump-leads-to-layoffs-at-international-law-firms>

^c PwC staff told to go on leave amid IPO slump, 9 December 2023, <https://www.thestandard.com.hk/section-news/section/2/258576/PwC-staff-told-to-go-on-leave-amid-IPO-slump>;

^d Table compiled from the below media reports: Hong Kong Law Firms Cut Office Space in Blow to Business Hub, 4 March 2024, <https://www.bloomberg.com/news/articles/2024-03-04/hong-kong-law-firms-cut-office-space-in-new-blow-to-business-hub>; Kirkland Lays Off Capital Markets Lawyers in Greater China; 4 March 2024, <https://www.law.com/international-edition/2024/03/04/https://www.law.com/radar/card/kirkland-lays-off-capital-markets-lawyers-in-greater-china-378-241414/>; China Dealmaking Slump Leads to Layoffs at International Law Firms, <https://super.news/en/articles/2024/03/13/china-dealmaking-slump-leads-to-layoffs-at-international-law-firms>; Once High-Flying Bankers in Hong Kong Become a Lost Generation, March 23, 2024, <https://www.bloomberg.com/news/features/2024-03-24/hong-kong-bankers-with-china-experience-face-grim-reality-after-layoffs-cuts>; Weil exits Beijing and set to close Shanghai office, 4 April 2024, <https://law.asia/weil-office-consolidation-china/>

subsequently fostering government-led funds (Pan and Liu, 2023). The rise of China's homegrown venture capital, private or state-owned, reflects a significant capacity for adopting the model of VC and deal structuring, yet it still confronts persistent challenges in facilitating integration into the global value chain, a hurdle that becomes more pronounced against the backdrop of U.S.-China financial decoupling. This evolving investment landscape presents a critical juncture that may redefine China's trajectory to meet new demands from the tech sector in China.

The Chinese government began official support for venture capital, particularly for high-risk technological research and development, in 1985. This led to the State Council's 1991 proposal to create venture capital funds in high-tech zones, marking the state's pivotal role in the early stages of China's venture capital market. During the early stages of China's venture capital market, direct investment was dominant, with governments at all levels or SOEs setting up subsidiary investment companies to make venture capital

investments. During this early stage, the predominant challenge was the lack of venture capital regulations, business environments, and market systems. Consequently, these conditions pose difficulties for private capital attempting to enter the market, while the direct investment model involving state-owned capital lacks exit pathways, such as an IPO.

The development of China's venture capital began in 1998. The "CPPCC Proposal No. 1" triggered two years of venture capital "fever" and stimulated an increase in private capital.⁷ With the IDG capital and the State Scientific and Technological Commission, the first U.S-China joint venture capital began to pivot into China's capital market in 1992.⁸ With that breakthrough, a wave of joint VCs entered China, including the Walden Investment Group, which was identified by the U.S. congressional committee as a significant backer of Chinese AI companies and included one investment – Intellifusion that was blacklisted by the U.S. governments.⁹ During this time, the investment climate in China's VC market has significantly improved with new regulations like the Administration of Foreign-Invested Venture Investment Enterprises Provisions and SME Promotion Law.

The establishment of the first government-guided fund in 2002 marked a shift toward a more market-oriented approach, exploring the dual mechanisms of proactive government and effective markets.¹⁰ The Interim Measures for the Administration of Venture Capital Enterprises issued by 10 ministries and commissions in 2005 formally opened a new date for central and local governments to set up guidance funds for venture capital. In 2007, Shenzhen Venture Capital (SZVC) established the first government-guided fund in China, Suzhou.¹¹ This period saw the creation of various types of state-owned venture capital companies and guidance funds from central to local governments, which stimulated market growth. Subsequently, various types of state-owned venture capital companies and guidance funds have gradually emerged from central to local levels and stimulated the prosperity of the venture capital market. As a result, they began to play an active role in guiding the development of emerging industries and the transformation of scientific and technological achievements.

In general, there are two vehicles for state-owned capital to invest in tech start-ups under China's current legal framework. The first is the "state-owned direct investment" model in which the government completely controls equity or voting shares and directly makes investment decisions through state-owned entities. The second is the "state-owned indirect investment" model, whereby the government serves as a limited partner (LP) and entrusts professional investment institutions, e.g. the PEVC firms,

⁷ At the Ninth Plenary Session of the Chinese People's Political Consultative Conference (CPPCC) in March 1998, the motion on "Accelerating the Development of China's Venture Capital Business" was highly valued and listed as the "No. 1 Proposal." This proposal aroused a strong reaction in the theoretical community, the economics community and governments at all levels, and China's venture capital entered a period of steady development.

