When Shadow Banking Retreats: The Effects of Financial Regulation on Venture Capital*

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Abstract

This paper documents a novel role of shadow banking in financing venture capital (VC) in a bank-dominated financial system. Our identification exploits China's 2018 New Regulations on Asset Management, which restricts banks' off-balance-sheet activities. Exploiting cross-sectional variation in pre-regulation shadow-banking exposure, measured by the share of shadow-banking limited partners, we find a sharp contraction in VC activity. A one-standard-deviation increase in pre-regulation exposure leads to a 12.4% investment decline afterward. Affected VC firms experience reductions in average fund size, a shift away from institutional investors, and a retreat from early-stage investments. Portfolio firms experience significant declines in subsequent patenting. Our results highlight unintended consequences of shadow banking regulation on risk capital and innovation.

Keywords: Venture capital, shadow banking, innovation, financial regulation, China

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1 Introduction

Venture capital (VC) plays a central role in financing innovative startups and fostering technological progress (Kortum and Lerner, 2000; Lerner and Nanda, 2020). A large literature has shown that VC development depends critically on strong legal institutions and well-functioning capital markets (Black and Gilson, 1998; Lerner and Schoar, 2005). From this perspective, bank-dominated financial systems—common in developing economies—are generally viewed as less conducive to VC activity than market-based systems. More broadly, financial structure shapes firms' access to external finance and growth opportunities, with market-based systems better able to support firms that depend on long-term financing (Demirgüç-Kunt and Maksimovic, 2002).[1]

China—the largest bank-centric economy—therefore presents a striking puzzle. Despite its underdeveloped capital markets (e.g., Cong and Howell, 2021; Allen et al., 2024) and a predominantly bank-based financial system, China experienced rapid VC expansion during the 2010s. Specifically, China's share of global VC investments rose from 10% in 2012 to nearly 40% by 2016, while the U.S. share declined from 66% to 43% over the same period (Lerner et al., 2024). How did VC scale so quickly in a financial system seemingly ill-suited to supplying long-horizon risk capital?

This paper documents a novel channel through which VC can be financed in a bank-dominated financial system: shadow banking. China provides an important and useful setting. Its financial system is overwhelmingly bank-centric, with banks accounting for more

[1]Black and Gilson (1998) argue that stock-market-centered financial systems are more supportive of venture capital than bank-centered systems partly because active stock markets provide an important IPO exit channel. Relatedly, Demirgüç-Kunt and Maksimovic (2002) show that market-based financial systems are more conducive to firms' access to long-term external finance, whereas bank-based systems better support firms that rely on short-term external finance.

than 80% of total financial sector assets. At the same time, banks have long been prohibited from making direct equity investments, much like U.S. banks under the post-Volcker Rule regulatory regime. This institutional constraint created a natural tension: banks controlled the bulk of household savings, but could not directly supply long-term equity capital to entrepreneurial firms.

The rapid expansion of non-bank financial institutions following the 2012 deregulation and financial liberalization substantially reshaped China's financial sector. Securities firms, trust companies, mutual fund companies, and other non-bank institutions became important participants in China's shadow banking system. Banks increasingly collaborated with these intermediaries to channel credit outside traditional on-balance-sheet lending and to invest in less liquid assets through off-balance-sheet arrangements. In particular, non-bank intermediaries relied on bank-distributed asset management products to pool short-term household savings and channel them into longer-term financing for illiquid assets, including VC and private equity investments. This process created maturity transformation outside traditional banking channels.

We show that this bank-VC nexus is sharply disrupted by shadow banking regulation. Our empirical setting exploits the 2018 New Regulations on Asset Management (NRAM), which restricted multi-layered product nesting across financial institutions and prohibited maturity mismatches in asset management products. The reform was primarily designed to curb systemic risk associated with debt defaults and shadow banking activities, with no explicit intention to target VC. As such, the NRAM provides a clean laboratory to study how shadow banking facilitates the provision of risk capital in a bank-dominated financial system.

Identifying the causal impact of the NRAM poses a central challenge because the regulation was implemented nationwide, ruling out a simple treated-versus-control comparison across regions. Our identification hence exploits heterogeneity in pre-regulation exposure to shadow-bank funding that arises from differences in the limited partner (LP) composition of VC funds. VC funds that relied more heavily on shadow-banking intermediaries as LPs prior to 2018 experienced a larger contraction in funding supply and therefore should be more affected by the regulation.

Importantly, this exposure is determined by the funding structure of GPs, reflecting historical financing relationships that were contractually established before the regulation. As a result, our empirical design is a continuous difference-in-differences framework, in which a common regulatory shock is interacted with predetermined differences in GPs' reliance on shadow-banking LP capital.

A further challenge is that shadow-bank investments in VC are difficult to observe directly, as asset management products typically disclose limited information about their underlying assets and often involve complex, multi-tiered ownership structures. To overcome this limitation, we construct novel fund-level linkages by combining VC and private equity transaction data with firm registration records to identify fund partners and their capital commitments. This approach allows us to identify shadow-banking intermediaries acting as LPs and to measure each general partner's (GP's) pre-policy exposure to shadow-bank funding.

We find that the NRAM has large, negative effects on VC activity. At the GP level, a one-standard-deviation increase in pre-regulation shadow banking exposure is associated with a 12.4% decline in the number of investment deals and a 19.5% decline in total investment

amount. These findings indicate that VC firms are unable to fully substitute away from shadow-bank funding, implying that the regulation imposes binding financing constraints on the VC sector.

Beyond aggregate contraction, the regulation reshapes VC fundraising and investment behavior. Following the NRAM, average fund size declines, institutional participation falls, and the share of individual investors increases, suggesting a deterioration in investor quality and monitoring capacity. Constrained by reduced maturity transformation, VC firms with greater shadow-banking LP exposure delay capital deployment and invest later in their life cycles, consistent with shorter effective investment horizons.

We further document a pronounced reallocation of VC investment across industries. Using the *Made in China 2025* industrial policy as a benchmark, we show that investment contractions among highly exposed VC firms are concentrated in non-priority industries, while investment in government-supported industries is relatively preserved. Shadow banking regulation thus increased the policy sensitivity of VC capital allocation: as overall funding contracted, VC investment became increasingly concentrated in industries prioritized by the government.

Finally, we examine the real effects of shadow banking regulation on portfolio firms' innovation outcomes. Portfolio firms backed by GPs with greater pre-regulation exposure to shadow banking experience significant declines in both patent applications and granted patents following the NRAM. These negative effects are concentrated among industries with greater external finance dependence and higher R&D intensity, consistent with the view that tighter VC financing constraints disproportionately affect firms whose innovation activities rely more heavily on external and long-term risk capital.

This paper contributes to three strands of literature. First, we document a novel bank-VC nexus in a bank-dominated financial system. VC is more naturally supported by stock-market-centered financial systems, where active public equity markets and IPO exit opportunities facilitate VC development (Black and Gilson, 1998; Gao et al., 2026). Other research examines how banks support venture investing through direct participation as LPs (Hellmann et al., 2008; Fang et al., 2013) and how regulatory constraints affect such investments (Chen and Ewens, 2025). We study a distinct setting in which commercial banks' direct equity investment in VC is constrained. In this environment, we show that banks' off-balance-sheet activities provide an indirect channel through which bank liquidity is transformed into VC funding. Our evidence therefore identifies a novel bank-to-VC transmission mechanism in developing economies where access to market-based risk capital is limited.

Second, we contribute to the literature on the role of shadow banking and financial intermediation. Existing studies emphasize that shadow banking expands the scope of financial intermediation through non-bank channels. He and Li (2022) develop a theoretical framework of credit chains and show that layered financial intermediation can enhance borrowing capacity. In the Chinese context, Allen et al. (2023) show that shadow banking with implicit guarantees can alleviate financing constraints for private firms and improve capital allocation, while Tian et al. (2024) documents the real effects of entrusted loans on firm innovation.[2] We extend this literature from credit provision to the supply of long-horizon risk capital. Specifically, shadow-banking institutions participate as LPs in VC funds and channel bank-related funding into venture capital. More broadly, our findings uncover a reg-

[2]Shadow banking in China often involves off-balance-sheet activities associated with banks, including wealth management products (Acharya et al., 2025), entrusted loans (Allen et al., 2019), and financial leases (Chang et al., 2022).

ulatory trade-off: policies that reduce maturity mismatch and financial interconnectedness may simultaneously disrupt the provision of risk capital to innovative firms.

Third, we contribute to the growing literature on how LP characteristics shape VC intermediation. Because VC funds invest in illiquid assets over long horizons, the liquidity, sophistication, and investment horizons of their LPs can influence fund structure, investment strategy, and performance (Lerner and Schoar, 2004; Lerner et al., 2007; Chernenko et al., 2021; Lerner et al., 2022). Recent studies in China further show that the identity and characteristics of investors shape their participation in VC and its entrepreneurial consequences.[3] While existing studies primarily examine heterogeneity across LP types or the entry of particular investors, we study the consequences of a regulatory-induced contraction in LP-side funding. We show that LP funding conditions shape not only fund performance and investment strategy, but also the allocation of risk capital and startup innovation in the real economy.

The remainder of the paper is organized as follows. Section 2 provides institutional background. Section 3 describes the data. Section 4 presents the empirical strategy. Section 5 shows the baseline results. Section 6 examines changes in VC fundraising and investment behavior. Section 7 analyzes real effects on firm innovation. Section 8 concludes.

[3]Colonnelli et al. (2024) show that GPs in China are reluctant to accept government-affiliated investors because of concerns about political interference. Chen et al. (2026) show that government VC helps sustain investment by serving as an instrument of industrial policy. Lerner et al. (2023) document that individual LPs learn from participating in VC funds and subsequently establish more innovative ventures. Recent evidence from Li et al. (2026) shows that the entry of patient insurance capital encourages earlier-stage investment and improved startup outcomes.

2 Institutional Background

2.1 The Development of VC in China

When China became the world's second-largest economy in 2010, its VC industry was still relatively underdeveloped. According to Lerner et al. (2024), China accounted for less than 10% of global VC investment in 2010, while the United States contributed 66%. By 2016, however, China's global share had risen to around 40%, whereas the U.S. share had declined to approximately 42%.

The growth of China's VC industry has been driven primarily by domestic renminbi (RMB)-denominated funds. Figure 1 illustrates the evolution of VC/PE investment in China by currency. From 2013 to 2022, total VC/PE investment increased from RMB 188.68 billion to RMB 907.68 billion, with RMB investment accounting for an average of 67.45% of the total. RMB investment reached its historical peak in 2017 and has not surpassed that level ever since. Notably, during 2017-2019, the amount of RMB-denominated investment declined by 43.5%, while foreign currency investment remained largely unchanged.

In China, VC investments are commonly made through funds organized as limited partnerships. Their LPs include government-backed funds, state-owned enterprises (SOEs), listed and unlisted nonfinancial firms, non-bank financial institutions, and individual investors. Commercial banks, by contrast, have generally been prohibited from investing directly in private equity.[4] Once a limited partnership is established, it is registered as a business entity with the State Administration for Market Regulation (SAMR). After fundraising, a

[4]These restrictions have recently been partially relaxed through pilot programs that permit bank-affiliated financial asset investment companies (AICs) to conduct equity investments.

qualifying private fund is also required to complete fund filing with the Asset Management Association of China (AMAC). Business-registration records identify the fund's partners and their subscribed capital, allowing us to reconstruct its LP and GP structure through commercial business-information platforms. These funds are generally closed-ended and have a finite contractual life comprising an investment period followed by an exit period. After the fund terminates and completes liquidation, the partnership entity is deregistered.

2.2 The Asset Management Industry and Shadow Banking

The expansion of China's shadow banking sector is closely associated with the asset management industry, particularly through off-balance-sheet activities by commercial banks (Chen et al., 2020; Acharya et al., 2025). The top-down deregulation and financial liberalization since 2012[5] contributed to the rise of shadow banking in China.

