The Rise of Government Venture Capital in China

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Abstract

We document the rise of government venture capital (government VC) in China as an increasingly important industrial policy tool and examine how China's Budget Law reform induced this shift. We construct a comprehensive dataset covering the universe of VC firms, funds, and investment deals in China. Using this dataset, we establish three stylized facts: (1) the number of government VC fundraising activities and investment events has increased rapidly since 2014, with growth rates gradually exceeding those of private VC; (2) government VC investments are broadly similar to private VC in industry composition but are more strongly concentrated in manufacturing sectors; (3) relative to private VC, government VC exhibits a stronger preference for investing in more mature ventures with larger registered capital. Exploiting exogenous cross-city variation in pre-reform subsidy intensity, we causally show that the Budget Law reform, by tightening local fiscal constraints, encouraged local governments to shift from subsidies to government VC as their new industrial policy strategy. We find that this policy shift is associated with a decline in firm entry, accompanied by improvements in the quality of entrants and innovation. Moreover, the reform generates a strong crowding-in effect on private VC investment.

I. Introduction

Industrial policy has resurged in recent years. Defined as government action intended to alter the composition of economic activity, IP

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was championed by Hamilton (1791), formalised by Gerschenkron (1962) and Rosenstein-Rodan (1961), fiercely contested during the neoliberal era, and has since revived, especially in the aftermath of the COVID-19 pandemic. Drawing on new evidence in comparative politics and empirical economics (Johnson, 1982; Amsden, 2001; Harrison and Rodríguez-Clare, 2010; Lane, 2025), the debate has shifted from whether industrial policy should be used to how it should be designed and implemented (Rodrik, 2009). Addressing the latter requires clarity about the industrial policy toolkit and the heterogeneous effects of its instruments across political–economic contexts. Existing scholarship largely focuses on traditional instruments—such as tax incentives, R&D subsidies, and tariff protection—that operate primarily through transfers or fiscal support. Yet alongside these familiar tools, a novel form of industrial policy has emerged: government venture capital (Government VC). Distinct from subsidies, government VC entails the state deploying public funds directly as equity investments in targeted sectors, while entrusting professional fund managers with investment selection and portfolio management. This new industrial policy approach raises two central questions: (1) what are the distinct features of government VC? (2) what are the effects of government VC on industrial development and on the private VC sector?

Regarding the first question, compared to subsidies, government VC blends state-led innovation policy with market-driven investment, making it conceptually distinct from traditional industrial policy in two key respects. First, a common critique of industrial policy is that governments lack the information necessary to effectively target industrial support. By partnering with professional fund managers, government VC leverages market expertise to identify high-growth firms, thereby mitigating information asymmetries. As a result, government VC investments tend to be more selective, whereas subsidies are typically industry-wide and more diffused. Second, government VC requires the state to share both upside returns and downside risks with private investors, as government and private investors jointly contribute capital at the fundraising stage to establish VC funds. This structure better aligns state and market incentives, although it may also result in differences in the risk preferences of government VC compared to private VC.

For the second question, a central challenge in studying the impact of industrial policy lies in endogeneity: the choice of policy instruments is not random but is shaped by local economic conditions, institutional capacity, and the preferences of political leaders. Another challenge is

that multiple policy instruments are often deployed simultaneously. For example, in the case of the new energy vehicle (NEV) industry, industrial policy may include direct production subsidies, preferential land allocation, tax exemptions, and procurement guarantees. This makes it difficult to isolate the effect of any single policy tool, as these instruments are designed to operate jointly and may interact with one another in complex ways.

To address these concerns, we leverage a nationwide, supply-side funding shock: the 2014 amendment to China's Budget Law. This exogenous reform resulted in more local government budget constraints and curtailed prefectural governments' ability to provide subsidies, thereby inducing the employment of government VC as an alternative means to sustain local GDP growth. Using an event-study framework, we identify its effects by comparing outcomes across prefecture-level cities with differing exposure to the shock, proxied by their pre-amendment subsidy rates. To do so, we construct a comprehensive dataset on government VC in China by linking firm registration records with Zero2IPO, a commercial Chinese VC/PE database, and data from the Asset Management Association of China, which contains the official registry of all VC/PE funds in China since 2014. We first document three stylised facts about the rise of government VC in China and how it differs from private VC in its characteristics. We then causally show that the reform shifted the composition of city-level industrial policy by encouraging greater reliance on government VC for cities with higher ex-ante subsidy intensity. Finally, we examine the amendment's effects on prefecture-level industrial development outcomes and assess whether government VC crowded in or crowded out private VC investment.

We highlight four key empirical results. First, we document three stylised facts about the rise of government VC in China. Specifically, government VC surged after 2014 and began to grow at a faster pace than private VC. Compared with private VC, government VC places greater emphasis on the manufacturing sector. Government VC also exhibits a stronger preference for more mature ventures with larger registered capital.

Second, the policy shock induced prefecture-level cities with higher ex ante subsidy intensity to expand government VC investment. A one-percentage-point increase in the ex ante subsidy rate led to a 0.4 percent rise in government VC investment after 2014. In addition, we find no evidence of differential pre-trends across cities with differing exposure after controlling for relevant covariates. The increase in government VC

was driven by growth in both early- and late-stage investments, with the latter exhibiting a slightly larger magnitude. Moreover, syndicated deals constituted a key channel through which government VC expanded, suggesting state efforts include private investors, share decision-making authority, and mitigate potential capital losses.

Third, the shift from subsidies to government VC has significant implications for industrial development in Chinese cities, most notably in firm-entry dynamics. A 1% increase in treatment exposure reduces firm entry by 0.08%. Nevertheless, this reduction in entry is accompanied by higher entrant quality, proxied by registered capital at entry. We interpret this as the result of greater selectivity in government VC, which discourages lower-quality entrants. Moreover, government VC appears to outperform subsidies in fostering innovation: cities with greater treatment exposure experienced larger increases in patents granted and citations, conditional on their pre-treatment characteristics.

Fourth, we find that government VC crowds in private VC. We further examine how this effect varies with the ex ante availability of private VC and the government's willingness to syndicate with private investors, and show that both channels contribute significantly to the overall crowding-in effect. The government's willingness to syndicate is primarily responsible for crowding in early-stage private VC, as private investors value the government's certification role in mitigating information asymmetries in riskier, early-stage ventures. By contrast, the availability of private capital plays a larger role in shaping the crowding-in effect for later-stage private VC investments, where information asymmetries are less binding and the private sector's capacity to follow on from government investments becomes more important.

This study makes three contributions. First, our paper contributes to the growing empirical literature on government VC, an emerging substrand of the broader field of state entrepreneurship. Earlier studies of government VC have largely centred on advanced economies, including Cumming (2007), Brander et al. (2008), Grilli and Murtinu (2014), and Brander et al. (2015). More recently, however, attention has shifted toward China, where government VC activity has expanded rapidly. Colonnelli et al. (2024), for example, use a field experiment to show that firms often resist state-linked investors because of their propensity to interfere with managerial decisions. Chen et al. (2025) highlight the countercyclical role of government VC in China, demonstrating how it sustains innovation during downturns. Beraja et al. (2024) find that although government VC tends to back firms with weaker ex-ante performance, it

ultimately helps generate stronger growth and attracts additional private capital in subsequent funding rounds. Our paper combines China's commercial venture capital database with government firm registration records to construct a comprehensive dataset, documents key features of the rise of government VC, and explains this rise from the perspective of government budget constraints.

Second, we contribute to the literature that quantitatively evaluate the effects of industrial policy tools. Seminal case studies include Lane (2025) on South Korea's Heavy-Chemical Industry Drive; Juhász (2018) on the long-term economic impact of the Napoleonic Blockade; Howell (2017) on the U.S. government's R&D grant programme; and Kalouptsidi (2018) on China's shipbuilding subsidies. In cross-country settings, Moretti et al. (2025) show that increases in defence-related government R&D funding crowd in additional private capital; Juhász et al. (2025) document a rapid rise in the global adoption of industrial policy, driven by subsidies and other export-promotion measures; and Goldberg et al. (2024) identify learning-by-doing effects and global knowledge spillovers by examining semiconductor industrial policies worldwide.

Third, our paper is among the first to compare two distinct types of industrial policy instruments—equity-based versus subsidy-based—thereby addressing the "how" question in the industrial policy research agenda, particularly with respect to instrument choice. Existing studies have largely focused on the design of individual instruments. For instance, Aghion et al. (2015) argue that subsidies should be directed toward more competitive sectors to maximize productivity gains. Barwick et al. (2025) show that reducing entry subsidies can prevent the proliferation of rent-seeking, low-quality firms. Other scholars focus on broader design principles for policy packages. Liu (2019) propose targeting sectors with the highest "distortion centrality," which often correspond to upstream industries. Wei (2025) and Hua et al. (2025) recommend supporting sectors with stronger comparative advantage, finding that these industries generated more innovation following China's industrial policy initiatives.

II. Background

II.A. What is Government Venture Capital?

VC is an important intermediary in the financial market, designed to help startups traverse the so-called "valley of death." Such firms face

high levels of uncertainty due to the information asymmetry between investors and entrepreneurs. Moreover, they typically possess few tangible assets, making it difficult for them to obtain credit from commercial banks (Gompers and Lerner, 2001). VC firms typically fund these high-risk, high-reward projects through equity injections while the firms are still privately held, and seek to exit via routes such as initial public offerings or mergers and acquisitions.

Typical VC firms follow a limited partnership structure. These specialised investors are granted formal and informal powers as so-called "general partners" (GPs) to make investment decisions and manage the portfolio on behalf of "limited partners" (LPs)—the non-specialised investors that supply the majority of the fund's capital. These powers often include the rights to exercise majority voting power in the startup without retaining a majority equity stake, abandon the startup between financing stages, and restrict startups from accessing other sources of funding (Gilson, 2003). For their inputs, venture capitalists are paid based on a skewed compensation structure—commonly a 2 percent management fee and 20 percent carried interest—that ties the lion's share of their earnings to the fund's performance.