⁸ The Pacific Venture Capital Fund, a subsidiary of IDG Group, invested 20 million dollars and cooperated with the Science and Technology Commission to set up China's first Sino-U.S. venture capital enterprise, Pacific Technology Venture Fund-China, Inc., which was the predecessor of IDG Capital.

⁹ In June 1989, China Kezhao High Technology Co.,Ltd. was established with the approval of the State Council as the first Chinese-foreign joint venture capital company in China.

¹⁰ In 2002, Zhongguancun Venture Capital Guidance Fund was established with the capital of Zhongguancun Management Committee. The first government-funded fund with the nature of guidance formally landed in Zhongguancun.

¹¹ In 2007, SZVC set up the first government-guided sub-fund Suzhou International Development Venture Capital (SIDVC), which was the first government-guided venture capital fund in China.



Fig. 4 Changes in government-guided funds (2012–2022). Source of data for Fig. 4: China Equity Investment Market Research Report 2022 by Zero2IPO Research Center

to operate and make investment decisions on behalf of the LP. By devising this model, the state plays an “indirect” role as an investor in the tech market, acting as a shareholder or LP in the market. In some cases, indirect investment funds also adopt the mode of “sub-fund investment”, in which the “mother fund” invests in a “sub-fund”, who can take over the legal identity of the limited partner and, more importantly, the legal responsibilities of capital investment. With these flexible modes and other supportive policies, the last decade witnessed a state-driven investment tide peaked in 2016, as illustrated in the Fig. 4. By 2022, China had set up a total of 2,107 state-owned funds, with a target size of about RMB 12.84 trillion and a confirmed total contribution of about RMB 6.51 trillion. As illustrated in the Fig. 5.

There are several differences between the two models. Taking the source and scale of capital for example, the capital of the “state-owned direct investment” mainly comes from the government, whereas the state only partially and indirectly holds a share or an equity interest in the “state-owned indirect investment” model, thereby encouraging the participation of private capital. Regarding the mode of investment, state-owned direct investment invests directly with the visible hand, whereas “state-owned indirect investment” model, including the GGFs combines the visible hand” of the government with the “invisible hand” of the market. In the state-owned direct investment model, funds directly invest in enterprises to certify their quality, reduce information asymmetry, and primarily serve as a demonstration. On the other hand, in the “state-owned indirect investment” model, funds directly guide social capital to invest in partnerships and indirectly urges social capital to follow the investment through demonstration and output effects. As financial instruments for promoting scientific and technological innovation, both approaches attempt at addressing market failures, nurturing innovative and

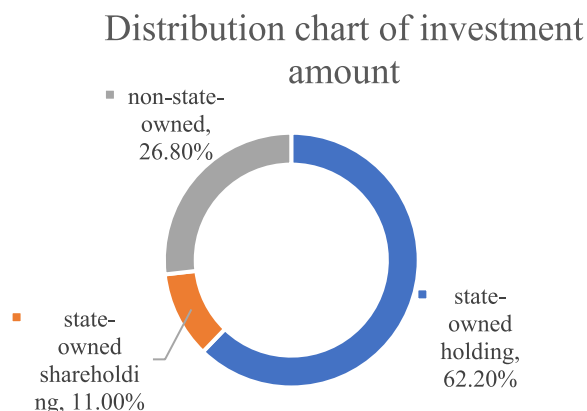


Fig. 5 Distribution of state-owned attributes of LPs of newly raised RMB funds in China's equity investment market, 2022. Data source: Zero2IPO Research Center, February 2023, "Zero2IPO 2022 Annual Inventory: 120 Newly Established Government Guided Funds, Consolidation and Optimization Becoming the Norm"

high-tech enterprises, and promoting basic research and the transformation of scientific and technological achievements.

Can the government guided funds pull china out of the middle technology trap?