Prior to 2012, trust companies functioned as the dominant channel for moving bank assets off-balance-sheet. A significant shift commenced in 2012 when securities regulators relaxed investment restrictions on the asset management divisions of securities firms, permitting them to establish customized investment structures negotiated directly with specific clients.[6] Mutual fund companies soon gained similar qualifications and established their own private-market asset management subsidiaries.[7] This regulatory evolution meant that these institutions could engage in private market investment by issuing asset management

[5]Since 2012, to address credit misallocation in China's financial system and the persistent financing constraints faced by small and medium-sized enterprises, the new Chinese government has implemented a series of financial liberalization measures. These policies included loosening regulatory restrictions on non-bank financial institutions and promoting the development of the asset management industry and various new financial business models. See `https://fund.sohu.com/20120608/n345100639.shtml`.

[6]See `https://finance.huanqiu.com/article/9CaKrnJxr85`.

[7]See `https://www.gov.cn/gongbao/content/2012/content_2283047.htm`.

products.

However, a substantial portion of these products evolved into vehicles for repackaging banks' off-balance-sheet assets. From the banks' perspective, the most common way to move assets off balance sheet is through the issuance of wealth management products (WMPs), which grew at an average annual rate of nearly 50% after 2012 (Figure 2, Panel A). In practice, these WMPs are typically channeled into asset management products issued by non-bank financial institutions to circumvent regulatory restrictions on investment scope.[8] A typical example involves a bank commissioning a securities firm to set up an asset management product. The securities firm, following the bank's instructions, would then deploy the funds to purchase bank-specified assets, such as WMPs and commercial bills. This model of inter-institutional collaboration rapidly became a primary activity for asset management companies after the 2012 deregulation, giving rise to what is termed "conduit business". Common forms of the conduit business include bank-trust cooperation, bank-securities firm cooperation, bank–mutual fund cooperation, and various complex tripartite collaboration models. This created layered credit chains between banks and non-bank financial institutions, paralleling the U.S. experience of financial liberalization and securitization since the 1980s (He and Li, 2022). While such credit chains may improve efficiency through maturity transformation (Allen et al., 2023), they also generate systemic risk by increasing opacity and interconnectedness.

The growth of this business was further propelled by constraints within the banking sector itself. Subject to investment capacity limits and regulatory boundaries, banks began

[8]For instance, 2009 regulations on commercial banks' personal wealth management business restricted direct investments in equities and unlisted assets.

increasingly outsourcing wealth management operations to third-party institutions from 2014 onward. This trend resulted in a deep intertwining of funds. By 2016, over 40% of the capital in trust products was sourced directly from banks. At the same time, approximately 70% of securities firms' asset management products were devoted to conduit services. For mutual fund subsidiaries, more than 50% of their funding originated from banks. Therefore, shadow banking in China has been described as the "shadow of the banks" (Ehlers et al., 2018).

2.3 Regulatory Tightening: The NRAM in 2018

Chinese regulators were deeply worried about the systemic risk posed by the excessive expansion of shadow banking. The China Shadow Banking Report[9] issued by the China Banking and Insurance Regulatory Commission (CBIRC) described the complexity of asset management products at the time:

> "Various asset management products invested in one another and became nested, forming large pools of assets; liabilities and assets could not be matched or identified, causing severe liquidity mismatches ... if follow-on funding cannot be raised in time, the funding chain will immediately break, and liquidity risk will spread through the industry like an epidemic in a short period."

In this context, the banking regulator launched an industry-wide rectification campaign targeting regulatory arbitrage, shadow-banking activities, and banks' off-balance-sheet businesses in 2017.[10] In November 2017, multiple regulatory agencies jointly released the draft

[9]See China Shadow Banking Report issued by CBIRC in 2020: `https://china.caixin.com/upload/ddd.pdf`.

[10]In May 2017, the CBRC started a special inspection program called "3-3-4-10 Action" to tighten regulation in the banking sector. See, for instance, `https://www.chinanews.com.cn/fortune/2018/01-10/8420478.shtml`.

NRAM for public consultation, signaling a broader overhaul of the asset management industry. The final rules were issued and formally implemented in April 2018.[11] Chinese regulators explicitly required strict separation of products and the end of pooled, rolling, and maturity-mismatched structures. The NRAM states:

> "Each asset management product's funds must be managed, accounted for, and audited separately; participation in pooled-fund businesses with features such as rolling issuance, collective operation, or separate pricing is prohibited ... Asset management products that directly or indirectly invest in equity of unlisted firms must be closed-ended and must specify exit arrangements for such equity; the equity exit date may not be *later* than the product's maturity date."

Primarily addressing shadow banking risks such as multi-layer product nesting and the operation of pooled funds, the 2018 NRAM eliminates key practices that had linked short-term asset management products to long-term investments, thus adversely affecting the VC/PE industry. VC/PE commitments typically require long lock-ups (often well beyond seven years), whereas the maturity of bank-issued WMPs is typically 2–3 years. A common circumvention before the NRAM was rolling over short-term WMPs to raise long-term capital (see Figure A2). For example, banks issue a WMP (Product A) and invest its proceeds into a long-term PE project; before A matured, the issuer launch Product B and use B's proceeds to meet A's redemption; if still short, the issuer would offer an "A+1" rollover that converted A's principal and accrued interest into a new product under preferential terms. Such rolling issuance generated maturity mismatch and allowed separate pricing across products tied to the same underlying asset. By constraining these practices, the NRAM largely severs

[11] See `http://www.pbc.gov.cn/tiaofasi/144941/3581332/3730258/index.html`.

the conventional channel through which asset management products funded long-duration, equity-style investments.[12]

To curb multi-layer nesting and regulatory arbitrage, the NRAM imposed two key restrictions: a prohibition on "conduit business" used to evade supervision and a cap permitting at most one layer of fund nesting. Prior to the reform, banks commonly invested in private equity by nesting asset management products issued by other financial institutions (see Figure A1). The restrictions unintentionally affected the prevalent pre-reform use of fund-of-fund (FOF) structures in VC investments, which are classified as multi-layer nesting. Although a December 2019 clarification exempted VC and government-guidance funds from counting as an additional layer in FOF structures,[13] the NRAM had already sharply curtailed banks' ability to channel WMP proceeds into private equity through multi-tiered vehicles.

The NRAM had a large and immediate impact on the asset management industry, especially in private markets (including private credit and private equity). Figure 2 Panel B shows that asset under management (AUM) in private markets declined by 22.8% from 2017 to 2022, while its share fell from 62.7% to 42.8%. As part of the private-markets segment, the VC industry was also unintentionally dampened. The effect was especially pronounced on the fundraising side, where domestic RMB VC fundraising fell by 35.4% in 2018. Industry participants attribute this drop to the reform's disruption of shadow-banking funding. As noted in the Annual Report of the VC/PE Industry, in an environment short of long-term capital, banks' maturity-mismatched WMP pools had been a major source of commitments

[12]See `https://www.jdsupra.com/legalnews/2018-a-turbulent-transition-year-for-95482/` for detailed analysis.

[13]See `https://www.gov.cn/gongbao/content/2020/content_5477322.htm`.

to VC funds, and the NRAM largely cut off that funding channel.[14]

3 Data and Summary Statistics

3.1 VC Funds and VC Investment Deals

Our VC investment data are obtained from Zero2IPO, a leading professional VC/PE database in China. Its data have been widely used in previous studies on China's VC/PE industry (e.g., Lerner et al., 2023; Colonnelli et al., 2024). We obtain VC deal-level information, including the investors, target firm, deal date, and deal location.[15] However, approximately 10% of portfolio firms' names are not publicly disclosed, and over 40% of investment amounts are missing. Therefore, in the subsequent analysis, we focus on the number of investment deals as the primary measure of VC activity.

We obtain each portfolio firm's and VC fund's founding date, registered capital, address, and industry classification by matching names to records in Tianyancha, a comprehensive Chinese business registration database. We then link fund names to shareholder lists and equity-change histories. Using these ownership records, we apply an ownership-tracing procedure to reconstruct each fund's partner composition, including both LPs and GPs, at the time of each investment. This procedure allows us to identify shadow-banking institutions acting as LPs.

As discussed above, China's shadow banking system includes several types of institutions, such as bank-affiliated entities, trust companies, securities firms, and mutual fund asset

[14]See `https://finance.sina.com.cn/money/smjj/smgq/2019-05-06/doc-ihvhiqax6847580.shtml`.

[15]The Zero2IPO database does not distinguish between VC and PE investments. Because the distinction between the two is often blurred in the Chinese context, we refer to both VC and PE investments as VC investments throughout the paper.

management subsidiaries. We identify the capital commitments made by these institutions to VC funds and define *ShadowBankShare* as the ratio of capital committed by shadow banking institutions to the total capital commitments of VC fund j. This fund-level measure is then assigned to each investment deal i (made in year t and managed by GP g). [16]

$$\text{ShadowBankShare}_{i(gjt)} = \frac{\#Funding from Shadow Banks_{i(gjt)}}{\#Total Funding_{i(gjt)}} \tag{1}$$

3.2 Shadow Banking Exposure

To identify the impact of nationwide shadow banking regulation on VC, we exploit cross-sectional variation in VC firms' (GPs') exposure to shadow banking financing. Since VC funds managed by the same GP typically share fundraising channels and organizational structures, the extent to which a GP relies on shadow banking capital provides a natural measure of its exposure to the regulatory shock.

At the GP level, we construct each GP's exposure to shadow banking as a registered-capital-weighted (ω_j) average of the shadow-banking capital commitment shares of the funds it manages. For VC firm g that manages funds $j = 1, ..., n$, we first define a fund-level shadow banking share, $ShadowBankShare_{j(g)}$, as the maximum share of shadow-banking capital commitments observed during the pre-policy period (2013–2017). We then aggregate

[16] This measure likely understates the actual exposure to shadow-banking funding. Asset management products cannot be directly registered as shareholders and are therefore typically recorded under affiliated financial institutions or investment vehicles. Our measure captures some of these entities when they appear in VC fund ownership records, but cannot fully identify capital channeled through investment companies or GPs themselves. In addition, debt-like financing provided by asset management products is not captured in equity ownership records.

fund-level exposure to the GP level using the registered capital of each fund as weights:

$$\omega_{j(g)} = \frac{\text{RegistCapital}_{j(g)}}{\sum_{j=1}^{n} \text{RegistCapital}_{j(g)}} \tag{2}$$

$$ShadowBankExpo_g = \sum_{j=1}^{n} \omega_{j(g)} \times \max_{t \in \{2013,\ldots,2017\}} ShadowBankShare_{j(g)} \tag{3}$$

This measure captures the extent to which a GP relied on shadow banking capital before the regulatory reform. We use the pre-policy maximum exposure to mitigate concerns that funds' shadow banking reliance may have adjusted in anticipation of the regulation.

3.3 Patents of Portfolio Firms

In addition, we proxy firm-level innovation using patenting activity, drawing records from the China National Intellectual Property Administration (CNIPA). The CNIPA classifies patents as invention, utility model, or design patents. We match patents to portfolio firms by applicant name and aggregate ultimately granted filings by application year to construct firm-year panels.

3.4 Sample and Summary Statistics

Our sample spans between 2013 and 2022, which covers the period of the rapid expansion of shadow banking in China and the implementation of regulatory tightening. We further restrict the sample to investments made by funds organized as limited partnerships, the dominant organizational form for VC investments in China. We exclude investments in listed firms to focus on VC investments in startups. Our sample comprises 77,209 investment deals

between 2013 and 2022.

Table 1 reports descriptive statistics from different levels. At the deal level, shadow banking institutions contribute, on average, 3.4% of the total capital committed to VC funds. Panels B present aggregated measures at the GP level. Among 5,351 GPs with pre-policy VC investments, the mean *ShadowBankExpo* is 4.4%. For the 20,629 portfolio firms in our sample, the average annual number of patents is 10.224 and the average annual number of granted patents is 5.720.