By structuring themselves in this manner, government VC firms are designed to address two main sources of market failure. First, the limited partnership arrangement establishes high-powered incentives that help mitigate the information asymmetries hampering startup financing. For example, the largely performance-based compensation scheme motivates government VC investors not only to rigorously screen promising startups and monitor their post-investment performance, but also to contribute technical expertise and personal or institutional networks to help these startups succeed (Lerner and Tåg, 2013; Lerner, 2009). Second, given that innovations are a public good, the knowledge generated by government VC–financed startups spills over to other segments of the economy, thereby addressing the positive externalities of innovation.

It is a common myth to associate government VC with China, believing that the use of government VC is a special characteristic of Chinese industrial policy. However, the advent of government VC long predates the use of it in China, and government VC is prevalent in many countries beyond China. The use of government VC as an industrial policy instrument has been around since at least the U.S. Small Business Investment Company (SBIC) program's formation in 1958. But its use has expanded, particularly in recent years, as countries engaged in economic

and strategic competition have sought more creative methods of bolstering domestic innovation. China is no exception in deploying government VC. By 2023, it has established over 1,800 government guidance funds (GGFs)—a government VC program, with the goal of raising 1.52 trillion dollars to grow advanced and strategic industries (Wei et al., 2023). Besides China, countries traditionally championing neoliberal principles have also deployed government VCs. In Europe, for instance, Germany's High-Tech Gründerfonds (HTGF) is one of the oldest public VC funds in Europe; and Finland's SITRA and TESI play catalytic roles in clean tech and ICT by co-investing with private funds. In the US, DARPA, DOE ARPA-E, and In-Q-Tel (the CIA's strategic VC arm) also channel state funding into frontier technologies. While in this paper, we use China as a case study due to data availability, the learnings can be applied in wider geographical contexts.

II.B. 2014 Amendment to China's Budget Law

In August 2014, China's National People's Congress passed a major amendment to the Budget Law, which came into effect on January 1, 2015. The reform aimed to enhance fiscal transparency, strengthen budgetary oversight, and formalise subnational government borrowing. For instance, it was explicitly stated that "All government revenues and expenditures must be incorporated into the budget"[1] and "Debts incurred by local governments may only be used for public-interest capital expenditures and the moderate repayment of existing debt; they may not be used for regular (recurrent) expenditures."[2] Additionally, in line with the amendment, the State Council issued the Notice on Preferential Tax Policies and Other Preferences on December 9, 2014, which further standardised the administration of government subsidies by prohibiting local governments from setting their own subsidy rates. In a nutshell, the Budget Law amendment primarily aimed to contain rising local government debt risks, enhance fiscal transparency, and curb disorderly subsidy competition. As a result, local governments with higher ex-ante subsidy intensity would find it more difficult to sustain previous subsidy levels through off-budget borrowing, forcing a reduction in subsidies.

We find corroborating empirical evidence indicating that the 2014 Budget Law Amendment had a negative impact on subsidy rates at the prefecture level. This finding is based on data from the National Tax Sur-

1. http://www.npc.gov.cn/npc/c2/c12435/c12488/201905/t20190521$_2$21131.*html*

2. http://www.scio.gov.cn/gwyzclxcfh/cfh/2022n$_1$6602/2022*n*04*y*12*r*/*wjxgzc*$_1$6681/202208/*t*20220808$_3$08438.*html*

vey (NTS) covering the years 2010 to 2020, which is jointly collected by the State Taxation Administration and the Ministry of Finance of China. In addition to detailed information on firms' tax status, the dataset includes financial variables, such as the amount of government subsidies received by each firm. We calculate the average subsidies received by each firm per unit of assets to approximate trends in average government subsidy levels, as shown in Figure I. Following a peak in 2013, the average government subsidy rate experienced a persistent decline over the several years after the 2014 Amendment was introduced.

Although the 2014 budget law amendment curtailed the ability of local governments to promote industrial development and economic growth through subsidies, GDP growth remained a key criterion in local officials' promotion evaluations. To meet growth targets with reduced subsidy discretion, local governments began shifting toward alternative industrial policy instruments that were more aligned with, and permitted by, the central government. Among these, government VC emerged as a key instrument that local governments increasingly embraced in the aftermath of the reform.

Policy documents after 2014 provide clear evidence that China's subnational authorities began to prioritise market-based industrial policy instruments over traditional subsidies. For instance, in Wuhan's announcement of "*Plan for Reforming the Management and Use of Special Fiscal Funds to Support Enterprise Innovation and Development*" in 2015, the municipal government explicitly stated that "industrial development funds should be channelled to equity investments rather than government subsidies." Around the same time, the Hunan Provincial Finance Department similarly declared that "industrial policy instruments are now more market-oriented. Unconditional government subsidies are being replaced by tools such as government equity investments."

III. Data

This section details the data collection and cleaning process, where we create a comprehensive dataset of VC investments in China and compile other relevant variables from government databases and reputable private data sources. A full summary of variables is provided in Table I.

III.A. VC investments in China

Building on methodologies established by Colonnelli et al. (2024) and Beraja et al. (2024), our analysis draws from Zero2IPO, China's leading VC and private equity service provider that maintains the nation's most extensive commercial VC/PE database. The original dataset encompasses 336,757 investment transactions recorded until the conclusion of 2024, providing comprehensive details about target companies, VC funds, and the GPs overseeing these funds. We implement a systematic data cleaning protocol to develop a robust and complete VC dataset.

To address gaps in Zero2IPO's records, we employ the Chinese Business Registration Database (CBRD) as a supplementary data source. Specifically, for transactions in which company information is missing, we extract the identities of general partners and reconstruct their investment portfolios by identifying firms in which they hold ownership stakes based on CBRD. Similarly, when portfolio companies are identified but GPs are missing, we apply a parallel approach by using CBRD to trace ownership structures and incorporate any newly discovered transactions. We further complement the Zero2IPO dataset with publicly disclosed information from the Asset Management Association of China (AMAC), a self-regulatory organisation for the securities investment fund industry operating under the supervision of the China Securities Regulatory Commission. Since 2014, regulatory requirements have mandated that various types of VC firms and VC funds register with AMAC. However, some VC firms and funds that were already operating prior to 2014 did not complete registration, making it difficult to consistently identify linkages between VC funds and their corresponding VC firms. We address this limitation by using the CBRD to recover missing information and ensure that each transaction can be linked to an identified GP and fund. Finally, any transactions uncovered through this procedure that are absent from the original Zero2IPO database are incorporated, yielding our final dataset.

This comprehensive data recovery process successfully restores most previously missing information, yielding a dataset containing 415,662 Chinese VC investments with complete documentation of both target firms and investors. We then apply a chronological classification rule, categorising investments as early-stage when they precede any documented early-stage transaction for the same company. Note that, under this rule, an early-stage classification does not necessarily correspond to

seed-stage investment. Rather, it indicates that no VC firm has previously invested in the company, implying relatively greater information asymmetry due to the absence of prior due diligence.

Determining government affiliation of VC funds requires examining the composition of their shareholders or LPs. Given that Chinese governmental entities typically channel capital through complex subsidiary structures beneath state-owned holding companies rather than investing directly (Li, 2022), we employ equity penetration using CBRD data. This approach allows us to identify the ultimate beneficial owner—defined as holding more than 25% of equity, shares, or voting rights—of each VC fund and to determine government affiliation with precision using text-based classification. In the end, we identified a total of 107,109 government VC investments. Figure IV shows their spatial distribution across China, with each city's investments aggregated over all years. It can be observed that VC investments are disproportionately concentrated in coastal regions, which tend to exhibit higher levels of economic development.

III.B. Estimating Prefecture-Level Subsidies

Given the absence of official government records on subsidy distribution, we construct prefecture-level subsidy measures using firm-level data from the Annual Survey of Industrial Firms (ASIF), administered by the National Bureau of Statistics of China. This comprehensive survey spans 1998 to 2013 and covers all substantial state-owned and non-state-owned enterprises nationwide. The dataset comprises approximately 80 variables extracted from firms' balance sheets, income statements, and cash flow statements, providing detailed information on firm ownership structures, export activities, employment levels, capital stock, and revenue streams. Crucially for our analysis, each firm-level observation includes a "government subsidy" variable that records the precise amount of financial support received from state entities.

To ensure temporal consistency and comparability, we restrict our analysis to the 2011–2013 survey waves, as a significant change in firm size eligibility criteria occurred after 2010. Prior to this threshold adjustment, firms with annual sales exceeding 5 million yuan were eligible for survey inclusion. Beginning in 2011, however, the eligibility threshold was raised to 20 million yuan in annual sales, creating a more uniform sample frame for our analysis period.

We then implement the following data cleaning procedures. To mitigate the influence of extreme values, we trim the top 0.5% of observations based on government subsidy amounts. Following this outlier treatment, we aggregate the remaining firm-level observations to the prefecture level for each survey year and normalise the aggregate by city GDP to proxy for subsidy intensity. We then compute the mean subsidy level over the three-year period (2011–2013) to construct a continuous prefecture-level treatment variable capturing the pre-shock baseline intensity of government subsidies in each administrative region. Figure V and Figure VI displays the spatial distribution of subsidies and subsidy intensity across Chinese cities, respectively. Figure VI contains more missing values because official GDP statistics are unavailable for a subset of cities, most of which are located in inland regions, making it impossible to compute their subsidy intensity.

IV. Stylised Facts of Government VC in China

In this section, we use the comprehensive dataset described above to present a series of descriptive figures that document the rise and key features of government VC in China. These figures visualise patterns that have previously been discussed largely in anecdotal terms and provide systematic evidence on the evolution of government VC activity. The graphical analysis serves two main purposes. First, it highlights salient empirical patterns in the scale, composition, and geographic distribution of government VC investments. Second, it serves as a diagnostic check of the dataset, confirming its internal consistency and suitability for subsequent causal analysis. Although some figures are not directly linked to the identification strategy, they provide important background evidence that helps contextualise the role of government VC as an emerging industrial policy instrument.

IV.A. Stylised Fact 1: The rapid rise of government VC after 2014.

