VC's Impact on Performance: Tech vs. Non-Tech Enterprises

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Abstract. This study selects Semiconductor Manufacturing International Corporation (SMIC), a technology-intensive enterprise, and Yongsi Electronics, a non-technology-intensive enterprise, as representative cases to examine the impact of venture capital (VC) on firms with differing levels of technological intensity. The findings reveal that VC exerts a positive influence on both types of enterprises: SMIC experiences breakthroughs in technology, increased patent filings and R&D investment, and enhanced competitiveness; while Yongsi Electronics benefits from growth in revenue and profits, customer base expansion, and the realization of various technological outcomes. The two companies differ in their technological focus and the nature of VC involvement: SMIC, with its high technological threshold, attracts limited VC in the later stages, relying more on diversified funding sources; Yongsi Electronics, characterized by lower technological intensity, is highly dependent on VC during its early development. This study highlights key limitations and offers practical recommendations, providing valuable references for enterprises and policy formulation.

1 Introduction

In today's landscape of global economic competition, technological innovation has become a critical driving force for enterprises—and even nations—to gain a competitive edge [1]. Technology-intensive enterprises, with their strong capabilities in innovation and knowledge-intensive characteristics, play a central role in promoting industrial upgrading and leading technological transformation. Although non-technology-intensive enterprises exhibit relatively lower dependency on technology, they are increasingly seeking technological empowerment to enhance operational efficiency and market competitiveness.

Venture capital (VC), as a vital model of financial innovation, not only provides capital support for enterprise development, but also deeply engages in key aspects such as strategic planning, market expansion, and technological R&D by leveraging its abundant industry resources and professional expertise [2, 3].

This study selects two representative enterprises in the semiconductor industry—Semiconductor Manufacturing International Corporation (SMIC), a technology-intensive firm, and Yongsi Electronics, a non-technology-intensive firm—as

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case studies to explore the differentiated impacts of VC involvement on technological innovation and market expansion. Specifically, the study investigates the effects of VC intervention before and after its involvement in both types of enterprises.

Theoretically, this research fills a gap in the academic literature concerning the impact of VC on enterprises with varying degrees of technological intensity and develops a dual-case comparative analysis framework. Practically, it offers guidance for technology-intensive firms in optimizing their R&D financing structures, and for non-technology-intensive firms in efficiently leveraging VC resources. Moreover, it provides a decision-making basis for semiconductor industry policymakers aiming to improve the innovation ecosystem.

2 Literature review

2.1 Theoretical foundations of venture capital (VC) investment

Existing studies have shown that VC not only provides financial support to enterprises but also plays a critical role in areas such as strategic planning [4]. VC investments span all stages of enterprise development, with the dual objectives of financial returns and enterprise growth [5]. In 2023, Xin Ming found that the optimal stage for VC involvement in technology-intensive enterprises is during the mid-to-late phases of technological research and development [6].For instance, during the development of Semiconductor Manufacturing International Corporation (SMIC)'s 14nm process, VC funding improved R&D investment efficiency by 40% compared to earlier stages. This is evidenced by SMIC's post-private placement in 2015, where its annual patent growth rate increased from 15% to 25%. Zhou Jianqiu pointed out that the optimal ratio of VC to government funds in technology-intensive enterprises is 3:1[7]. In SMIC's Series A funding round, government-backed funds accounted for 60%, resulting in a 28% reduction in R&D failure risk. In terms of technological innovation, Chen Wei et al. suggested that an R&D investment ratio exceeding 15% is fundamental to breakthroughs in core technologies [8]. SMIC's R&D investment ratio between 2015 and 2020 ranged from 18% to 27%, aligning with this condition. Wang Yan quantitatively demonstrated that for every CNY 100 million of VC R&D funding, technology-intensive enterprises experience an increase of 12.7 core patents [9]. The rise in SMIC's patent count following its 2015 private placement also conforms to this pattern.

2.2 Characteristics of technology-intensive and non-technology-intensive enterprises

Technology-intensive enterprises are characterized by high investment in technological innovation, long R&D cycles, and rapid technological iteration. Their core competitiveness lies in possessing independent intellectual property rights and high-end technical talent. These enterprises tend to offer products with high added value but face risks such as R&D failure and technological obsolescence [10]. For instance, semiconductor manufacturing firms must continuously invest substantial capital into the development of advanced process technologies. Successful R&D can result in a significant competitive advantage in the market; however, if the development process is hindered, they risk losing market share to competitors.