We also document aggregate changes in shadow banking exposure before and after the NRAM. Using the same approach employed to construct GPs' pre-policy exposure, we calculate each GP's shadow banking exposure in each year and plot the annual average over 2013–2022. As shown in the Figure 3, average exposure increased between 2013 and 2016, peaked in 2016, and then began to decline in 2017. The decline became more pronounced in 2018, coinciding with the broader tightening of shadow banking regulation that began in 2017 and the formal implementation of the NRAM in 2018. Exposure continued to fall thereafter. We also map the pre-policy shadow banking exposure of different cities in our sample in Figure A3, which reveals substantial spatial heterogeneity of shadow banking financing.

4 Identification Strategy

Our objective is to identify the causal effect of shadow banking regulation on VC activity. Because the 2018 NRAM applies to all regions simultaneously, identification cannot rely on geographic variation in policy timing. Instead, our empirical strategy exploits heterogeneity in pre-regulation exposure to shadow-bank funding arising from differences in the funding

structure of VC investors.

Conceptually, our design follows an exposure-based framework in which a common regulatory shock interacts with predetermined differences in reliance on shadow-banking intermediaries. In this sense, our approach is closely related to a Bartik-style (shift-share) design, where variation is generated by the interaction of a nationwide shock with cross-sectional differences in exposure that were determined prior to the policy change.

4.1 GP-Level Exposure Design

We estimate analogous specifications at the GP (VC firm) level, which allows us to exploit variation in exposure across VC firms with different funding structures. The GP-level specification is:

$$Y_{gt} = \alpha + \beta ShadowBankExpo_g \times Post_t + \gamma' X_g \times \lambda_t + \eta_g + \lambda_t + \varepsilon_{gt}, \tag{4}$$

where Y_{gt} denotes investment outcomes of GP g in year t. $ShadowBankExpo_g$ measures the GP's pre-2018 reliance on shadow-banking intermediaries as limited partners. GP fixed effects, η_g, absorb time-invariant differences in investment strategy, quality, and network access, while year fixed effects capture aggregate shocks.

To account for heterogeneous trends across VC firms, we interact time-invariant GP characteristics, X_g, with year fixed effects. These characteristics include the GP's founding year (measured relative to 2017) and registered capital as filed with the State Administration for Market Regulation (SAMR). By conditioning on GP fixed effects and flexible trend controls, identification is driven by within-GP changes over time that vary with ex ante

exposure, rather than by cross-sectional differences in GP quality.

4.2 Deal-Level Specification

Finally, we exploit deal-level data to study how exposure to shadow banking regulation affects investment behavior and deal characteristics. We estimate the following specification:

$$Y_{i(gfdt)} = \alpha + \beta ShadowBankExpo_g \times Post_t + \gamma' X_g \times \lambda_t + \delta' Z_f \times \lambda_t + \eta_g + \mu_d + \lambda_t + \varepsilon_{i(gfdt)}, \quad (5)$$

where $Y_{i(gfdt)}$ denotes outcomes for deal i involving portfolio firm f in industry d, backed by GP g, in year t. Outcomes include fund size, timing of capital deployment and so on. X_g denotes predetermined GP-level characteristics, including GP registered capital and GP age at the time of investment, which are interacted with year fixed effects to account for heterogeneous trends across VC firms. Z_f denotes predetermined portfolio-firm characteristics, including the firm's registered capital and age at the time of investment, which are interacted with year fixed effects to absorb differential trends across portfolio firms.

We also include GP fixed effects and industry fixed effects, μ_d. This specification ensures that identification comes from variation among deals undertaken by the same VC firm within the same industry and macroeconomic environment. As a result, the estimates are unlikely to be driven by demand-side shocks or industry-specific trends.

5 Aggregate Impact on VC Investment

5.1 Baseline Results

Next, we examine the effects of the NRAM at the GP level. Table 2 presents the results of Equation 4. We find that both the number of deals and total investment amounts decrease significantly following the NRAM. Specifically, a one-standard-deviation increase in a GP's shadow banking exposure is associated with a 12.4% decrease in the number of deals and a 19.5% reduction in total investment amount. These findings reveal that VC firms with greater reliance on funding from shadow banks experience more constrained financing after the regulatory tightening.

We further conduct a regional-level analysis following (Chen and Ewens, 2025). Specifically, we aggregate VC deals to the city level and construct city-level shadow banking exposure as the average value of *ShadowBankShare* across all VC deals in a given city during 2013–2017. Table A1 shows that cities with greater pre-regulation exposure to shadow banking experienced a significant decline in both the number and value of VC investment deals after the NRAM. As a robustness check, these city-level results provide consistent evidence that the negative effect of shadow banking regulation on VC activity is not sensitive to the level of aggregation.

5.2 Dynamic Effects and Pre-trend Analysis

Our interpretation of the DID coefficient β as a causal impact is subject to standard endogeneity concerns. If GPs with greater pre-policy exposure to shadow banking were already on differential trajectories in VC activity prior to 2018, then the estimated post-

regulation effects could reflect these confounding trends rather than the regulatory shock itself.

To assess this possibility, we examine the dynamic evolution of VC investment around the implementation of the NRAM using an event-study framework. Figure 4 reports estimates. Consistent with the identifying assumption underlying our difference-in-differences design, we find no evidence of differential pre-trends in VC investment across GPs with varying degrees of exposure to shadow banking prior to 2018. One exception is the coefficient for 2016 relative to the omitted year of 2017, which is statistically significant. This pattern is plausibly explained by the fact that regulatory scrutiny of shadow banking had already intensified during 2017, with the draft NRAM formally released in November of that year. Thus, the difference between 2016 and 2017 may reflect a response to the tightening regulatory environment rather than a differential pre-trend.

In contrast, following the NRAM, VC investment declines sharply in cities and among VC firms with greater pre-policy reliance on shadow-banking funding. The absence of pre-trends combined with the abrupt post-2018 divergence supports a causal interpretation in which the NRAM drives the observed contraction in VC investment.

5.3 Robustness Checks

We conduct several robustness checks to assess the sensitivity of our main findings. First, we implement a placebo test to rule out alternative explanations. As shown in Figure 1, domestic RMB VC funds had already played a dominant role in China's VC market before 2018. By contrast, foreign VC funds primarily raise capital from foreign investors and

therefore do not rely on shadow banking. We thus use foreign capital exposure as a placebo measure, defined as the pre-2018 share of USD-denominated capital commitments in each VC firm's total capital commitments. Table A2 shows that foreign capital exposure does not have a negative effect on VC firms' investments in or after 2018. This suggests that our main results are driven by firms' dependence on shadow banking. Alternative explanations related to foreign capital shocks, such as China–U.S. economic tensions and changes in cross-border investment conditions, are therefore unlikely to account for our findings. By contrast, the coefficients on GP investment deals are positive and marginally significant (p-value = 0.110), suggesting that foreign capital exposure may have a substitution effect following the regulatory shock.

Second, existing literature emphasizes the importance of well-functioning stock markets for VC activity(Black and Gilson, 1998; Gao et al., 2026), particularly through their role in providing IPO exit opportunities. In China, IPOs represent a major exit channel for VC investments. However, the IPO environment has experienced substantial changes over time, as regulators have periodically adjusted IPO issuance policies to balance capital market development and market stability. In addition, several important capital market reforms occurred after 2018, including the establishment of the STAR Market (Science and Technology Innovation Board) and the introduction of the registration-based IPO system, which may have improved exit opportunities for technology-oriented firms. To examine whether changes in IPO opportunities could confound our results, we construct a GP-level IPO opportunity measure based on the historical industry composition of each GP's portfolio before the NRAM. Specifically, we calculate the measure using the number (or share) of A-share IPOs in each industry during the post-policy period, weighted by each GP's portfolio compo-

sition between 2013 and 2017. This approach captures ex ante differences in GPs' exposure to industries with greater IPO opportunities while avoiding the influence of post-policy investment decisions.

Table A3 reports the results. The coefficient on $ShadowBankExpo \times Post$ remains negative and statistically significant after controlling for IPO opportunities, suggesting that the decline in VC activity is not driven by differential changes in IPO exit opportunities. The coefficients on both $IPOoppNum$ and $IPOoppShare$ are positive and significant, indicating that GPs with greater exposure to industries experiencing more IPO activity tend to undertake more investments. However, the inclusion of IPO opportunity measures does not materially affect the magnitude or statistical significance of the estimated impact of shadow banking regulation. This suggests that although IPO market conditions influence VC investment decisions, changes in IPO opportunities are unlikely to explain the contraction in VC activity associated with the tightening of shadow banking regulation.

We also conduct several other tests. First, we replace the baseline exposure measures with alternative definitions. At the GP level, the treatment group is defined as VC firms whose shadow banking exposure exceeds 30%. As shown in Table A4, the results in Columns (1) and (2) remain quantitatively and statistically similar. Second, to rule out potential confounding effects from the COVID-19 pandemic, we restrict the sample period to 2013-2019. The results remain similar, suggesting that our findings are not driven by the economic disruptions associated with the pandemic. Finally, given the substantial geographic concentration of VC activity in China, we further control for GP location-by-year fixed effects to absorb time-varying local shocks that may affect VC investment. As shown in Columns (5) and (6) of Table A4, the estimated effect of shadow banking exposure remains negative and statistically

significant. Overall, these results confirm that the suppressing effect of regulating shadow banking on VC holds across alternative specifications and sample restrictions.

6 Changes in VC Fundraising and Investments

6.1 Fundraising Contraction

We next examine how the NRAM affects VC fundraising. We expect constraints on shadow banking funding make it more difficult for VC firms to raise capital, resulting in smaller fund sizes. Table 3 presents the results. Due to data limitation, we use each fund's registered capital to proxy for fundraising. Column (1) shows that funds managed by GPs with higher pre-policy reliance on shadow banking financing are significantly smaller. This effect remains statistically significant after controlling for characteristics of the portfolio firms, as shown in Column (2). To further examine the source of the decline in fundraising, we construct a GP-year panel and decompose fundraising contraction into extensive and intensive margins. Appendix Table A5 reports the results. We find that GPs with greater pre-policy exposure to shadow banking experience a decline in both the total registered capital and the number of newly established funds after the NRAM. In addition, the average size of newly established funds also decreases. These results suggest that the contraction in shadow banking funding reduced VC fundraising capacity through both fewer newly established funds and smaller fund sizes.

Furthermore, to examine heterogeneity by investment horizon, we split the sample into early-stage and non-early-stage investment deals in Columns (3) and (4), respectively. We

find that the reduction in fund size is primarily concentrated in early-stage investments. This suggests that funds focusing on more risky projects are more severely affected by the regulatory tightening.

6.2 LP Composition Shift

The NRAM imposes strict criteria on financial institutions that pool capital from investors. According to these rules, asset management entities are prohibited from raising and investing pooled funds without obtaining prior regulatory approval. Consequently, we expect these regulatory measures to reduce VC participation from institutional investors, who are more sensitive to compliance risks and regulatory constraints.

Table 4 examines how the NRAM reshapes the composition of LPs in VC funds. Panel A compares institutional and individual LPs. We find a pronounced shift away from institutional investors toward individual investors among VC funds managed by GPs with greater pre-policy exposure to shadow banking. These effects are highly statistically significant and remain stable after controlling for VC-backed firm characteristics, GP characteristics, industry fixed effects, and GP fixed effects. The coefficient estimates imply that a one-standard-deviation increase in shadow banking exposure is associated with a 3.1 percentage-point decline in the share of institutional LPs by number after 2018, corresponding to a 4.5% reduction relative to the sample mean. This decline is accompanied by a corresponding increase in the share of individual LPs.

Panel B further decomposes institutional LPs into financial institutions and nonfinancial corporate investors. We find that the post-regulation decline is driven primarily by finan-

cial institutional LPs, as shown by the negative and statistically significant coefficients in Columns (1) and (3). That is, VC funds more exposed to shadow banking experience a large and significant reduction in the share of financial institutional investors following the NRAM. In contrast, the estimated impact on the share of corporate LPs is economically small and statistically insignificant (Column (2)) or marginally significant (Column (4)). These results strengthen our argument that the changes in the LP composition are attributed to the NRAM, which targets the financial industry.