Figure VII depicts the evolution of government VC investment activity in China over time. Notably, the total number of government VC deals exhibits a sharp uptick beginning in 2014. Figures VIII and IX depict the evolution of VC activity in China from both the investment and fundraising perspectives. On the investment side, Figure VIII shows that the number of VC investment events increased steadily over time, with a sharp acceleration after 2014. While the

share of government VC in total investment events declined through the late 2000s and early 2010s, it reversed course around 2014-2015 and rose persistently thereafter, reaching around 40 % by the early 2020s. A similar pattern emerges on the fundraising side. As shown in Figure IX, total VC fundraising expanded substantially after 2014, accompanied by a pronounced increase in the share of government VC funds. Together, these figures document a clear structural break in the role of government VC following 2014.

A natural explanation for the sharp rise in government VC after 2014 is the tightening of local governments' budget constraints induced by the Budget Law Amendment. The reform strengthened fiscal discipline and limited the use of traditional subsidy-based instruments that rely on direct budgetary transfers. In this environment, government VC provided local governments with an alternative, equity-based policy tool through which they could continue to support industrial development while sharing risks with private investors. By investing through VC funds rather than providing direct subsidies, local governments were able to leverage private capital instead of relying solely on public funds. This structure allowed governments to mobilise additional resources for industrial development while preserving fiscal flexibility and complying with tighter budgetary oversight. Under this interpretation, the post-2014 increase in government VC reflects not merely the overall expansion of the VC market, but a shift in industrial policy toward market-based, equity instruments under binding fiscal constraints.

IV.B. Stylised Fact 2: Government VC focuses more on manufacturing industries

Figure XI compares the industry distribution of investment events by private VC and government VC. The two exhibit broadly similar patterns in sectoral allocation. Both private VC and government VC concentrate investments in a limited set of industries commonly associated with innovation and high growth, including manufacturing, scientific research and technical services, information technology, and business services. This overlap suggests that government VC largely follows market-oriented criteria in selecting target industries, rather than diverging sharply from private-sector investment priorities.

At the same time, a systematic difference emerges in the relative importance of manufacturing. Government VC allocates a larger share of its investments to manufacturing-related ventures than private VC.

This pattern is consistent with the central role of manufacturing in China's industrial policy framework and reflects governments' interest in supporting industrial capacity expansion and employment growth. In contrast, private VC places relatively more weight on service-oriented sectors.

IV.C. Stylised Fact 3: Government VC prefers older and larger ventures

Figure XII compares the characteristics of ventures backed by private VC and government VC at the time of investment. Two patterns emerge. First, government VC disproportionately invests in older ventures. The age distribution of government VC-backed ventures is more skewed to the right relative to that of private VC, indicating that government VC is less concentrated in very young startups. Second, government VC targets larger ventures as measured by registered capital. Government VC-backed ventures exhibit a higher level of registered capital, and the gap remains evident when comparing log registered capital to account for the right-skewed size distribution. These patterns suggest that government VC systematically tilts toward more mature and better-capitalised ventures than private VC.

A natural explanation for this maturity and size tilt is that government VC faces stronger constraints on downside risk and capital losses than private VC, especially under tighter fiscal environments. Investing in older and larger ventures can reduce information and execution risk, as these firms typically have more established operations, clearer business prospects, and greater collateral or asset bases. In addition, local governments may value the near-term visibility of industrial and employment outcomes, which are more readily delivered by more mature firms. These considerations are consistent with the broader budget-constraint perspective: when fiscal resources are constrained, governments may prefer to leverage equity-based instruments while maintaining a relatively conservative risk profile, thereby allocating government VC toward ventures that are more likely to survive and generate observable economic returns.

V. Empirical Strategy

In this section, we aim to explain the rise of government VC in China through the budget constraint channel induced by the Budget Law re-

form and to discuss the implications of this shift for the private VC sector and for industrial development. To identify the causal impact of the 2014 Budget Law Amendment on both the use of government VC and regional industrial dynamics, we employ an event-study framework, or a generalised difference-in-differences design with a continuous treatment intensity. We estimate the following model:

$$y_{it} = f(\alpha_i + \tau_t + \sum_{j \neq 2014} \beta_j (\ln(Subsidy_i) \times \text{Year}_t^j) + \sum_{j \neq 2014} \Omega_j X_i' \times \text{Year}_t^j + \epsilon_{it}) \quad (1)$$

where y_{it} is the outcome of interest, such as the total number of government VC investments, in city i at year t. The sample spans 2009–2021, beginning after the National Development and Reform Commission's (NDRC) announcement of the "*the Guiding Opinions on the Regulated Formation and Operation of Venture Capital Guidance Funds*," which first conceptualised the role of government VC in China's industrial development. We cluster standard errors at the city level, allowing for within-city correlation. We also estimate equation 1 using pre-treatment variables to control for unobserved factors correlated with the intensity of government subsidies, including average invention patent granted, average real GDP, average number of government VC investments, average number of special economic zones, number of 'Project 211' colleges, and the secondary and tertiary sectors' combined share of GDP. GDP is log-transformed and deflated to 2009 Chinese Yuan. Except for the number of 'Project 211' colleges and the secondary and tertiary sectors' combined share of GDP, all other control variables are inverse hyperbolic sine–transformed to accommodate zeros. Data on the control variables are sourced from our Chinese VC dataset, the Chinese Cities Statistical Yearbook, and the State Intellectual Property Office (SIPO). Since the pretreatment control variables X_i' are time-invariant, we interact them with year effects to estimate their impact over time. In addition, city and year fixed effects are included to control for unobserved, time-invariant factors specific to each city, as well as year specific shocks.

The function $f(\cdot)$ depends on the outcome variable of interest. When the outcome variables concern government VC investments, their distributions are highly skewed and concentrated in coastal regions (see Figure IV); many inland cities record zero investments for multiple years in our sample period. To account for 'logs with zeros' and preserve an interpretation analogous to ordinary least squares (OLS) estimation with log-transformed outcomes, we follow the innovation and econometrics literature (Azoulay et al., 2019; Chen and Roth, 2024) and estimate the

model using a Poisson pseudo-maximum likelihood (PPML) estimator, in which case $f(\cdot)$ is exponential. For outcome variables capturing industry dynamics other than patent-based innovation measures, zero outcomes are relatively rare. Accordingly, we use OLS estimation and specify $f(\cdot)$ as a linear function in these cases while employing PPML estimators for patent outcomes.

We estimate the effect of phasing out subsidies using a continuous variable $\ln(Subsidy_i)$, the log of the pre-treatment average subsidy intensity in city i before the 2014 amendments, indicating how strongly each city was affected by the policy change. The assumption is that cities with a higher pre-treatment subsidy level are more intensely affected by the 2014 amendments, as they are required to reduce government subsidy by a greater extent. The set of coefficients β_j measures, for each year j, the change in the outcome associated with a one-unit increase in $\ln(Subsidy_i)$, relative to the pre-treatment year 2014. The coefficient for 2014 is normalised to zero. To summarise the magnitude of total effects or ATT, we will also report the post-period average of the β_j for $j \geq 2014$. Specifically, we replace the post-shock period dummies with a single indicator $post_t$ that equals 1 if $t \geq 2014$ (and 0 otherwise), analogous to a classic two-period difference-in-difference design. The ATT is then given by the coefficient on $\ln(Subsidy_i)$*$post_t$.

VI. Main Results

VI.A. Government VC

Figure XIII plots baseline event study estimates of how phasing out subsidies encouraged the deployment of government VC, thereby causally establishing the fact that the prefecture-level city governments began switching to market-based industrial policy following the 2014 amendment. Plot A presents estimates of the dynamic effect of the policy shock on prefecture-level cities' government VC investment counts. During the pre-treatment period (before 2014), The outcome variable evolves similarly across cities with differing subsidy levels. Following 2014, cities with higher ex-ante subsidy levels experience markedly larger increases in the number of government VC investments. Plots B and C depict the relationship between ex ante subsidy intensity and government VC investments in the manufacturing and service sectors, respectively. By comparison, government VC investments in

the manufacturing sector exhibit a more pronounced increase in the post-2014 period.

We next turn to Plots D and E, which estimate the relationship between pre-shock subsidy levels and the number of government VC investments at different investments stages. Neither early- nor late-stage investments exhibited significant pre-trends and both types of investments rise sharply in cities with higher ex-ante subsidies. Plots E and F compare post-2014 changes in syndicated government VC investments across cities with different levels of subsidy intensity. We classify a government VC investment as syndicated when a private VC fund also participates in the same funding round. With no significant pre-trends, cities with higher ex-ante subsidy intensity saw a larger and more consistent post-2014 increase in syndicated government VC investments. This finding suggests that, in the post-shock period, additional government VC investments—introduced to offset withdrawn subsidies—begin to seek more private-sector expertise by collaborating with private VC investors rather than backing firms on a stand-alone basis. Another key factor underlying the relatively larger increase in syndicated government VC deals is local governments' desire to maintain the level of industry support under tighter budget constraints by leveraging private capital to achieve their industrial policy objectives.

On average, as shown in Table II, 1% increase in ex-ante subsidy intensity led to 0.38% increase in the number of government VC investments.[3] While higher ex ante subsidy rates are associated with increases in both early- and late-stage government VC investments, the increase is slightly larger for late-stage investments. Similarly, the 2×2 DID estimate for government VC investments in the manufacturing sector is only marginally larger than that for the service sector, despite the former exhibiting a more pronounced effect in the event-study plot. The contrast in magnitudes is most pronounced when comparing syndicated and non-syndicated government VC investments, with the former being nearly twice as large as the latter.

VI.B. Industrial Development

Figure XIV plots baseline estimates of how phasing out subsidies impacts prefecture-level industrial development outcomes after 2014. Plots

3. In a PPML regression, coefficients are interpreted as semi-elasticities: a one-unit increase in the explanatory variable changes the dependent variable by $100 \times (e^{\beta} - 1)\%$, holding other factors constant. For small β, this approximates to a $100 \times \beta\%$ change.

A show that higher ex-ante subsidy rates are associated with lower firm entry. However, Plot B shows that the average registered capital of entrant firms experiences an increase after 2014. Taken together, this suggests that while the shock reduced the number of new firms, it was accompanied by higher-quality entries, potentially because only such firms could secure government VC investments as industrial policy became more selective.