In recent years, the GGFs received particular interest and has become a crucial pillar in China's PEVC market, taking a driver's seat in the middle of the withdrawal of U.S. private funds. In the first half of 2023, state-controlled and state-owned LPs' combined disclosed capital contributions¹² accounted for 73.2% of newly raised RMB funds, with 62.2% of state ownership.¹³ Scholarly discourse often highlights the inefficiency of state-owned PEVC in China as well as the dichotomy between private and state-owned firms in the domestic context, but it tends to overlook the strategic imperative for GGFs to capitalize on their potential in providing intangible benefits to Chinese tech firms beyond finance alone. A critical examination of crafting strategies for enabling GGFs to mitigate their inherent constraints and thereby equipping Chinese tech start-ups to contend on a level playing field with that in the U.S. is critical for China's escape from the "Middle Technology Trap" as illustrated in the Fig. 6.

Given the limited literature and prior knowledge on the impact of U.S. sanctions, outbound funding restrictions, and inbound investment scrutiny toward Chinese tech companies, we conducted private interviews by organizing field trips, holding closed-door seminars, and conducting semi-structured interviews to explore the potential bottleneck of GGFs in pulling China out of the middle technology industry from the impact of an increasingly antagonistic relationship with the U.S. in general. Specifically, we chose an exploratory single-case-study research design to address our how-type research question on a complex and understudied issue involving various variables. The research analysis primarily relies on two main sources of information: 1) Collaboratively organized

¹² A Limited Partner (LP) is an individual or entity whose liability is restricted to the amount of capital they have invested in the company. Typically, LPs do not actively participate in the day-to-day management of the company but are entitled to a share of the partnership's profits. They also have the right to be informed about the partnership's activities and offer advice, but their primary role is seen as that of a financial contributor.

¹³ Data source: Zero2IPO Research Center, 17th China Fund Partners Summit.

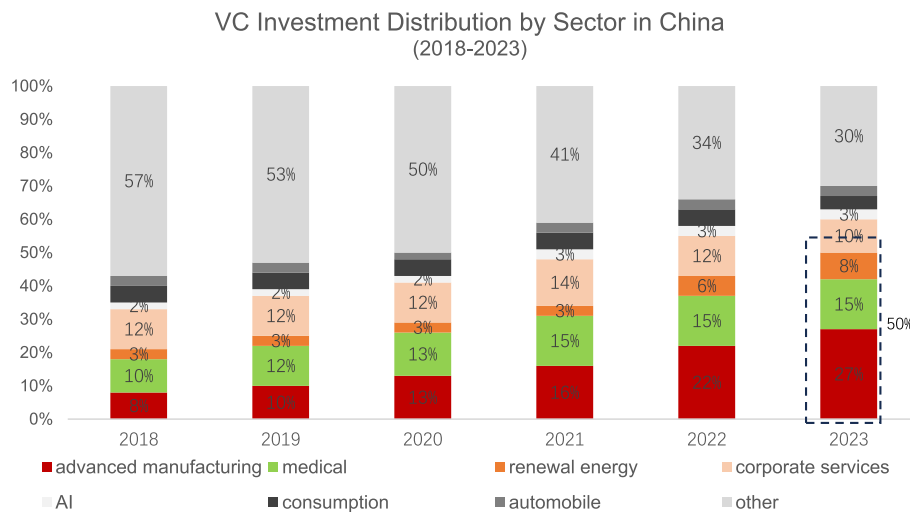


Fig. 6 Distribution of PEVC investments by sector in China (2018–2023). *ibid*

meetings or seminars involving financial regulators and local government departments; 2) In-depth interviews conducted by our research team with a wide range of individuals, including financial officials, experts, scholars, entrepreneurs, and investors from the Guangdong, Hong Kong, and Macao Greater Bay Area.

The subsequent analysis was inductive, using text-as-data software to code the fully transcribed interviews, speeches, PowerPoint slides, and observation field notes. We maintained the original language during the analysis to preserve nuanced meanings, and we translated only the quotations into English. Our first-hand experiences at the research sites informed these translations, ensuring that the original intent and meaning were retained (Table 2).

Our findings indicate that Chinese technology firms, especially those operated by repeated entrepreneurs or overseas returnees, have managed to sustain their innovative activities without immediate detrimental effects from the so-called “technological decoupling”. This resilience can be attributed to their early integration into the GIN and the GFN, prior to technological decoupling, acting as a buffer against initial shocks of geopolitical tensions. In contrast, the real challenges lie ahead of the “new-new comers”, which lack these established connections. Despite U.S. restrictions, such private networks have helped maintain the flow of ideas and resources. However, this mitigation strategy is limited.