Taken together, these results indicate that the tightening of shadow banking regulation disproportionately constrained regulated financial institutions' participation in VC funds, consistent with the NRAM's restrictions on pooled and multi-layer investment vehicles. As institutional capital retrenched, VC funds substituted toward individual investors, who face fewer regulatory constraints but typically provide smaller, less stable, and less professionally monitored capital. This shift in LP composition is consistent with the decline in fundraising documented in Table 3, and also helps explain the subsequent changes in VC investment behavior and portfolio firm innovation outcomes documented in later sections.

6.3 Timing of Capital Deployment and Investment Horizons

Next, we examine whether the NRAM altered the timing of capital deployment over the fund life cycle. A key provision of the NRAM is the strict prohibition of maturity mismatch in asset management products. Since such products were a major source of shadow banking funding, this rule is expected to shorten the effective investment horizons of funds reliant on such capital, potentially altering their investment behavior. Prior literature supports this

mechanism; for instance, Barrot (2017) show that younger funds with longer horizons tend to favor growth-stage firms, which subsequently exhibit higher patent growth, whereas funds nearing liquidation become more risk-averse. We therefore use the fund's age at the time of investment, both in years and relative to its contractual lifetime, to measure the timing of capital deployment and the remaining horizon available for an investment.

Table 5 examines how VC firms with greater reliance on shadow-bank funding adjust their investment horizons following the 2018 NRAM. GPs with higher pre-policy shadow banking exposure invest at later stages of their fund life cycles after the regulation, as indicated by the positive and statistically significant coefficients in Columns (1) and (3). A one-standard-deviation increase in shadow banking exposure is associated with a 5.8% increase in fund age at the time of investment. This result is also robust when investment timing is measured relative to the fund's contractual lifetime. Under China's business registration system, partnership entities are allowed to register their operating duration, although this information is not available for all entities in our sample. We therefore use the registered fund duration as the denominator to construct the fund age ratio. The results show that greater shadow banking exposure is associated with a statistically significant increase in this relative investment timing measure. Specifically, a one-standard-deviation increase in shadow banking exposure is associated with a 6.4% increase in fund age ratio. These results show that the regulation delayed capital deployment among more exposed VC firms. Given the finite contractual lives of VC funds, later deployment also leaves less time for portfolio firms to mature before fund termination. The findings are therefore consistent with a shortening of the remaining investment horizon.

We next examine how the investment behavior associated with shadow-bank-backed funds

changed after the NRAM. Unlike the preceding analysis, which uses GPs' predetermined exposure to shadow banking, this analysis uses the share of capital contributed by shadow-banking institutions to each fund at the investing time. This specification allows us to examine whether the investment characteristics associated with shadow-bank participation changed after the regulation. We estimate the following deal-level specification:

$$\begin{aligned} Y_{i(gfdt)} = \alpha + \beta ShadowBankShare_i \times Post_t + \phi ShadowBankShare_i \\ + \gamma' X_g \times \lambda_t + \delta' Z_f \times \lambda_t + \eta_g + \mu_d + \lambda_t + \varepsilon_{i(gfdt)} \end{aligned} \tag{6}$$

where $ShadowBankShare_i$ is the share of capital contributed by shadow-banking institutions to the VC fund involved in deal i. Other specifications remain consistent with Equation 5.

Table A6 presents the results. Prior to the regulation, funds with a higher shadow-bank share tend to invest earlier in their life cycles, as indicated by the negative and statistically significant coefficients on *ShadowBankShare* in Columns (1) and (3). However, following the implementation of the NRAM, this investment pattern reverses sharply. We find the interaction term $ShadowBankShare \times Post$ is positive and statistically significant across all specifications, indicating that shadow-bank-backed funds shift toward investing at later stages of the fund life cycle. Consistent with this shift, the age of portfolio firms at investment also increases significantly in the post-NRAM period (Columns (2) and (4)), suggesting a reallocation away from early-stage firms toward more mature targets.

These changes in investment horizon is closely aligned with the NRAM's strict prohibition of maturity mismatch in asset management products. Under the regulation, products allocating to equity in unlisted firms must specify an exit date no later than the prod-

uct's contractual maturity, effectively eliminating the widespread practice of using rolling short-term products to support long-term VC investments. Although commercial banks subsequently established wealth management subsidiaries to manage these products more professionally after the NRAM, few closed-end WMPs targeting private equity have been introduced. Their maturities remain far shorter than the multi-year horizon required for early-stage VC investments. Data from *chinawealth.com.cn* show that newly issued closed-end WMPs in the first half of 2025 had average maturities of only 377–489 days, whereas a typical VC investment cycle often exceeds seven years. This persistent maturity mismatch makes early-stage investing incompatible with shadow-bank-based funding and incentivizes a reallocation of capital toward later-stage investments with higher exit certainty and shorter horizons, such as pre-IPO financing.[17]

6.4 Shifts in Industry Focus of VC Investment

Furthermore, we examine changes in the industry focus of VC investments. In China, the government actively implements industrial policies to guide VC investment and promote strategic sectors. A particularly important example is the "Made in China 2025" initiative, launched in 2015, which aims to enhance China's autonomous technological innovation and manufacturing capabilities.[18] Table 6 compares VC investments in industries prioritized by the "Made in China 2025" initiative with other industries. We find that the contraction in VC activity after the regulatory shock is concentrated in non-prioritized industries. Specifically, a higher shadow banking exposure is associated with a significant decline in both the

[17] https://finance.sina.com.cn/money/bank/bank_hydt/2023-09-08/doc-imzkynyn2472290.shtml

[18] See https://www.gov.cn/zhengce/content/2015-05/19/content_9784.htm.

number of investment deals and the investment share allocated to non-prioritized industries. In contrast, VC investment in "Made in China 2025" industries does not exhibit a significant decline in the number of deals and shows a relative increase in investment share. These findings suggest that the tightening of shadow banking regulation disproportionately constrained VC investment in industries outside government-prioritized sectors, while policy-supported industries were relatively more resilient to the financing shock.

7 Real Impacts on Firm Innovation

Next, we examine the real effects of the NRAM on portfolio firms. Given VC's central role in promoting innovation, we focus on how the innovation output of portfolio firms changed following the implementation of the NRAM in 2018.

7.1 Post-VC-investment Innovation Changes

We begin by analyzing firm-level innovation outcomes after a firm receives its first round of VC investment. Our analysis focuses primarily on two measures: the total number of patent applications and the number of granted patents. The latter serves as a better quality indicator of innovation.

Table A7 presents the impact of VC investment on firm-level innovation and its attenuation following the 2018 regulatory shock. The positive and highly significant coefficient on $AfterInvest$ shows that VC funding robustly stimulates patenting activity among portfolio firms. However, the negative and significant coefficient on the interaction term $AfterInvest \times Post$ indicates that this positive effect was materially weakened after the

NRAM. Quantitatively, the innovation premium associated with VC investment dropped substantially post-2018. This demonstrates that the regulation, by constricting the shadow banking channel that supplied long-term capital to VCs, impairs the core function of VC in fostering innovation.

7.2 Regulation Impacts on Firm Innovation

To more rigorously identify the NRAM's impact on innovation, we analyze portfolio firm-level panel data in the DID framework. We focus on the first round of investment. Since many first-round investments are syndicated, we calculate the average shadow banking exposure across all investing GPs for firms receiving joint investments. We treat each syndicate as a single VC investor for simplicity. The regression results are presented in Table 7. As shown in Columns (1) and (3), portfolio firms backed by GPs with higher pre-policy shadow banking exposure experience a significant decline in patent applications after the NRAM, regardless of whether industry fixed effects or portfolio firm fixed effects are included. A similar pattern is observed for granted patents in Columns (2) and (4). These findings suggest that the contraction of shadow banking financing not only reduced VC investment activity but also adversely affected the subsequent innovation outcomes of portfolio firms.

We provide two explanations for the decrease in innovation output. As shown in Section 6, on the one hand, fundraising difficulties and a rising share of individual investors reduce fund size and the availability of patient, professional capital. On the other hand, investment activity became constrained by maturity-mismatch restrictions and regulatory compliance, leading funds to shorten investment horizons. Together, these factors likely reduce the level

of support for portfolio firms or prompted VCs to avoid riskier, more innovative investments.

7.3 Heterogeneous Effects Across Industries

We further examine whether the regulatory shock affects industries differently. Specifically, we test whether the decline in innovation is more pronounced in sectors that are inherently more vulnerable to financing constraints. We first examine heterogeneity based on industry-level external finance dependence (EFD). We calculate firm-level EFD using data from A-share listed firms and aggregate it to the industry level by taking the median value within each industry. Industries are then classified as having high or low EFD based on whether their industry-level EFD is above or below the median across industries.

Table 8 Panel A shows clear heterogeneity in the innovation effects of shadow banking regulation. The coefficient on $ShadowBankExpo \times Post$ is negative and statistically significant in high-EFD industries for both patent applications and granted patents. By contrast, the corresponding estimates for low-EFD industries are smaller in magnitude and statistically insignificant. This pattern suggests that the contraction of shadow banking financing disproportionately affected firms in industries that rely more heavily on external capital to support innovation and investment activities, consistent with the view that financing constraints are an important channel through which the regulation affected innovation.

We further examine heterogeneity based on industry-level R&D intensity. R&D intensity is measured as the ratio of R&D expenditures to sales revenue using industry-level data. Industries are classified as having high or low R&D intensity following the same procedure used for EFD. As shown in Panel B, the negative effect of the regulatory shock is concen-

trated among industries with higher R&D intensity, with significant declines in both patent applications and granted patents. Since R&D-intensive industries typically require sustained investment over longer horizons and involve greater uncertainty before commercialization, their innovation activities are more dependent on stable sources of long-term risk capital. The stronger effects in these industries suggest that the contraction of shadow banking financing constrained VC-backed innovation particularly in sectors where patient capital is more critical. Overall, these heterogeneous effects indicate that shadow banking regulation affected not only the aggregate availability of VC financing but also the allocation of risk capital across different types of innovative activities.

8 Conclusion

We study how shadow banking regulation affects the supply of VC and its real consequences in a bank-dominated financial system. Focusing on China, the largest bank-centric economy, we document a previously unexplored channel through which banks indirectly fund VC through off-balance-sheet asset management products that engage in maturity transformation. Exploiting cross-sectional variation in pre-regulation reliance of VCs on shadow-banking funding, we construct a GP-level exposure measure to identify the causal impact of the 2018 NRAM. We document a large and persistent contraction in VC supply following the regulatory tightening. VC firms with greater pre-policy exposure experience significant declines in both deal counts and total investment amounts after 2018. These results are robust across alternative specifications and exposure measures.

Beyond aggregate effects, the shadow banking regulation induces systematic changes in

VC fundraising and investment behavior. VC funds are smaller post-regulation, with institutional participation declining and individual investors accounting for a larger share of capital. Funds more exposed to shadow-bank funding shift away from early-stage, long-horizon investments toward later-stage and more mature firms, consistent with tighter liquidity constraints and reduced capacity for maturity transformation. In addition, VC investments become more concentrated in government-prioritized industries, indicating that private capital allocation has become increasingly sensitive to government policy.

These funding and behavioral changes have meaningful real effects on portfolio firms. While VC investment is generally associated with stronger innovation outcomes, this effect weakens after the NRAM. Portfolio firms backed by highly exposed VC firms experience significant declines in patenting activity, particularly in industries more dependent on external finance. These results indicate that shadow banking regulation curtails the supply of long-term, risk-bearing capital to VC, with downstream consequences for firm-level innovation.

Our findings highlight an important trade-off between financial stability and the provision of risk capital in bank-centric financial systems. In the absence of well-developed alternative financing channels, shadow banking serves as a *de facto* mechanism for supplying long-term capital to the VC sector. Regulatory efforts that restrict such channels without facilitating substitutes may inadvertently dampen innovative activity. Overall, our results underscore how financial regulation affects not only credit provision but also the allocation of risk capital and the dynamics of innovation.