Plots C-D show that ex-ante subsidy rates do not have a discernible impact on firm exit as well as the quality of exiting firms. Meanwhile, Plots E, F, and G indicate that a shift from subsidies to government VC is associated with higher innovation output when examining patent outcomes. Specifically, moving away from subsidies does not increase the number of patent applications, likely because the change in policy instruments does not expand—and may even narrow—the set of firms receiving support. However, we observe a significant increase in both patents granted and citation-weighted patents in more intensely treated cities. Taken together, these results suggest that the policy switch enhances the conversion of innovative effort into realised innovation output, consistent with an improvement in the average quality of supported firms.

VI.C. Robustness

We address the possibility that treatment intensity may be systematically related to certain city characteristics by using the generalised propensity score (GPS). GPS extends the binary propensity score framework to continuous treatments, allowing us to reweight observations so that treatment intensity is independent of pre-treatment covariates. Formally, the GPS is defined as the conditional density of the treatment given covariates:

$$r(t,x) = f_{T|X}(t \mid x) \tag{2}$$

where T is the continuously distributed treatment dose and X is a vector of covariates.

In the context of the paper, we estimate the GPS in two steps. First, We regress T_i on the set of pre-treatment covariates X_i to obtain the predicted treatment level $\hat{\mu}_i$ and the estimated standard deviation $\hat{\sigma}$. Second, assuming that the residuals are normally distributed, the GPS for observation i is

$$r_i = \frac{1}{\hat{\sigma}\sqrt{2\pi}} \exp\left(-\frac{(T_i - \hat{\mu}_i)^2}{2\hat{\sigma}^2}\right) \tag{3}$$

We then apply inverse density weighting, so that observations with a low GPS (meaning their treatment level is unusual given their covariates) receive a higher weight in the regression. This approximates the scenario where treatment dose is independent of covariates. We winsorise the inverse GPS at the 95^{th} percentile to prevent extreme values from distorting our estimates.

We re-estimate equation 1 with both government VC investment patterns and industrial development outcomes as dependent variables, and we display the GPS-weighted results in Figures XV and XVI alongside the baseline results. In both figures, the GPS-weighted estimates do not differ significantly from the baseline.

Beyond using GPS, we also seek to rule out additional sources of bias. We include extra controls in the regression to account for contemporaneous shocks occurring after 2015. In the first specification, we focus on a landmark industrial policy in China—the Strategic and Emerging Industries (SEI) initiative—and construct a binary variable that captures its staggered adoption across prefecture-level cities. In the second specification, we address higher-level shocks by including province-specific linear trends in the regression. Based on Figure XVI and XVII, neither specification yields estimates that deviate substantially from our baseline, except for patent granted when we control for province linear trend. In this specification, the post-event coefficients become statistically insignificant, suggesting that the increase in patent grants observed in our baseline estimates may be driven by differential province-level trends correlated with treatment intensity, rather than by the treatment itself. In contrast, the results for patent citations remain robust after controlling for province-specific linear time trends. This affirms that the shift from subsidies to government VC investments still improves innovation quality overall, even when accounting for heterogeneous provincial dynamics.

VII. Additional Analyses

We further examine the impact of additional government VC on private VC dynamics. Specifically, we assess whether government VC crowds in private VC and investigate the mechanisms through which this effect materialises. Figure XIX presents the event-study plot of dynamic treatment effects on the count of private VC investments. Regions with greater treatment intensity experience larger increases

in private VC activity, consistent with a strong crowding-in effect of government VC. These effects are broad-based, spanning investments at both early and late stages, across manufacturing and service sectors, and in both syndicated and non-syndicated deals. Based on the 2×2 DID estimates reported in Table IV, a 1% rise in ex-ante subsidy intensity corresponds to 0.35% more private VC investments. A decomposition of private VC investment types suggests that the treatment is associated with relatively larger increases in private VC investments in service sectors, late-stage deals, and investments syndicated with government VC investors.

We examine the channels through which government VC crowds in private VC. The overall crowding-in effect operates through two main mechanisms. First, private VC may co-invest with government VC in syndicated deals. Second, private VC may invest in firms or industries that have previously received government VC funding. We hypothesise that the strength of the former channel depends on the government's willingness to partner with private investors, while the strength of the latter channel depends on the availability of private capital, as greater availability increases the capacity of private VC to follow on from state investments.

To operationalise these channels, we proxy the government's willingness to co-invest with private partners using the pre-shock share of syndicated government VC deals, and the availability of private VC using the pre-shock share of private VC deals. We then construct two indicators: $SyndRatio$=1 if the syndicated government VC share is above the median, and $PVCRatio$=1 if the private VC share is above the median. We interact both variables with treatment intensity and report the results in Table V. Based on column (1), both the government's willingness to partner with the private sector and the availability of private capital amplify the crowding-in effect, and the baseline DID estimate becomes statistically insignificant once these channels are accounted for. Columns (2) and (3) indicate that the syndication channel is more strongly associated with the crowding-in of early-stage private VC, while the availability of private capital is more relevant for late-stage private VC investments. These patterns likely arise because private VC values the government's certification effect when investing in riskier ventures, as well as the government's ability to provide young start-ups with additional public resources. By contrast, at later stages, information asymmetries become less binding, and the availability of private capital plays

a more important role in supporting government-VC-backed firms and industries with proven track records.

VIII. Conclusion

This paper highlights the drivers of the rise of government VC in China and examines the consequences of China's shift in industrial policy from subsidies to government VC following the 2014 Budget Law reform. We find that additional government VC investments span various kinds, with syndicated government VC investments experiencing a particularly salient increase. We also find that this policy shock had wide-ranging ramifications.

First, the reform led to a decline in firm entry but an improvement in the quality of new entrants. This suggests that the more selective nature of government VC may discourage less competitive entrepreneurs from entering the market. Second, shifting from subsidies to government VC as the industrial policy strategy has an overall positive effect on innovation. We find some evidence of an increase in the number of patents granted after the shock, and stronger evidence of improvements in innovation quality. Third, we address a perennial question regarding government VC: whether it crowds in or crowds out private VC. We find an overall positive effect, consistent with the conclusions of Santoleri et al. (2024), Howell (2017), and Beraja et al. (2024). Beyond the scope of previous studies, we further show that the strength of this crowding-in effect depends crucially on the ex-ante availability of private VC and the government's willingness to cooperate with the private sector.

From its early beginnings with the SBIC programme in the United States and the Yozma programme in Israel, government VC has steadily gained traction and grown in importance worldwide. Beyond China, it now accounts for 37% of total VC supply in Europe. By addressing the information asymmetries inherent in innovation-intensive sectors, government VC has the potential to serve as a next-generation industrial policy instrument—one that enables advanced economies to push the technological frontier further while helping middle-income economies accelerate their catch-up. This study takes an initial step toward understanding how government VC differs from traditional industrial policy instruments in its impact, how it can be designed effectively, and the conditions under which governments should consider adopting it.

We also acknowledge the limitations of this study and point to several areas for further research. Although government VC is theoretically insulated from bureaucratic influence through the use of private GPs and performance-based compensation schemes, these safeguards can still be undermined by political dynamics. In China, for instance, some government officials prefer establishing state-owned GPs to manage government VC in order to exert greater control over investment decisions (Luong et al., 2021). Tournament-style promotion incentives further encourage local officials to impose geographical restrictions on government VC (Pan et al., 2021). Even in democratic contexts, government VC investment behaviour has been shown to be influenced by electoral cycles (Bertoni and Quas, 2016). These findings underscore the importance of future research on the political economy of government VC.

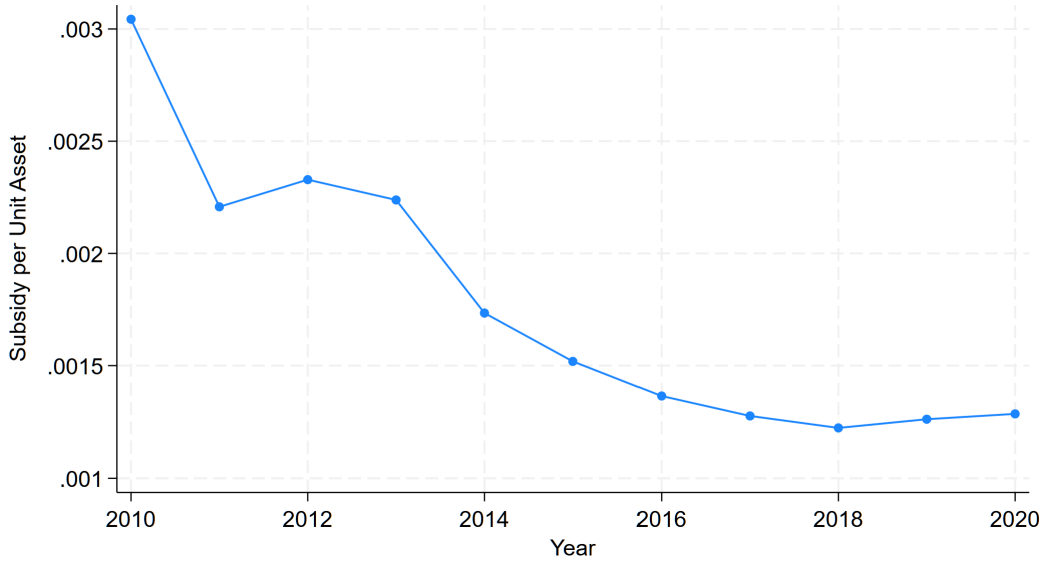


FIGURE I
Average Subsidy per Unit Asset by Year

The city's fiscal investment has been transformed from subsidies to equity.

2015-07-09 11:32 Source: Municipal State-owned Assets Supervision and Administration Commission

On July 6, the municipal government's executive meeting approved in principle the "Implementation Plan on Reforming the Management and Use of Special Fiscal Funds to Support Enterprise Innovation and Development." It is understood that the management of the city's special fiscal funds will undergo significant adjustments, with key changes including reforming the department-led project review mechanism, reforming the non-repayable grant method, and substantially reducing or eliminating special funds in general competitive fields.