As revealed in the interviews, some GGFs’ decision-making and management modes remain relatively conservative, and their comparatively short investment cycles do not match the long-term R&D needs of science and innovation enterprises.¹⁴ According to research, most professionals believe that state-owned capital VCs are considerably less inclusive than foreign-funded VCs with relatively short investment. For example, U.S. dollar funds can accept long R&D cycles for venture capital projects and encourage invested companies to create market barriers to science and technology innovation. However, state-owned venture capital generally requires short-term “payback.” The

¹⁴ See Table 2, Interviews T1, T2, T3, V1,V2, V3.

Table 2 Interview records^a

Type of data	Organisation	Code	Position of the key informants	Gender	Duration (h)	Time collected
Interviews	TechCo (Biotech)	T1	CEO (Singaporean)	Male	2	20230606
Interviews	TechCo (Electronic Vehicle)	T2	Senior Engineer (R&D)	Male	2.5	20230808
Interviews	TechCo (Renewal Energy)	T3	Senior Engineer (R&D)	Male	1.5	20240110
Interviews	Advanced Manufacturing (Electronics)	T4	Senior Engineer (R&D)	Male	2	20240110
Interviews	Advanced Manufacturing (Household appliance)	T5	Senior Engineer (R&D)	Male	0.5	20240327
Interviews	Private VC (Tech)	V1	Chief Investment Officer	Female	4	20231011
Interviews	Government VC (Local)	V2	Chief Investment Officer	Male	3	20230926
Interviews	Security Firms (Outbound Business)	V3	Head of Strategic Engagement	Male	1	20240131
Interviews	University R&D Commercialisation Centre	U1	Lead PI (U.S. citizen)	Male	0.5	20240223
Interviews	University R&D Commercialisation Centre	U2	Lead PI (HKSAR resident)	Male	1.5	20240223
Interviews	University R&D Commercialisation Centre	U3	Lead PI (Chinese)	Male	2	20240227
Interviews	Finance regulators for VC firms	G1	Division Chief	Male	0.5	20230215
Interviews	SASAC	G2	Provincial Chief	Male	1	20230828
Interviews	Provincial Technology Bureau	G3	Division Head	Male	1	20240112
Seminar	Government VC (Local and central)	VX	Observation in closed door seminar	Male & Female	8	20230611

^a Confidential interview records on file with the Guangzhou Institute of the Greater Bay Area in People's Republic of China, website: <http://www.gigba.org.cn/en/about.html>

investment cycle of U.S. dollar funds can be as long as 10 years or more, but RMB funds are typically looking for an exit within five years. The lifecycle of state-owned capital projects may be even shorter, which is determined by the nature of state-owned venture capital. Due to changes in funders and funding requirements, professional fund managers are also eager for quick success and instant benefits.

Furthermore, some interviewees of tech companies and private investors have pointed out that most local government-guided funds have incorporated the “reinvestment requirements” into their investment contracts.¹⁵ Therefore, most venture capital projects must prioritize local investment needs or serve existing local industries. As funders, the provincial government hopes that funds “taken from the local” can be directly “used locally.” However, this requirement usually contradicts the original intent of financing

¹⁵ See Table 2, Interviews T1, T2 and T3.

innovation. In practice, investments in the existing local industry do not equate with supporting technological innovation. These projects are not inherently venture capital projects if they exist only to meet the reinvestment requirements imposed by local governments, since many of these local industries are not innovative.

Moreover, should the U.S. persist in implementing rigorous restrictions, particularly those precluding Chinese scholars from participating in American research platforms or limiting international dialogues with American industrial counterparts, the long-term ramifications could indeed be profound. Specifically, vulnerabilities are likely to increase due to policies like the denial of student visas to graduates from prominent Chinese technological universities, barring entry to premier international laboratories, and widespread scrutiny of hiring processes for Chinese technology professionals. Such measures may intensify the risk of a “Middle Technology Trap” for the forthcoming cohort of Chinese tech firms, potentially stifling their innovation and global market assimilation efforts.

For GGFs to effectively replicate the benefits previously provided by U.S. VCs, they would need to enable access to critical resources, such as advanced research facilities, top-tier mentors, and innovation networks. They may also need to act as bridges to alternative international partnerships, creating opportunities for Chinese entrepreneurs to engage with global thought leaders and innovators beyond the U.S. context.