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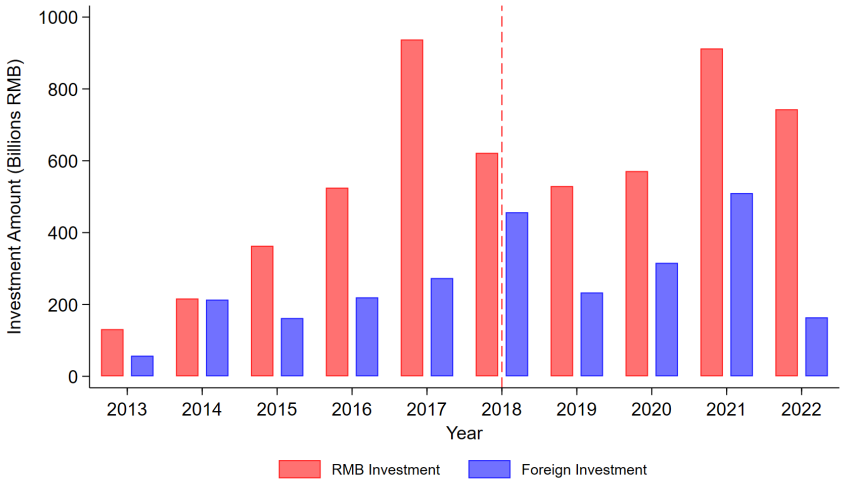
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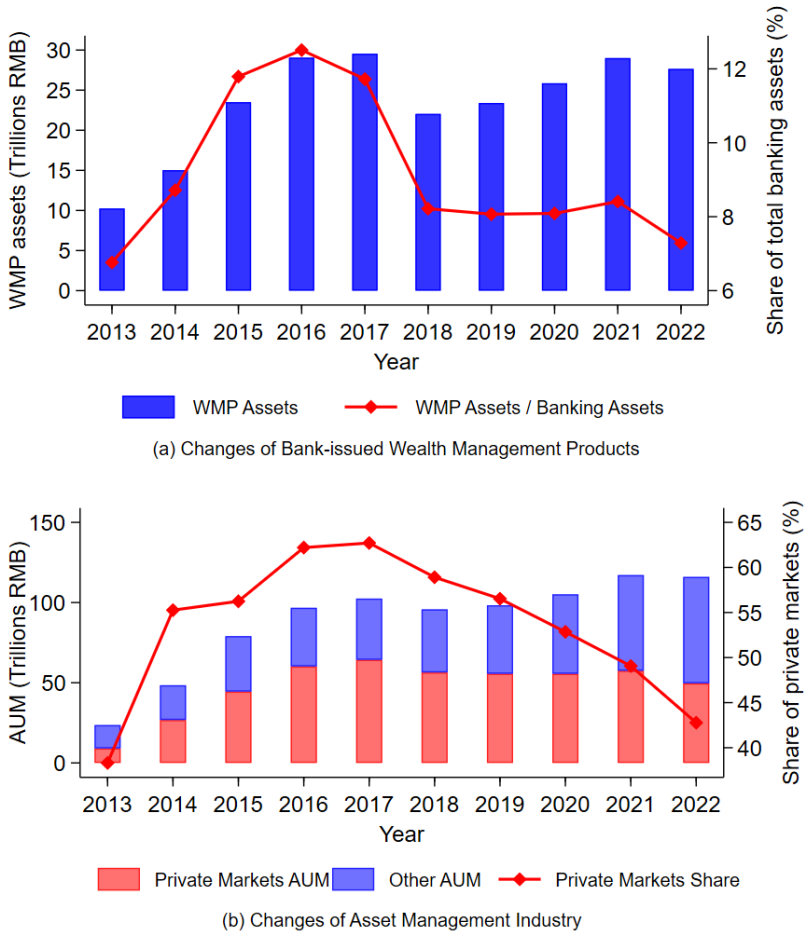
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Figure 1: VC/PE Investments in China



Notes: This figure illustrates the time trends of VC/PE investment amounts in China by currency. Data source: Zero2IPO.

Figure 2: Asset Management Industry in China

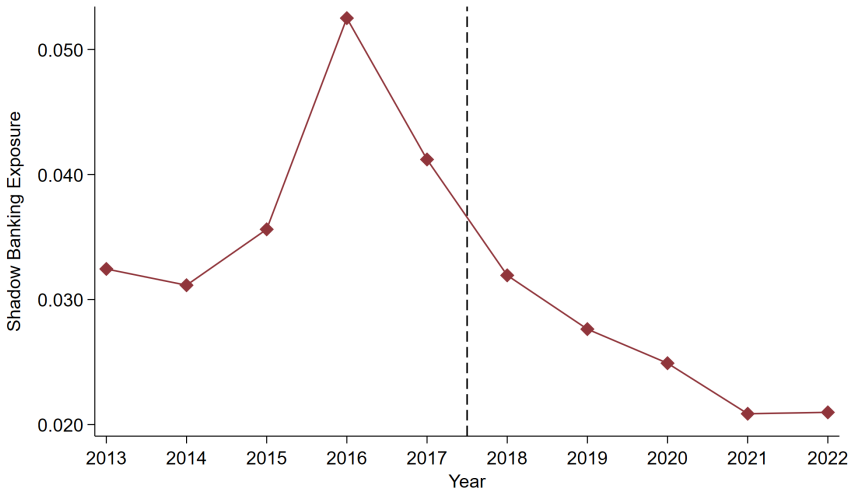


(a) Changes of Bank-issued Wealth Management Products

(b) Changes of Asset Management Industry

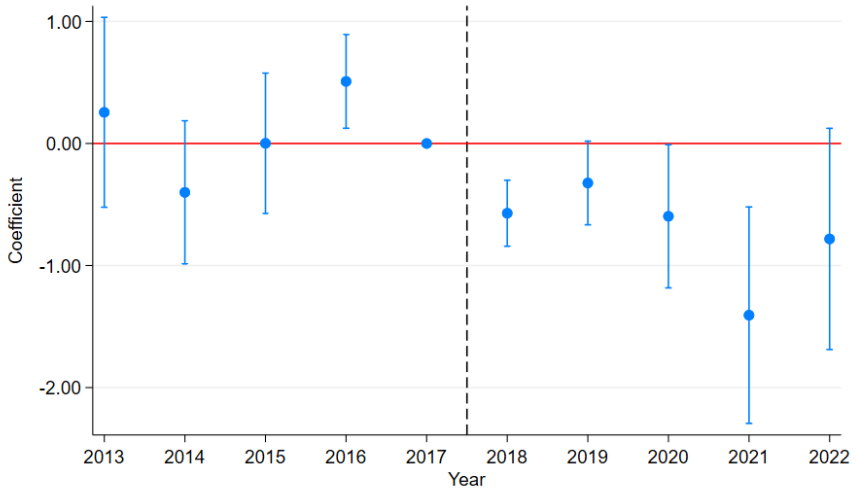
Notes: This figure illustrates the evolution of China's asset management industry from 2013 to 2022. Panel (a) shows changes in bank-issued wealth management products, including their total assets and their share of total banking assets. Panel (b) presents changes in total assets under management (AUM) in the asset management industry. Private-market AUM includes assets managed by securities firms, trust companies, mutual fund subsidiaries, and similar institutions. We exclude WMPs here because they primarily gain exposure to private markets by investing in products issued by other institutions. Data source: Banking Wealth Management Registration and Custody Center, Asset Management Association of China.

Figure 3: Changes in VC Exposure to Shadow Banking over Time



Notes: This figure shows the annual average shadow banking exposure of GPs from 2013 to 2022. For each GP-year, shadow banking exposure is calculated as the share of capital committed by shadow-banking institutions among the funds managed by the GP, weighted by the registered capital of each fund.

Figure 4: Dynamic Effects of Shadow Banking Regulation on VC Investment



Notes: This figure presents the dynamic effects of shadow banking regulation on VC investment deals at the GP level. The specification mirrors the baseline regression but is augmented with year dummies for 2013–2022 (2017 omitted) and interactions between those year dummies and $ShadowBankExpo$). Point estimates are plotted with 95% confidence intervals.

Table 1: Summary Statistics

Panel A: Deal-level Data						
VARIABLES	N	Mean	SD	Min	p50	Max
ShadowBankShare	77209	0.034	0.135	0	0	1
Early stage (angel, seed or A rounds)	77209	0.473	0.499	0	0	1
Firm capital (RMB, millions)	68765	343.392	2026.014	0.001	48.784	60192.797
Firm age (when invested)	68765	6.496	5.706	0	5	48
Panel B: GP-level Data						
VARIABLES	N	Mean	SD	Min	p50	Max
GPinvest	45843	1.122	4.628	0	0	232
GPinvest amount (ten millions)	42336	2.342	11.644	0	0	563.401
ShadowBankExpo	45843	0.044	0.166	0	0	1
GP capital (RMB, millions)	45843	130.550	1285.866	0.001	10	67044.625
GP founding year	45843	2013.179	3.166	1985	2014	2017
Panel C: Portfolio-firm-level Data						
VARIABLES	N	Mean	SD	Min	p50	Max
Patent	151452	10.224	109.790	0	0	17028
Granted patent	151452	5.720	55.907	0	0	8647

Notes: This table reports summary statistics for the main variables used in the analysis. Panel A presents deal-level characteristics. *ShadowBankShare* is the share of capital committed by shadow-banking institutions in a VC fund's total capital. *Early stage* is an indicator equal to one if the investment round is an angel, seed, pre-A, or Series A round. *Firm capital* is the portfolio firm's registered capital (in RMB millions), and *Firm age* measures the firm's age at the time of investment. Panel B presents GP-level characteristics. *GPinvest* is the annual number of VC investment deals undertaken by a VC firm (as a GP), and *GPinvest amount* is the annual total investment amount of the VC firm (in RMB ten millions). *ShadowBankExpo* measures a VC firm's exposure to shadow banking, defined as the share of shadow-banking capital commitments among funds managed by the VC firm. *GP capital* is the total capital managed by the VC firm (in RMB millions), and *GP founding year* is the year in which the VC firm was established. Panel C presents portfolio-firm-level characteristics. *Patent* is the total number of patents applied for by the portfolio firm in the reference year, and *Granted patent* is the number of granted patents applied for by the portfolio firm.