"Special fiscal funds have more or less become a tool for departmental interests, a 'switchboard' and a 'balancer'." It is reported that excessive government involvement in project review is one of the problems in the current management of special fiscal funds in our city, and also a key focus of this reform. In the future, our city will accelerate the transformation of government management functions, with departments no longer directly managing specific projects, but primarily responsible for planning, layout, and supervision; establishing a mechanism for project management relying on professional institutions, leveraging the advantages of social consulting agencies, utilizing the functions of state-owned investment companies, fund management companies, commercial banks, and social venture capital institutions, and leveraging the role of intermediary service agencies and industry experts in performance evaluation.

Regarding the allocation of fiscal funds, our city will change the allocation of special fiscal funds for industrial development from grants to equity investments, and vigorously develop industrial equity investment funds. It is reported that grants suffer from low efficiency and false reporting. Because subsidies are scattered and the recipients are numerous and diverse, departments find it difficult to supervise whether enterprises are using subsidies in accordance with regulations, and it is also difficult to assess the performance of each subsidy. In the future, our city will accelerate the establishment of industrial guidance funds in various districts and development zones, adhering to the principles of "government guidance, market operation, principal protection and profit sharing, and rolling development," mainly using equity investment, risk compensation, and cooperation between finance, banks, and enterprises to give full play to the decisive role of the market in resource allocation.

FIGURE II
Announcement by the Wuhan Municipal Government

The approach to fiscal support for economic development is being upgraded, with greater reliance on market-based methods and reduced administrative intervention.

Publication Date: 2015-11-23 08:36

Hunan Daily, November 20 (Reporter Liu Dexin, Correspondent Luo Yunfeng, Luo Zhenxin) – As the economy undergoes transformation and upgrading, Hunan Province is also upgrading its methods of fiscal support for economic development: support for enterprises is shifting from primarily direct subsidies and grants to more market-oriented methods such as equity investment, fund investment, loan interest subsidies, and post-subsidies, reducing administrative intervention; for major public infrastructure construction, a comprehensive approach using fiscal and financial policy tools is being explored, including the establishment of government-backed investment funds. This information was released today by the Hunan Provincial Department of Finance.

Establish infrastructure investment funds for railways, highways, water conservancy, and other projects. Through cooperation with banks such as the China Development Bank, introduce social capital through equity investment, appropriately leverage at low cost, and drive long-term, low-interest loans into infrastructure construction projects.

A new industry development fund will be established. The fund, with a total size of 5 billion yuan, will support strategic emerging industries such as advanced equipment manufacturing, new materials, cultural and creative industries, biomedicine, new energy, information technology, and energy conservation and environmental protection, and will gradually explore the inclusion of other emerging industries within the province. A "parent-subsidiary fund" model will be adopted, with the new industry development fund serving as the parent fund, which will then establish five sub-funds. These five sub-funds will then partner with social capital to establish venture capital firms, which will act as sub-funds and directly invest in industrial enterprises.