In this context, GGFs must proactively anticipate new challenges from the geopolitical tensions and move beyond as a financial investors, into strategic investors. They need to devise strategy beyond their conventional focus on “financial return” or “domestic-policy return”, and, as suggested by some interviewees, potentially assume the role of global innovation ecosystem builders. This would involve not only funding but also fostering environments conducive to innovation, collaboration, and knowledge-sharing that can operate independently of international constraints.

Departing from conventional thinking that urges GGFs to transition from policy-driven investment to financially oriented outcomes, a reconfiguration of evaluation criteria may be more effective in steering GGFs toward fostering global collaboration. These strategic realignments will extend their focus beyond domestic boundaries and enable them to engage more deeply with the international innovation ecosystem. In the setting of a market within the state, GGFs are inevitably constrained by three pitfalls: an eye on investment targets to support local industrial upgrades, political pressure to generate tangible progress within the tenure of current party-state leadership, and a state-centric construct that isolates them from the global talent pool. Although state-owned and private capital each have their own advantages, the practical integration of the two poses significant challenges.

Toward this end, the State-owned Assets Supervision and Administration Commission (SASAC), tasked with overseeing GGFs, could embrace a set of performance metrics and outbound initiatives that mirror the “institutional opening-up” approach to recouping with the GIN and the GFN through structural and systemic transformations. To commence, high-tech-focused investment collaboration with non-U.S. market players shall be prioritized for the GGFs. Leveraging the Belt and Road Initiative to forge a Technological and Investment Silk Road, particularly with Southeast Asian Sovereign Funds and Middle Eastern Family Offices, will catalyze a new impetus for

China's technological progress. Such an initiative will not only bridge the gaps left by U.S. VCs but will also leverage the technology portfolio of non-U.S. investors to recouple Chinese tech start-ups with the GIN.

Furthermore, GGFs must expand offshore by establishing significant presences in global financial and innovation centers throughout Europe, Japan, and the UAE. Such expansion would be more than a mere economic outreach; it would serve as a cornerstone for China's much-needed science and technology diplomacy, de-risking its over-reliance on interdependence with the United States. This approach would also make use of earlier investments that China had made under the Bilateral Science and Technology Cooperation Agreements, with 161 countries and regions.

Lastly, a strategic move worth considering is the recruitment of international investment professionals into GGFs as well as the appointment of seasoned technology leaders into the advisory body of the SASAC. This strategic initiative draws on historical precedent—during periods of financial instability and securities market turmoil, similar measures played a crucial role in elevating China out of crises. Such inclusiveness of global expertise would not only broaden the perspective and enhance the acumen within GGFs but also recouple them more closely to the GFN. This could also be smart tactics that could counteract U.S. attempts to constrict China's access to talent and opportunities, ensuring a steady influx of innovative thought and a robust presence in the technology sphere on the world stage.

In conclusion, a well-orchestrated combination of enhanced international cooperation, strategic offshore expansion, and the infusion of global talent will empower China GGFs to circumvent current geopolitical constraints and propel the nation toward a future where it remains a paramount player in the arena of global technological innovation.

Conclusion

In our analysis of U.S. financial statecrafts aimed at restricting American private capital from investing in Chinese technology firms and startups, we reveal the emergence of the “Middle Technology Trap” (Chandra 2024). This trap is characterized by soaring compliance costs, escalating reputational risks, and severely diminished access for Chinese tech companies within the GIN and the GFN. Accordingly, this article argues for the evolution of scholarship in Innovation and Finance to incorporate a geopolitical dimension when assessing China's GGFs.

Despite the acknowledged limitation of China's GGFs, they nevertheless serve as a much-needed financial cushion for Chinese tech companies, supporting them in seeking alternative private funding sources to bridge the gap left by the departure of American PEVCs. However, a primary drawback of China's GGFs is their lack of capacity to take up a brokerage role to bring China closer to the core and hub of the GIN and the GFN, which subsequently hinders their ability to foster synergies and establish connections for Chinese tech companies with that of Silicon Valley. To mitigate this bottleneck effectively, it is proposed that a new framework of performance metrics and proactive initiatives, resembling the “institutional opening-up” approach, be adopted.

Authors' contributions

Pan: made contributions to the conceptual framework and to the qualitative study and approved the final version to be published. Liu: made contributions to the data collection, analysis and chart production. Chen: made overall revision and crafting of the article.

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Declarations

Competing interests

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