Table 2: Impact on VC Investment across GPs

	(1) GPinvest	(2) GPinvest amount	(3) GPinvest	(4) GPinvest amount
ShadowBankExpo×Post	-0.739***	-2.967***	-0.837***	-2.760**
	(0.275)	(1.069)	(0.298)	(1.093)
ShadowBankExpo	0.088	3.903***		
	(0.142)	(0.851)		
lnGPcapital×Year	Yes	Yes	Yes	Yes
GPfoundedyear×Year	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
GP FE	No	No	Yes	Yes
N	45843	42336	45843	42333
R2	0.050	0.040	0.512	0.456
Mean of DV	1.122	2.342	1.122	2.342

Notes: This table examines the impact of regulation on VC firms' investment activity. The sample consists of a GP–year panel covering GPs with VC investments over the period 2013–2022. *GPinvest* is the number of VC investment deals made by a GP. *GPinvest amount* is the total value of VC investments made by a GP. *lnGPcapital* is the log of a GP's registered capital, and $GPfoundedyear$ denotes the GP's founding year (measured relative to 2017). Standard errors are clustered at the GP level in all regressions. *, **, and ***, denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 3: Impact on Fund Size

	All Investments		Early-stage Investments (Series A and before)	Non-Early-Stage Investments
	(1) lnFund size	(2) lnFund size	(3) lnFund size	(4) lnFund size
ShadowBankExpo×Post	-0.357**	-0.356**	-0.771***	-0.124
	(0.152)	(0.149)	(0.219)	(0.168)
FirmControls	No	Yes	Yes	Yes
GPControls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
GP FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	43178	43178	20361	21544
R2	0.688	0.689	0.718	0.669
Mean of DV	10.106	10.106	9.994	10.302

Notes: This table examines the impact of shadow banking regulation on the size of VC investment funds. *lnFundSize* is the log of a fund's registered capital. Columns (1)–(2) use all investment deals. Column (3) restricts the sample to early-stage investments (Series A and earlier), while Column (4) focuses on non–early-stage investments.$FirmControls$ include interactions between $lnRegistCapital$ and $FirmAge$ with year fixed effects, where $lnRegistCapital$ is the log of the VC-backed firm's registered capital and $FirmAge$ denotes the age of the firm at the time of investment. GP-level controls include $lnGPcapital$ and $GPage$, both interacted with year fixed effects, where $lnGPcapital$ is the logarithm of the GP's registered capital and $GPage$ denotes the age of the GP at the time of investment. Standard errors are clustered at the GP level and reported in parentheses. *, **, and ***, denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 4: Impact on the Composition of LP Types

	Panel A: Institutional LPs versus Individuals			
	(1) Institution LP	(2) Individual LP	(3) Institution LP	(4) Individual LP
ShadowBankExpo×Post	-0.208***	0.208***	-0.200***	0.200***
	(0.034)	(0.034)	(0.034)	(0.034)
FirmControls	No	No	Yes	Yes
GPControls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
GP FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	43193	43193	43193	43193
R2	0.608	0.608	0.610	0.610
Mean of DV	0.693	0.307	0.693	0.307
	Panel B: Financial Institutional LPs versus nonfinancial corporate LPs			
	(1) Financial LP	(2) Corporate LP	(3) Financial LP	(4) Corporate LP
ShadowBankExpo×Post	-0.149***	-0.031	-0.145***	-0.034
	(0.033)	(0.024)	(0.032)	(0.024)
FirmControls	No	No	Yes	Yes
GPControls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
GP FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	43193	43193	43193	43193
R2	0.608	0.637	0.609	0.638
Mean of DV	0.360	0.140	0.360	0.140

Notes: This table examines the impact of regulation on the composition of LP types in VC investments. Panel A presents the changes between institutional and individual LPs. *Institutional LP* is defined as the number of institutional investors divided by the total number of LPs in the investing fund, while *Individual LP* is defined as the number of individual investors divided by the total number of LPs. Panel B presents the changes between financial institutional LPs and nonfinancial corporate LPs. *Financial LP* is defined as the number of financial institutional investors (i.e., those classified as financial industries or with four-digit industry codes corresponding to asset management) divided by the total number of LPs, and *Corporate LP* is defined as the proportion of LPs that are non-financial corporations (i.e., those whose industry classification falls outside of finance, leasing, and commercial services). *FirmControls* include interactions between *lnRegistCapital* and *FirmAge* with year fixed effects, where *lnRegistCapital* is the log of the VC-backed firm's registered capital and *FirmAge* denotes the age of the firm at the time of investment. GP-level controls include *lnGPcapital* and *GPage*, both interacted with year fixed effects, where *lnGPcapital* is the logarithm of the GP's registered capital and *GPage* denotes the age of the GP at the time of investment. Standard errors are clustered at the GP level and reported in parentheses. *, **, and ***, denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 5: Impact on Timing of Capital Deployment and Investment Horizons

	(1) Fund age	(2) Fund age ratio	(3) Fund age	(4) Fund age ratio
ShadowBankExpo×Post	0.718***	0.067***	0.762***	0.070***
	(0.233)	(0.025)	(0.229)	(0.024)
FirmControls	No	No	Yes	Yes
GPControls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
GP FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	43190	31013	43190	31013
R2	0.418	0.462	0.421	0.464
Mean of DV	2.056	0.170	2.056	0.170

Notes: This table examines the impact of regulation on timing of capital deployment and investment horizon of VC firms. *Fund age* is calculated as the investment year minus the fund's founding year. *Fund age ratio* measures the relative investment age of the fund, calculated as the ratio of fund age at the time of investment to the fund's total contractual lifetime. $FirmControls$ include interactions between $lnRegistCapital$ and $FirmAge$ with year fixed effects, where $lnRegistCapital$ is the log of the VC-backed firm's registered capital and $FirmAge$ denotes the age of the firm at the time of investment. GP-level controls include $lnGPcapital$ and $GPage$, both interacted with year fixed effects, where $lnGPcapital$ is the logarithm of the GP's registered capital and $GPage$ denotes the age of the GP at the time of investment. Standard errors clustered at the GP level are used in all the regressions. *, **, and ***, respectively, indicate significance at the 0.1, 0.05, and 0.01 levels.

Table 6: Impact on VC Investments of Different Industries

	Industries in "Made in China 2025"		Other Industries	
	(1) GPinvest	(2) GPinvest share	(3) GPinvest	(4) GPinvest share
ShadowBankExpo×Post	-0.174	0.032*	-0.584***	-0.046**
	(0.107)	(0.018)	(0.143)	(0.021)
GPControls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
GP FE	Yes	Yes	Yes	Yes
N	45333	45333	45333	45333
R2	0.473	0.235	0.514	0.285
Mean of DV	0.362	0.110	0.638	0.199

Notes: This table examines the impact of regulation on VC investments across different industries, comparing industries prioritized by "Made in China 2025" with other industries. *GPinvest* is the number of VC investment deals undertaken by a GP in each industry group and year. *GPinvest share* is the share of a GP's annual investment deals allocated to each industry group. GP-level controls include $lnGPcapital$ and $GPfoundedyear$, each interacted with year fixed effects. Standard errors are clustered at the GP level and reported in parentheses. *, **, and ***, denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 7: Impact on Innovation of VC-backed Firms

	(1) Patent	(2) Granted patent	(3) Patent	(4) Granted patent
ShadowBankExpo×Post	-0.566**	-0.569**	-0.520**	-0.495**
	(0.249)	(0.222)	(0.260)	(0.240)
FirmControls	Yes	Yes	Yes	Yes
GPControls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
GP FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	No	No
Firm FE	No	No	Yes	Yes
N	108779	106294	87241	82653
Pseudo R2	0.718	0.680	0.795	0.751
Mean of DV	11.332	6.436	14.124	8.274

Notes: This table examines the impact of regulation on the innovation outcomes of VC-backed firms. All regressions are estimated using Poisson pseudo–maximum likelihood (PPML). The dependent variable *Patent* is the number of patents applied in the reference year, while *Granted patent* is the number of granted patents applied in the reference year. *ShadowBankExpo* measures the investing VC firms' exposure to shadow banking at the time when the VC-backed firm receives its first VC investment. For syndicated investments, *ShadowBankExpo* is defined as the average exposure across all investing GPs. *FirmControls* include interactions between *lnRegistCapital* and *FirmAge* with year fixed effects, where *lnRegistCapital* is the log of the VC-backed firm's registered capital and *FirmAge* denotes the age of the firm at the time of investment. GP-level controls include *lnGPcapital* and *GPage*, both interacted with year fixed effects, where *lnGPcapital* is the log of the GP's registered capital and *GPage* denotes the age of the GP at the time of investment. For syndicated investments, GP-level controls are constructed as averages across all investing GPs. Standard errors are two-way clustered at both the GP and portfolio-firm levels. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

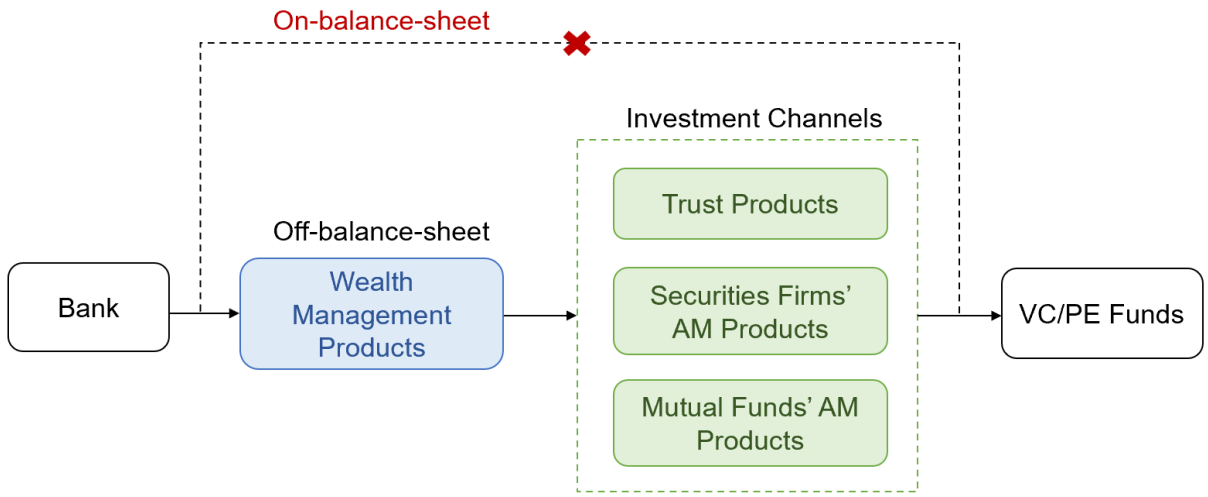
Table 8: Heterogeneous Effects on Innovation of VC-backed Firms

	Panel A: External Finance Dependence (EFD)			
	High EFD Industries		Low EFD Industries	
	(1) Patent	(2) Granted patent	(3) Patent	(4) Granted patent
ShadowBankExpo×Post	-0.557**	-0.602**	-0.430	-0.301
	(0.267)	(0.282)	(0.449)	(0.290)
FirmControls	Yes	Yes	Yes	Yes
GPControls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
GP FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
N	46686	44379	30586	28569
Pseudo R2	0.815	0.774	0.761	0.700
Mean of DV	17.351	10.240	11.769	6.805
	Panel B: R&D Intensity			
	High R&D Intensity Industries		Low R&D Intensity Industries	
	(1) Patent	(2) Granted patent	(3) Patent	(4) Granted patent
ShadowBankExpo×Post	-0.333*	-0.385**	-0.202	-0.237
	(0.200)	(0.193)	(0.412)	(0.415)
FirmControls	Yes	Yes	Yes	Yes
GPControls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
GP FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
N	50145	47145	28141	26825
Pseudo R2	0.830	0.787	0.821	0.779
Mean of DV	17.838	10.140	11.568	7.406

Notes: This table examines the heterogeneous impact of regulation on the innovation outcomes of VC-backed firms. Panel A splits the sample by external finance dependence (EFD): columns (1)–(2) restrict to industries with above-median EFD, while columns (3)–(4) restrict to industries with below-median EFD. Panel B splits the sample by R&D intensity: columns (1)–(2) restrict to industries with above-median R&D intensity, while columns (3)–(4) restrict to industries with below-median R&D intensity. All regressions are estimated using Poisson pseudo–maximum likelihood (PPML). The dependent variable *Patent* is the number of patents applied for in the reference year, while *Granted patent* is the number of granted patents applied for in the reference year. *ShadowBankExpo* measures the investing VC firms' exposure to shadow banking at the time when the VC-backed firm receives its first VC investment. For syndicated investments, *ShadowBankExpo* is defined as the average exposure across all participating VC firms. *FirmControls* include *lnRegistCapital* and *FirmAge*, each interacted with year fixed effects. GP-level controls include *lnGPcapital* and *GPage*, each interacted with year fixed effects. For syndicated investments, GP-level controls are constructed as averages across all investing GPs. Standard errors are two-way clustered at both the GP and portfolio-firm levels. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