FIGURE III
Announcement by the Hunan Provincial Finance Department

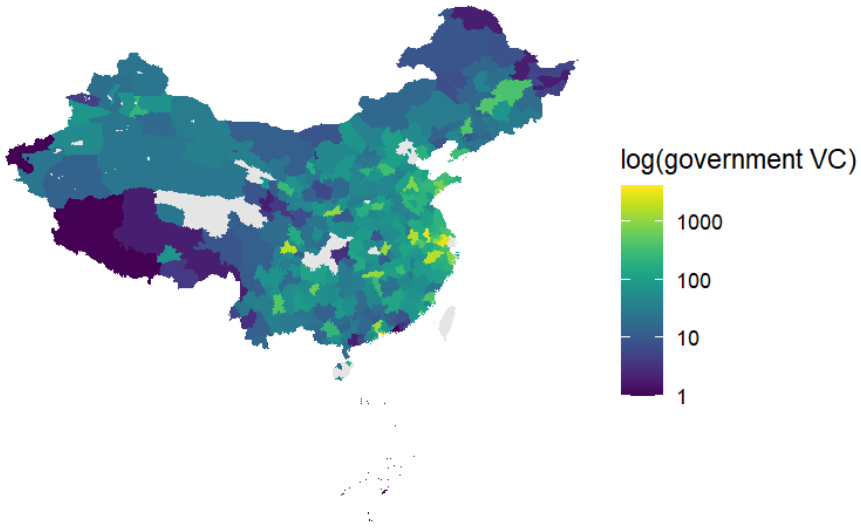


FIGURE IV
Spatial Distribution of Government VC in China

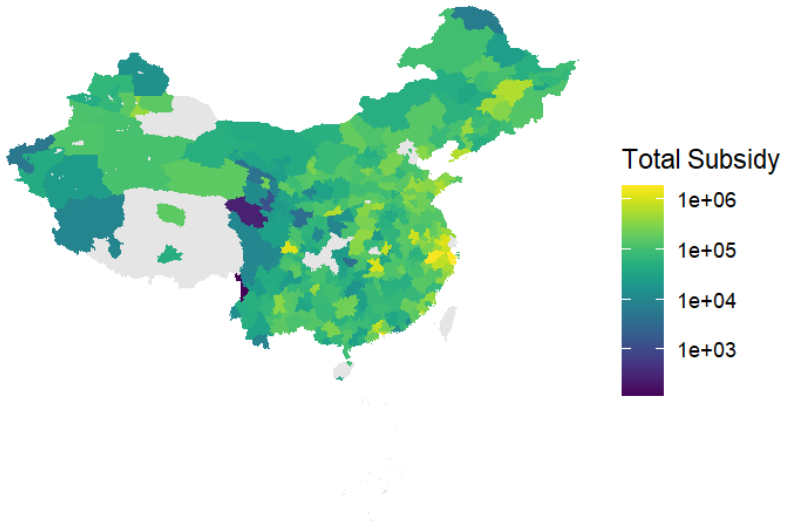


FIGURE V
Spatial Distribution of Total Pre-2014 Subsidy in China

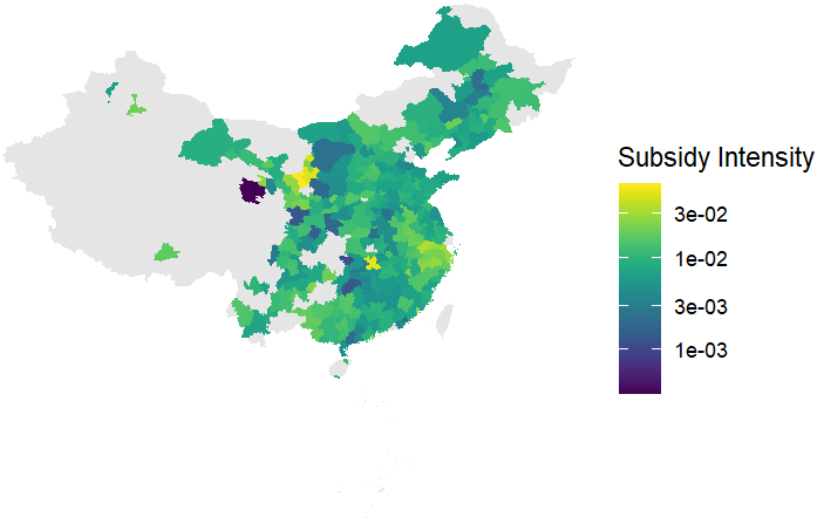


FIGURE VI
Spatial Distribution of Pre-2014 Subsidy Intensity in China

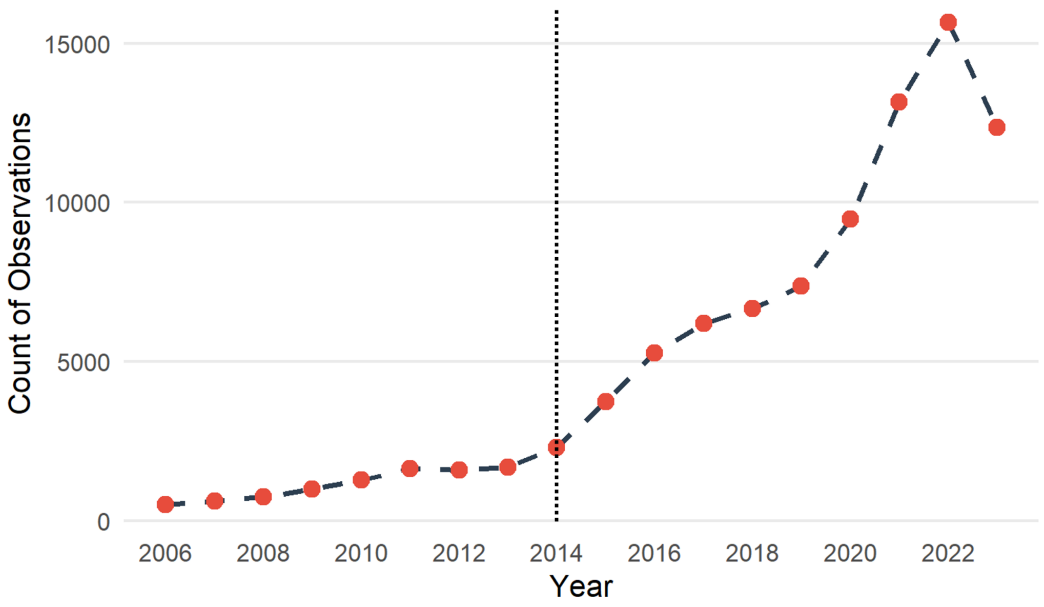


FIGURE VII
Number of Government VC Investments

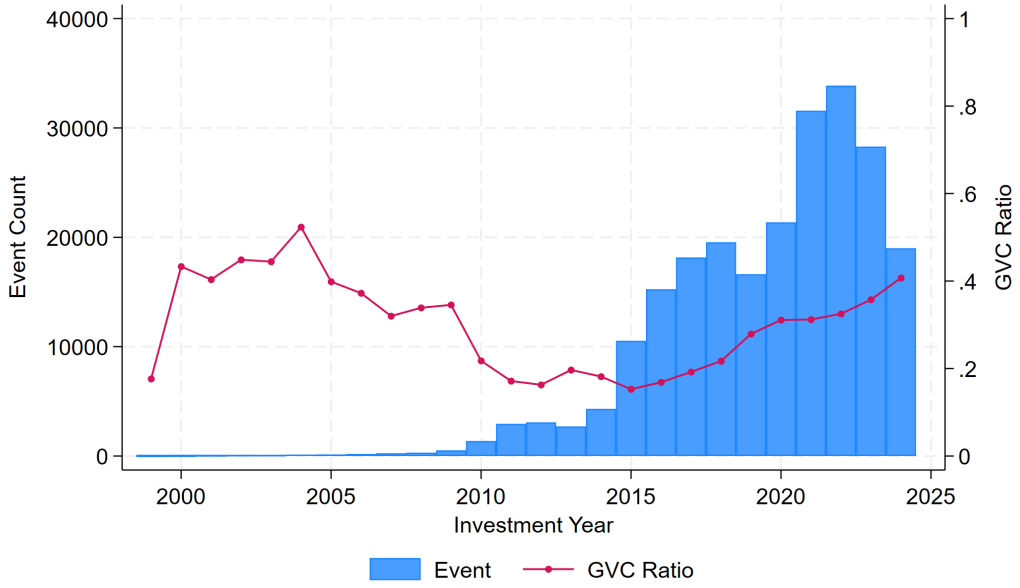


FIGURE VIII
Number of VC Investment Events, 1999–2024

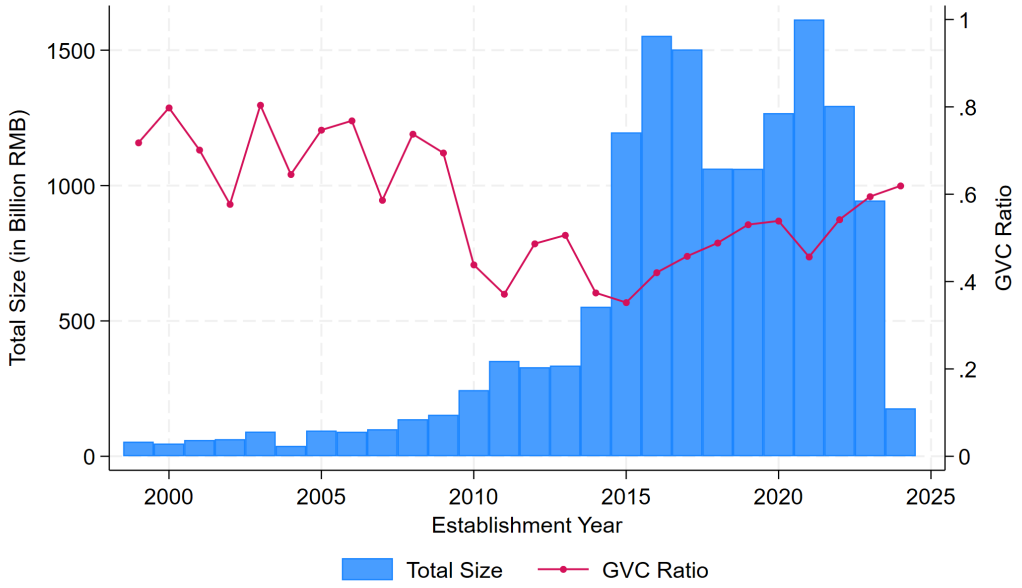
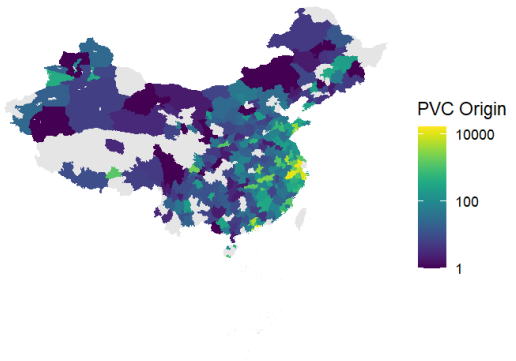
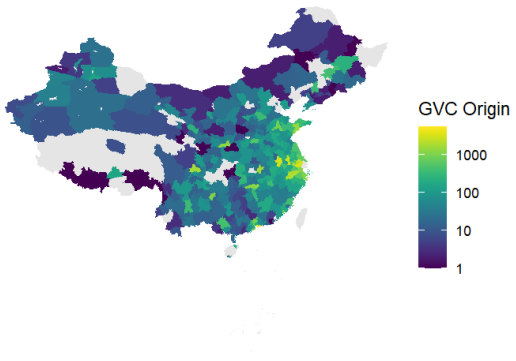


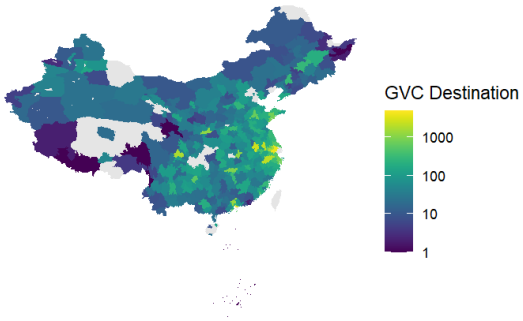
FIGURE IX
Fundraising Amount of VC Funds (in Billion RMB), 1999–2024



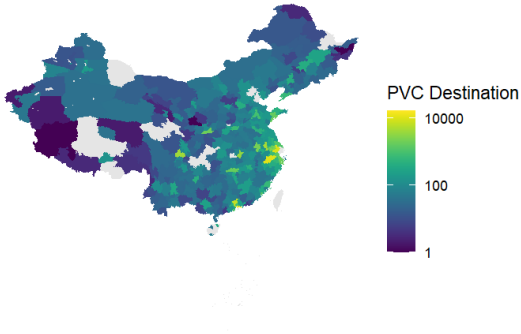
(a) PVC Origin



(b) GVC Origin

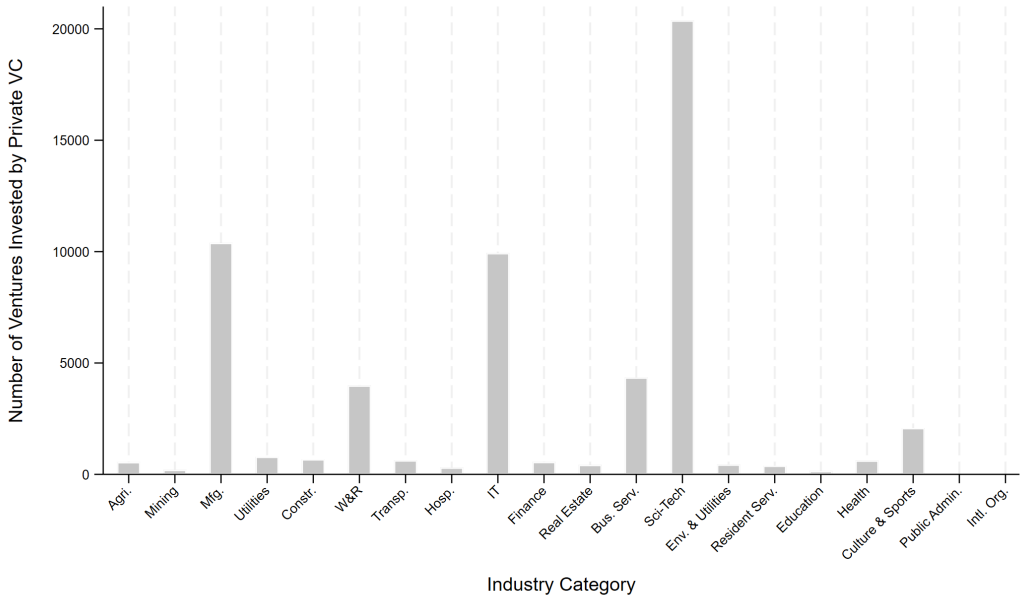


(c) GVC Destination

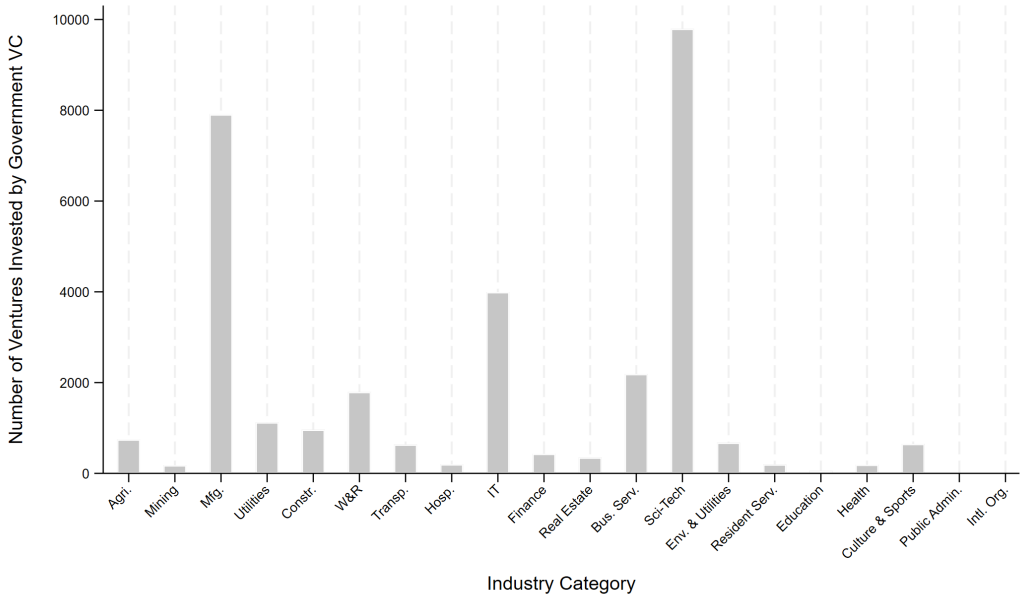


(d) PVC Destination

FIGURE X
Geographic Distribution of VC Investment Origins and Destinations



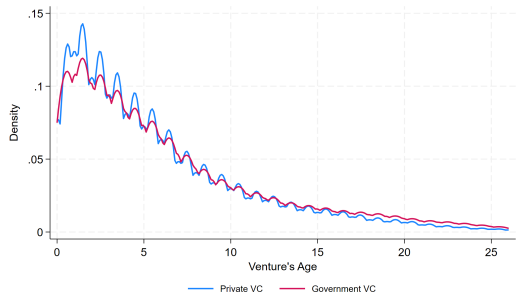
(a) Private VC



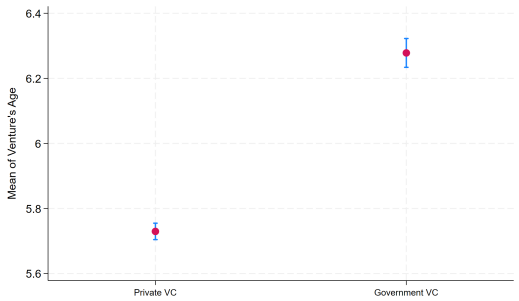
(b) Government VC

FIGURE XI
Industry Distribution of Companies Invested by Private and Government Venture Capital

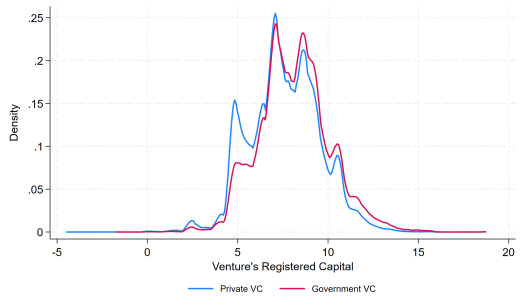
Notes: Industries are classified according to the GB/T 4754 one-digit industry classification. Agri. = Agriculture; Mfg. = Manufacturing; W&R = Wholesale and Retail; Bus. Serv. = Leasing and Business Services; Sci-Tech = Scientific Research and Technical Services; Env. & Utilities = Water Conservancy, Environment, and Public Facilities Management.



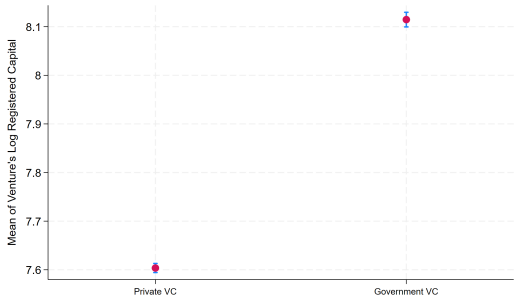
(a) Venture Age Distribution



(b) Mean Age (95% CI)



(c) Registered Capital Distribution



(d) Mean Log Registered Capital (95% CI)

FIGURE XII
Venture Age and Size: Private versus Government Venture Capital

Notes: The figure compares venture characteristics at the investment-event level between private VC and government VC. Venture age is measured at the time of investment. Registered capital refers to firm registered capital; panels using log registered capital apply the natural logarithm transformation.

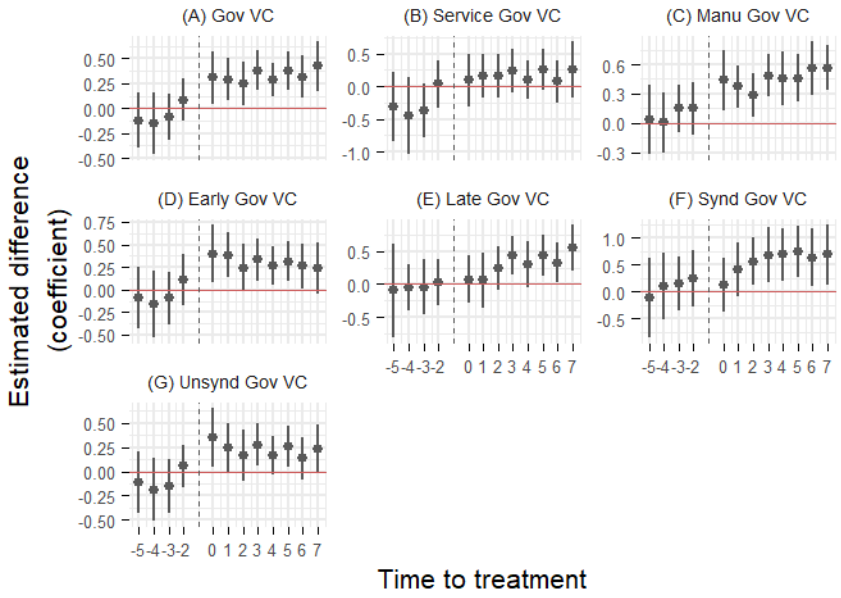


FIGURE XIII
Post-2014 Change in Government VC Investment, PPML

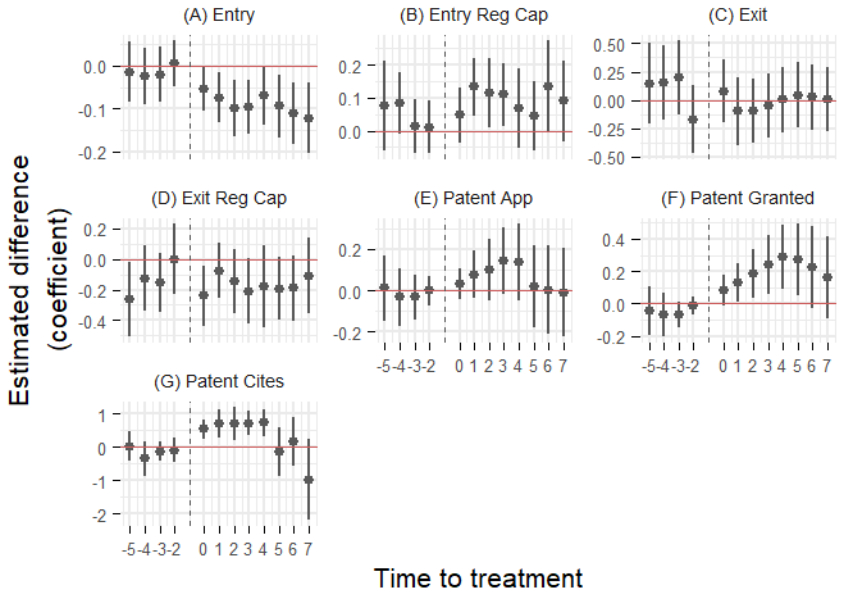


FIGURE XIV
Post-2014 Change in Industry Development Outcomes

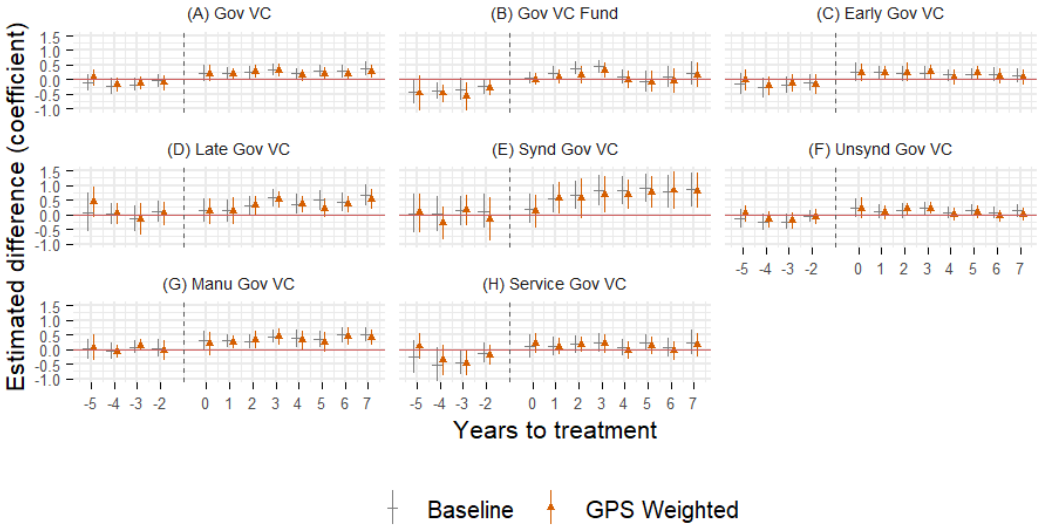


FIGURE XV
Post-2014 Change in Government VC Investment, GPS Weighted

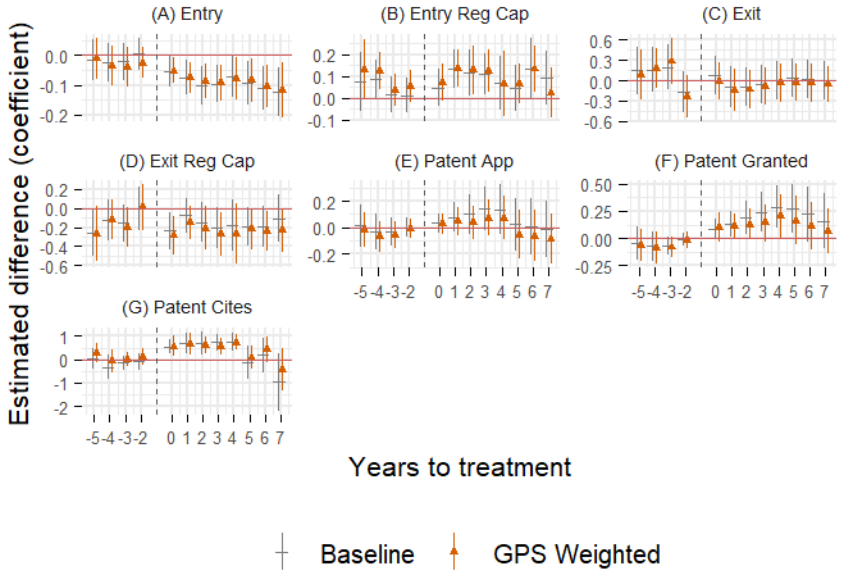


FIGURE XVI
Post-2014 Change in Industry Development Outcomes, GPS Weighted

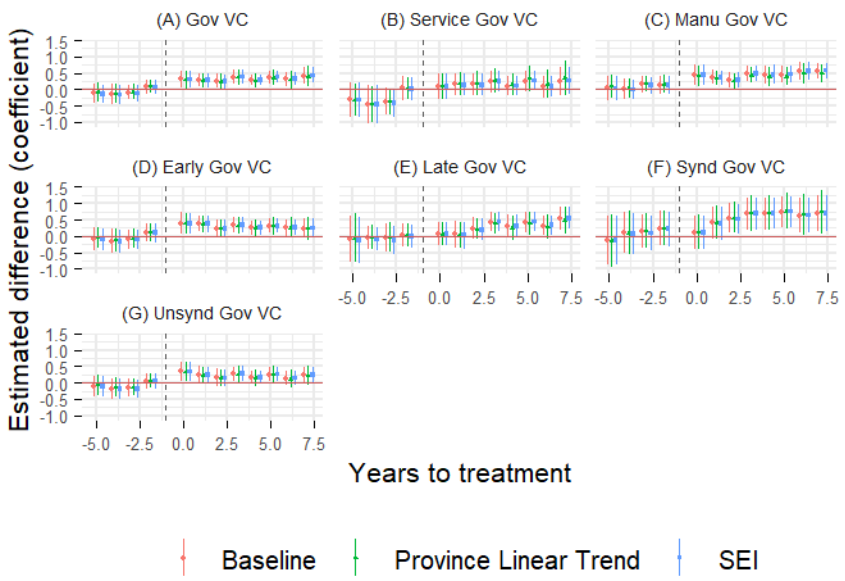


FIGURE XVII
Post-2014 Change in Government VC Investment, Alternative Specifications