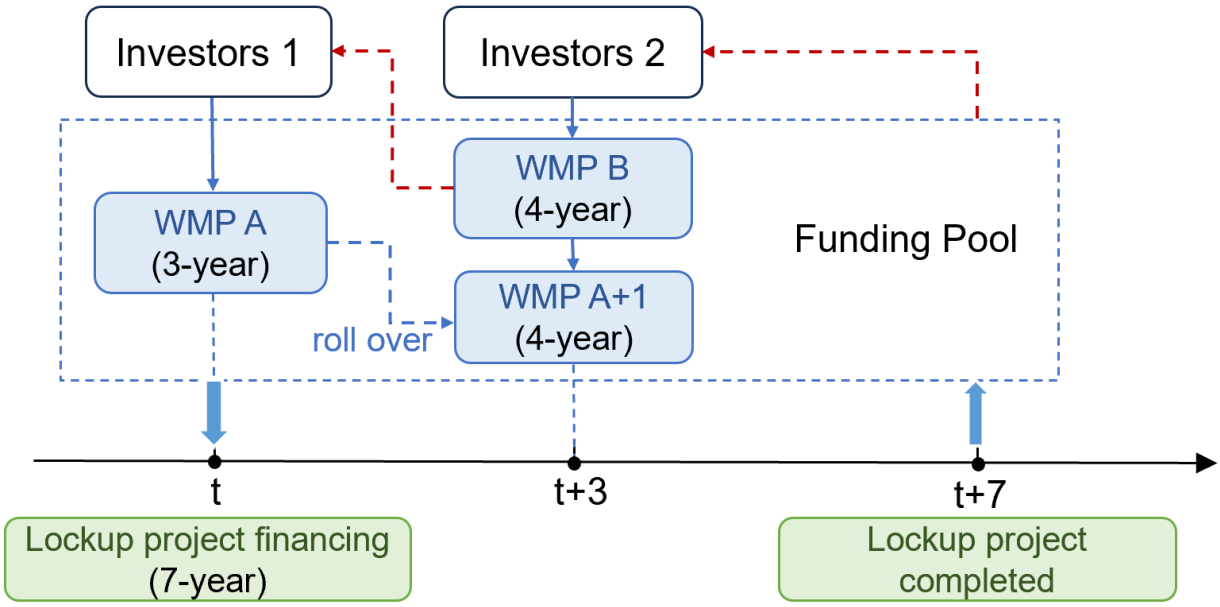
Appendix A

Figure A1: Banks' VC Investment Channels



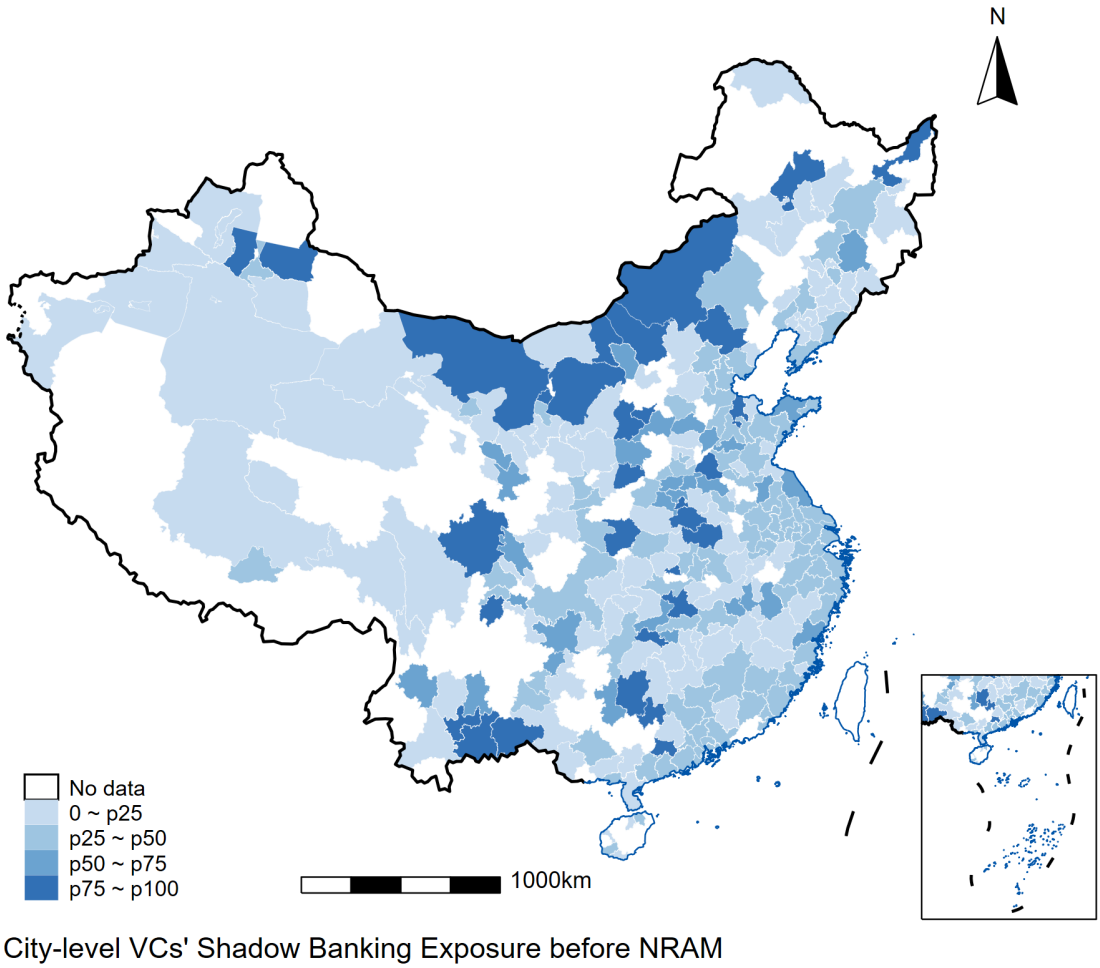
Notes: This figure illustrates the VC investment channels of banks in China. Legally, banks are not permitted to directly engage in private equity investments. Instead, they typically issue wealth management products, which subscribe to asset management products offered by non-bank financial institutions, thereby channeling funds into VC/PE funds.

Figure A2: Banks' WMPs and Funding Pool



Notes: This figure illustrates how banks' WMP funding pools created maturity transformation before the 2018 New Regulations on Asset Management. Short-term WMPs were pooled and rolled over to finance long-term lock-up projects, allowing bank-related asset-management capital to support investments with much longer horizons.

Figure A3: Geographic Distribution of VC Exposure to Shadow Banking



Notes: This figure shows geographic distribution of VC exposure to shadow banking before 2018. The calculation is based on city-level average share of shadow banking capital commitment in each investment deal.

Table A1: Impact on VC Investment across Cities

	(1) CityInvest	(2) CityInvest amount	(3) CityInvest	(4) CityInvest amount
ShadowBankExpo×Post	-0.073***	-1.466***	-0.061***	-1.261***
	(0.022)	(0.434)	(0.020)	(0.396)
lnGDP			0.018	0.805
			(0.039)	(0.551)
GDPgrowth			-0.032	-0.499
			(0.029)	(0.527)
lnpopulation			0.814*	9.401**
			(0.432)	(4.569)
Year FE	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes
N	2370	2082	2370	2082
R2	0.702	0.722	0.742	0.739
Mean of DV	0.046	1.090	0.046	1.090

Notes: This table examines the impact of regulation on VC investment. The sample consists of a city–year panel of cities with VC activity over the period 2013–2022. *CityInvest* is the number of VC investment deals per 10,000 residents in a city. *CityInvest amount* is the total value of VC investments in a city scaled by city population. City-level control variables include $lnGDP$, $GDPgrowth$, and $lnpopulation$. Standard errors are clustered at the city level. *, **, and ***, denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table A2: Placebo Test Using Foreign Capital Exposure

	(1) GPinvest	(2) GPinvest amount	(3) GPinvest	(4) GPinvest amount
ForeignExpo×Post	2.362	0.781	2.747	0.021
	(1.454)	(4.550)	(1.717)	(5.509)
ForeignExpo	-0.178	3.166		
	(0.339)	(2.980)		
GPControls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
GP FE	No	No	Yes	Yes
N	46174	42654	46174	42651
R2	0.049	0.039	0.511	0.455
Mean of DV	1.120	2.342	1.120	2.342

Notes: This table reports a placebo test examining the effect of foreign capital exposure on VC firms' investment activities. The sample comprises GP-year panel data covering GPs that had VC investment between 2013 and 2022. $ForeignExpo$ is defined as the pre-2018 share of total capital commitments from USD funds managed by each GP. *GPinvest* is the number of VC investment deals of the GP. *GPinvest amount* is the total VC investment amount of the GP. GP-level controls include $lnGPcapital$ and $GPfoundedyear$, each interacted with year fixed effects. Standard errors clustered at the GP level are used in all the regressions. *, **, and ***, respectively, indicate significance at the 0.1, 0.05, and 0.01 levels.

Table A3: VC Investment and IPO Exit Channels

	(1) GPinvest	(2) GPinvest amount	(3) GPinvest	(4) GPinvest amount
ShadowBankExpo×Post	-0.864***	-2.973***	-0.872***	-2.999***
	(0.303)	(1.098)	(0.303)	(1.100)
IPOoppNum	0.008***	0.023***		
	(0.002)	(0.005)		
IPOoppShare			1.017**	1.790
			(0.507)	(1.564)
GPControls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
GP FE	Yes	Yes	Yes	Yes
N	45093	41638	45093	41638
R2	0.513	0.458	0.513	0.458
Mean of DV	1.129	2.346	1.129	2.346

Notes: This table examines whether changes in IPO exit opportunities affect the estimated impact of shadow banking regulation on VC investment. $IPOoppNum_{gt}$ measures the IPO opportunities available to GP g in year t. It is constructed as the weighted average of the number of A-share IPOs across industries in year t, where the weights are determined by the industry composition of the GP's portfolio investments during the pre-policy period, 2013–2017. $IPOoppShare_{gt}$ is constructed similarly, using the industry-level IPO share among all A-share IPOs as the weighting variable. Both measures are based on pre-2018 portfolio exposure to avoid capturing post-policy investment adjustments.

Table A4: Other Robustness Checks

	Alternative Treatment Definition		Sample Period: 2013–2019		Controlling for GP Location-Year Fixed Effects	
	(1) GPinvest	(2) GPinvest amount	(3) GPinvest	(4) GPinvest amount	(5) GPinvest	(6) GPinvest amount
ShadowBankExpo×Post			-0.522***	-2.176*	-0.886***	-2.975***
			(0.153)	(1.124)	(0.314)	(1.139)
Treat×Post	-0.619**	-1.719**				
	(0.241)	(0.791)				
GPControls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
GP FE	Yes	Yes	Yes	Yes	Yes	Yes
N	45843	42333	29790	27252	45383	41893
R2	0.512	0.456	0.549	0.448	0.514	0.459
Mean of DV	1.122	2.342	0.942	2.372	1.119	2.344

Notes: This table reports robustness checks for the impact of regulation on VC investment activity. The dependent variables are *GPinvest* and *GPinvest amount*, respectively. In Columns (1)–(2), the treatment variable is redefined as a dummy, *Treat*, equal to one if a GP's pre-policy exposure to shadow banking exceeds 30%, and zero otherwise. Columns (3)–(4) restrict the sample to the pre-pandemic period, 2013–2019. Columns (5)–(6) include GP located city-by-year fixed effects. Standard errors are clustered at the GP level and reported in parentheses. *, **, and ***, respectively, indicate significance at the 0.1, 0.05, and 0.01 levels.

Table A5: Changes in GP-Level Fund Formation after the NRAM

	(1) Total fund capital	(2) Number of funds	(3) Average fund size
ShadowBankExpo×Post	-0.511***	-0.154***	-0.332***
	(0.118)	(0.057)	(0.092)
lnGPcapital × Year	Yes	Yes	Yes
GPage × Year	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
GP FE	Yes	Yes	Yes
N	45618	45618	45618
R2	0.281	0.417	0.195
Mean of DV	0.295	0.295	0.118

Notes: This table examines how the NRAM affected VC fundraising activities of GPs. The dependent variables are the total registered capital of newly established funds, the number of newly established funds, and the average registered capital per newly established fund, respectively. For GP-year observations without newly established funds, the average fund size measure is set to zero. $ShadowBankExpo$ measures the GP's pre-policy exposure to shadow banking funding, constructed based on the shadow banking share of LP commitments before 2018. GP-level controls include $lnGPcapital$ and $GPfoundedyear$, each interacted with year fixed effects. Standard errors are two-way clustered at the GP and year levels. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table A6: Impact on Shadow-bank-backed Funds' Investment

	(1) Fund age	(2) Firm age	(3) Fund age	(4) Firm age
ShadowBankShare×Post	0.898***	0.935*	0.932***	0.834*
	(0.198)	(0.530)	(0.197)	(0.505)
ShadowBankShare	-0.580***	0.100	-0.598***	-0.078
	(0.167)	(0.429)	(0.165)	(0.420)
GPControls	Yes	Yes	Yes	Yes
FirmControls	No	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
GP FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	61596	61635	61596	61635
R2	0.466	0.414	0.468	0.448
Mean of DV	1.941	6.361	1.941	6.361

Notes: This table examines the impact of regulation on investment horizon of VC funds with shadow banking as their LPs. *Fund age* is calculated as the investment year minus the fund's founding year. *Firm age* is calculated as the investment year minus the firm's founding year. $FirmControls$ include interactions between $lnRegistCapital$ and $FirmAge$ with year fixed effects, where $lnRegistCapital$ is the log of the VC-backed firm's registered capital and $FirmAge$ denotes the age of the firm at the time of investment. GP-level controls include $lnGPcapital$ and $GPage$, both interacted with year fixed effects, where $lnGPcapital$ is the log of the GP's registered capital and $GPage$ denotes the age of the GP at the time of investment. Standard errors clustered at the GP level are used in all the regressions. *, **, and ***, respectively, indicate significance at the 0.1, 0.05, and 0.01 levels.

Table A7: Impact of VC Investment on Firm-Level Innovation

	(1) Patent	(2) Granted patent	(3) Patent	(4) Granted patent
AfterInvest×Post	-0.137**	-0.192***	-0.164***	-0.211***
	(0.056)	(0.054)	(0.057)	(0.055)
AfterInvest	0.426***	0.451***	0.461***	0.483***
	(0.068)	(0.063)	(0.069)	(0.063)
FirmControls	Yes	Yes	Yes	Yes
GPControls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
GP FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	No	No
Firm FE	No	No	Yes	Yes
N	134184	131271	108987	103496
Pseudo R2	0.712	0.676	0.791	0.748
Mean of DV	11.538	6.598	14.199	8.365

Notes: This table examines the impact of VC investment on the innovation outcomes of portfolio firms and the changes following the 2018 regulation. All regressions are estimated using Poisson pseudo–maximum likelihood (PPML). The dependent variable *Patent* is the number of patents applied in the reference year, while *Granted patent* is the number of granted patents applied in the reference year. $AfterInvest$ is a dummy equal to 1 if the firm receives its first VC investment. *Post* is a dummy equal to 1 for the year 2018 and afterwards. $FirmControls$ include interactions between $lnRegistCapital$ and $FirmAge$ with year fixed effects, where $lnRegistCapital$ is the log of the VC-backed firm's registered capital and $FirmAge$ denotes the age of the firm at the time of investment. GP-level controls include $lnGPcapital$ and $GPage$, both interacted with year fixed effects, where $lnGPcapital$ is the log of the GP's registered capital and $GPage$ denotes the age of the GP at the time of investment. For syndicated investments, GP-level controls are constructed as averages across all investing GPs. Standard errors are two-way clustered at both the GP and portfolio-firm levels. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix B: Data Appendix

B1 Linking VC Transactions to Business-Registration Records

Our VC investment data are obtained from Zero2IPO, which records detailed information for each transaction, including the investing VC fund, investing VC firm, portfolio firm, the investee firm's location, investment date, and investment stage. However, Zero2IPO does not provide information on the LPs of VC funds. To recover LP information, we merge the investment data with business registration records.

In China, a limited-partnership fund is required to register with the State Administration for Market Regulation (SAMR) upon establishment. Its business-registration records report basic information such as the fund's founding year, registered location, industry classification, partners, subscribed capital, and executive partner. These records are publicly available through commercial business-information platforms. We collect business-registration data from Tianyancha.com to obtain information on VC funds, their LPs and GPs, and VC-backed firms.

The most challenging part of the data construction process is identifying capital commitments originating from shadow-banking institutions. For every VC fund in the transaction sample, we collect its partner information, subscribed capital, and all available historical changes in partnership interests. For each investment transaction, we use the partnership structure recorded closest to, but no later than, the investment date. We exclude a transaction if its investment date precedes the earliest available business-registration record for the investing fund. When a historical record identifies an LP but does not report its subscribed-capital share, we infer the missing share by comparing the fund's historical changes with its current partnership structure.

Because an LP may itself be an investment company or limited partnership, we systematically trace its upstream ownership through every observable layer until reaching the ultimate layer of owners. Within the limits of business-registration data, this full-penetration approach provides a systematic and rigorous means of identifying shadow-banking participation reflected in observable ownership links. Nevertheless, it has an important limitation. An investment entity may raise capital from asset management products and subsequently contribute that capital to a VC fund without the financing arrangement appearing in its registered ownership structure. Such funding cannot be identified through ownership tracing, and our measure therefore likely understates the true exposure of VC funds to shadow-banking capital.

B2 Classification of Shadow-Banking Institutions

We classify shadow-banking institutions in China into four categories: trust firms, bank-affiliated asset-management and investment entities, securities firms, and the asset management subsidiaries of mutual funds. The current official lists and institution counts reported below are used to help construct and validate a comprehensive institution list and to provide readers with a description of each category. Our classification is not restricted to institutions appearing on the current lists but also includes relevant institutions identified in historical records during our sample period, including entities that subsequently exited, merged, or changed names.

(1) Trust firms

Trust firms are the most straightforward category to identify. As of 2026, there are 66 trust firms in China, as officially listed by the National Association of Financial Market Institutional Investors (NAFMII).[19] We identify all trust firms as shadow banking conduits.

(2) Bank-affiliated asset-management and investment entities

Commercial banks in China are legally restricted from direct VC/PE investments, resulting in minimal direct deal participation. Their primary engagement in such activities occurs through affiliated or special purpose vehicles, which are frequently established in jurisdictions like Hong Kong. Post-2018, domestic commercial banks were permitted to establish wealth management subsidiaries authorized for asset management and equity investments. We classify these bank-affiliated subsidiaries as part of the shadow banking system.

(3) Securities firms

Securities firms constitute another important category of shadow-banking intermediaries. As of 2026, 150 securities firms are regulated by the China Securities Regulatory Commission (CSRC).[20] Following the expansion of asset management activities after 2012, many securities firms conducted private-market investments through dedicated asset management departments or subsidiaries. We therefore include securities firms and their relevant asset management entities in our classification.

(4) Mutual fund subsidiaries

We classify the private-market asset management subsidiaries established by mutual fund companies as shadow banking conduits. This designation is based on their regulatory foundation and business scope. Their establishment was authorized by the CSRC's 2012 Interim Provisions on the Administration of Subsidiaries of Securities Investment Fund Management Companies, which allowed fund companies to set up subsidiaries specifically for asset management businesses focused on private market transactions. As of 2026, there are 61

[19] See `https://www.nafmii.org.cn/hyfw/hyflmd/hyflmd_701/fyxljrjg/xtgs/`

[20] See `https://www.csrc.gov.cn/csrc/c101900/c1029659/content.shtml`.

such subsidiaries operating in China,[21] and we incorporate them into our shadow banking framework.

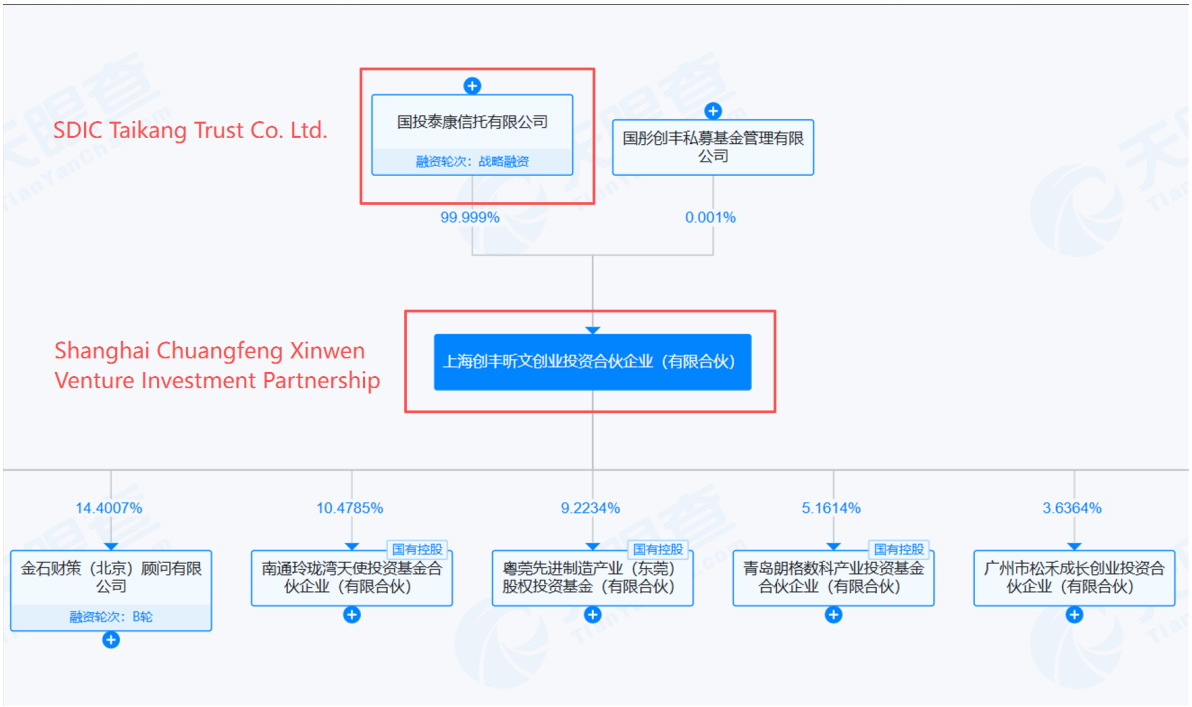
B3 Construction of Fund-Level Shadow-Banking Exposure

We use the traced ownership structure to calculate the portion of each LP's capital commitment ultimately attributable to shadow-banking institutions. When an LP is itself a shadow-banking institution, we classify its entire capital commitment as shadow-bank-related. When a shadow-banking institution invests through one or more intermediate entities, we multiply the ownership shares along each link in the chain. Thus, if a shadow-banking institution owns 30% of an intermediate entity that invests in a VC fund, we classify 30% of that entity's capital commitment as shadow-bank-related; if it owns the entity in full, we classify the entire commitment as shadow-bank-related. For a multilayered structure, we successively multiply the ownership shares across all layers. If multiple traced ownership paths lead to shadow-banking institutions, we add the resulting ultimate ownership shares. We then calculate $ShadowBankShare$ as the sum of direct and proportionally attributed shadow-bank capital commitments divided by the total capital commitments to the VC fund. This measure therefore captures both direct participation by shadow-banking institutions and the shadow-bank component of commitments made through intermediate investment vehicles.

Figure B1 illustrates the tracing procedure. In this example, SDIC Taikang Trust Co., Ltd., which we classify as a shadow-banking institution, holds a 99.999% partnership interest in Shanghai Chuangfeng Xinwen Venture Investment Partnership. The partnership, in turn, invests in several downstream limited-partnership funds. Accordingly, when this intermediate vehicle appears as an LP in a downstream fund, 99.999% of its capital commitment is attributed to shadow-banking capital.

[21] See `https://www.csrc.gov.cn/csrc/c101900/c1029658/content.shtml`.

Figure B1: Identifying Shadow-Bank Participation through Ownership Tracing



Notes: This figure illustrates an ownership chain used to identify shadow-bank participation in VC funds. Source: Tianyancha.