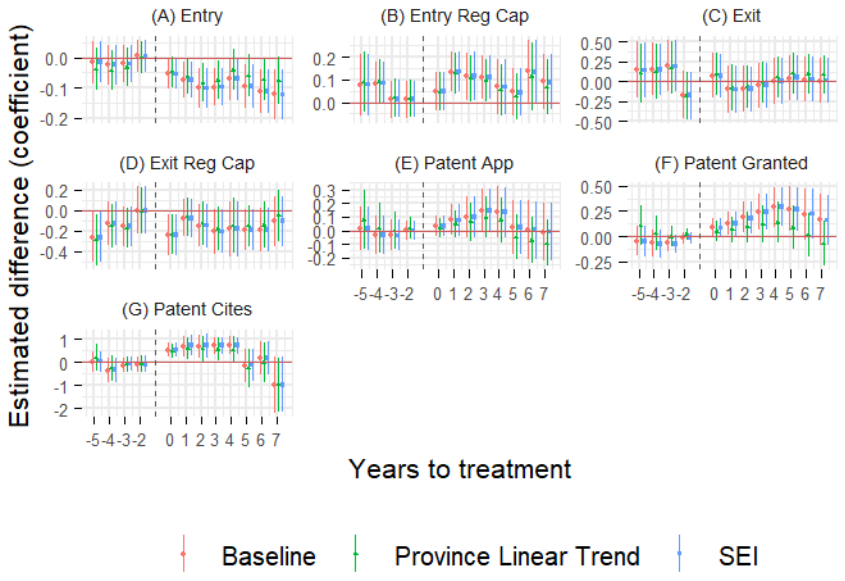


FIGURE XVIII
Post-2014 Change in Industry Development Outcomes, Alternative Specifications

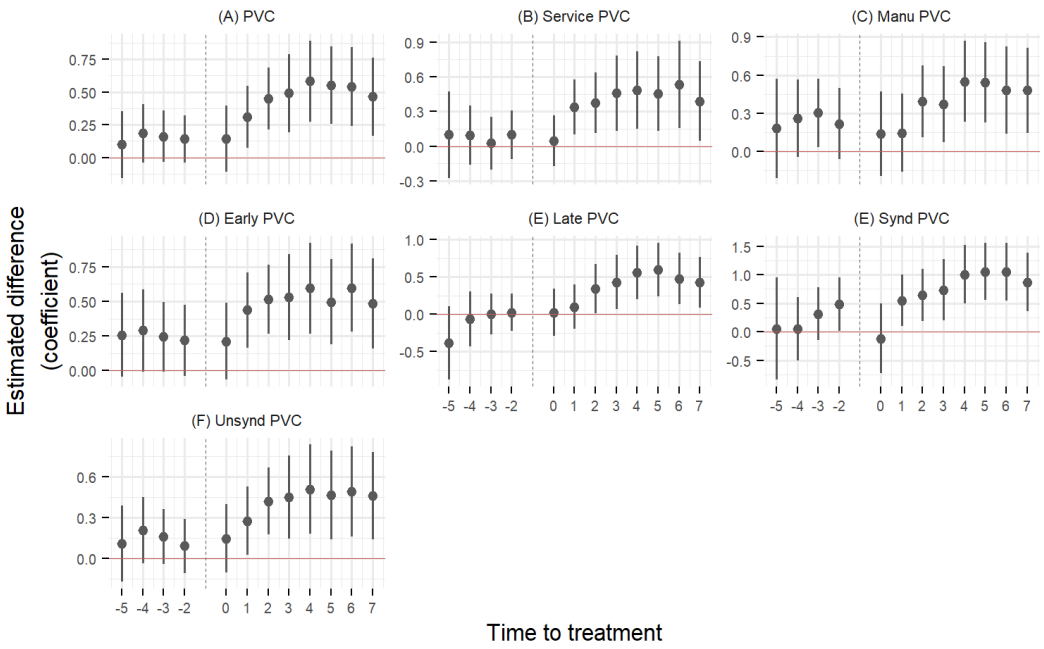


FIGURE XIX
Post-2014 Change in Private VC Investments

TABLE I
SUMMARY STATISTICS

	N	Mean	SD	Min	Max
I. Outcome Variables					
Government VC Investment	4381	10.12	38.50	0.00	958.00
Government VC Fund	4381	6.68	19.42	0.00	311.00
Early Government VC Investment	4381	5.91	18.36	0.00	375.00
Late Government VC Investment	4381	4.21	22.05	0.00	671.00
Syndicated Government VC Investment	4381	3.47	21.04	0.00	692.00
Unsyndicated Government VC Investment	4381	6.64	19.94	0.00	404.00
Private VC Investment	4381	25.70	142.72	0.00	3035.00
Firm Entry	4381	12901.03	26498.38	4.00	466782.00
Entry Registered Capital	4381	11411853.37	49034307.98	1150.00	2308434960.74
Firm Exit	4381	4100.34	10477.90	0.00	230059.00
Entry Registered Capital	4381	11411853.37	49034307.98	1150.00	2308434960.74
Patent Applied	3763	3697.83	11382.63	0.00	214227.00
Patent Granted	3763	545.75	1916.85	0.00	37920.00
Patent Cites	3763	58.60	659.79	0.00	17782.00
II. Control Variables					
Special Economic Zone	4381	5.77	4.78	0.00	31.00
GDP	3409	23969128.04	28611097.86	902748.00	306650000.00
211 College	4381	0.22	0.89	0.00	8.00
Subsidy	3588	0.01	0.01	0.00	0.06
Secondary and Tertiary Sectors's Share of GDP	3385	88.23	7.33	51.30	99.97

Notes. The table presents summary statistics for our prefecture-level city panel dataset spanning 2009 to 2021. For each variable, the mean, standard deviation, minimum, and maximum of the raw values are reported. Data for these variables are sourced from our Chinese VC dataset, the Annual Survey of Industrial Firms (ASIF), the Chinese Cities Statistical Yearbook, and the State Intelligence Property Office (SIPO).

TABLE II
DIFFERENCES IN GOVERNMENT VC INVESTMENT BY TREATMENT INTENSITY (PPML)

	Gov VC	Service Gov VC	Manu Gov VC	Early Gov VC	Late Gov VC	Syn Gov VC	Unsyn Gov VC
log(Subsidy)*Post	0.382***	0.369**	0.394***	0.324***	0.384***	0.510***	0.282***
	[0.086]	[0.152]	[0.077]	[0.095]	[0.118]	[0.122]	[0.094]
Controls	✓	✓	✓	✓	✓	✓	✓
City Fixed Effect	✓	✓	✓	✓	✓	✓	✓
Year Fixed Effect	✓	✓	✓	✓	✓	✓	✓
Sample size	3562	3536	3523	3562	3445	3120	3562

TABLE III
DIFFERENCES IN INDUSTRIAL DEVELOPMENT OUTCOME BY TREATMENT INTENSITY

	Entry	Entry Reg Cap	Exit	Exit Reg Cap	Patent App	Patent Granted	Patent Cite
log(Subsidy)*Post	-0.080***	0.054*	-0.076	-0.127	0.061	0.236***	0.639***
	[0.024]	[0.032]	[0.082]	[0.095]	[0.075]	[0.089]	[0.194]
Controls	✓	✓	✓	✓	✓	✓	✓
City Fixed Effect	✓	✓	✓	✓	✓	✓	✓
Year Fixed Effect	✓	✓	✓	✓	✓	✓	✓
Sample size	3562	3562	3556	3552	3301	3301	3193

TABLE IV
DIFFERENCES IN PRIVATE VC INVESTMENT BY TREATMENT INTENSITY (PPML)

	PVC	Service PVC	Manu PVC	Early PVC	Late PVC	Syn PVC	Unsyn PVC
log(Subsidy)*Post	0.351***	0.366***	0.208**	0.311***	0.431***	0.570***	0.319**
	[0.115]	[0.123]	[0.094]	[0.107]	[0.144]	[0.174]	[0.125]
Controls	✓	✓	✓	✓	✓	✓	✓
City Fixed Effect	✓	✓	✓	✓	✓	✓	✓
Year Fixed Effect	✓	✓	✓	✓	✓	✓	✓
Sample size	3562	3562	3549	3562	3458	3120	3562

TABLE V
CROWDING-IN EFFECT OF GOVERNMENT VC BY PRIVATE VC AVAILABILITY AND SYNDICATION RATIO

	PVC	Early PVC	Late PVC
log(Subsidy)*Post	0.065	0.078	-0.023
	[0.153]	[0.135]	[0.235]
log(Subsidy)*Post*SyndRatio	0.269*	0.290**	0.250
	[0.153]	[0.140]	[0.218]
log(Subsidy)*Post*PVCRatio	0.296*	0.183	0.595**
	[0.172]	[0.159]	[0.235]
Controls	✓	✓	✓
City Fixed Effect	✓	✓	✓
Year Fixed Effect	✓	✓	✓
Sample size	3086	3086	3049

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