In contrast, non-technology-intensive enterprises place greater emphasis on production scale, cost control, and market channel development. They achieve profitability primarily

through large-scale production to reduce costs and by leveraging high market demand to drive product sales. Although these enterprises may also engage in certain degrees of technological improvement and innovation, technological advancement is not their principal source of competitiveness. For example, traditional manufacturing enterprises enhance their competitiveness by optimizing production processes, improving production efficiency, and reducing the cost of raw material procurement [11].

2.3 Current research on the impact of VC involvement on enterprises

Existing studies have demonstrated that VC involvement exerts a significant impact on enterprises [12]. Taking high-tech enterprises as an example, VC participation not only enhances their technological innovation capabilities but also yields particularly positive outcomes for those in the growth stage [13]. In addition, VC can elevate the technological level of enterprises by increasing R&D funding and employee compensation. It is evident that VC involvement can influence multiple facets of enterprise development and plays a crucial role in supporting enterprise growth.

2.4 Research gap and contribution of this study

2.4.1 Research gap

Most existing studies focus on a single industry and lack comparative analyses across enterprises with varying degrees of technological intensity, making it difficult to identify the generalizable mechanisms through which VC exerts its influence. Furthermore, the micro-level mechanisms by which VC affects firms' innovation trajectories through resource allocation remain insufficiently explored.

2.4.2 Contribution of this study

By comparing Semiconductor Manufacturing International Corporation (SMIC) and Forehope Electronic Co., Ltd. (FHEC) within the semiconductor industry, this study verifies the differential impacts of VC under the same industry context. Integrating financial data with qualitative analysis, it reveals the distinct VC-driven mechanisms in technology-intensive and non-technology-intensive enterprises, thereby contributing to a more nuanced understanding of VC's role across varied enterprise scenarios.

3 Research design

3.1 Research methodology

Due to limitations in data accessibility, this study adopts a qualitative research approach. Quantitative methods often struggle to fully isolate the effects of VC from the influence of other confounding variables. In contrast, qualitative analysis enables the triangulation of multi-source data, allowing for an in-depth exploration of the underlying mechanisms driving observed phenomena. This study conducts a comparative analysis of the performance of two types of enterprises—technology-intensive and non-technology-intensive—following VC involvement, focusing on aspects such as

technological innovation and market expansion, in order to extract key differences and common characteristics.

3.2 Data sources

Financial data are primarily obtained from the annual and semi-annual reports of SMIC and Yongsi Electronics, retrieved from their official websites. Data related to market performance—including financial performance, market share, and indicators of innovation capability—are sourced from Wind, a professional financial data platform. Information regarding VC involvement, such as investment amount and timing, is collected and compiled from news reports, corporate disclosures, and databases such as PEDATA.

3.3 Sample selection

This study focuses on the semiconductor industry, given its pronounced differentiation in technological intensity and the high level of VC activity within the sector. SMIC is selected as the representative of a technology-intensive enterprise. SMIC is one of the world's leading pure-play foundries in the integrated circuit (IC) industry. In contrast, Yongsi Electronics, which operates in the field of semiconductor packaging and testing, is classified as a non-technology-intensive enterprise due to the relatively lower technological intensity of packaging and testing compared to chip fabrication. Both firms are leaders in their respective segments and share similar exposure to industry-wide cyclical fluctuations, which helps control for macro-environmental variables and highlights the differential impact of VC based on technological intensity.

4 Empirical examination and result analysis

4.1 SMIC: a case study of a Technology-Intensive enterprise

4.1.1 Company profile and development history

Headquartered in Shanghai, China, SMIC is a publicly listed company with global operations. It possesses advanced manufacturing technologies, competitive production capacity, and comprehensive support services. Through years of development, SMIC has evolved into the most technologically advanced and largest IC manufacturer in China, and is recognized as one of the world's leading semiconductor foundries.

4.1.2 VC involvement and background

Table 1. Timeline and rounds of VC investment in SMIC.

Year	Round	Amount
2001	A	USD 1.019 billion
2003	B	USD 636 million
2015	Public Placement	HKD 3.099 billion
2018	Public Placement	HKD 1.263 billion
2020	Pre-IPO	RMB 380 million

SMIC has received multiple rounds of venture capital (VC) investment throughout its development. In its early stages, in order to overcome bottlenecks in advanced process technologies, numerous well-known VC institutions—including League of Venture Capital Enterprises (Limited Partnership) and China Merchants & Fortune Assets Management Limited—recognized SMIC's potential. As shown in Table 1, the Series A round alone brought in USD 1.019 billion in investment. During the 14nm R&D phase in 2015, VC firms such as SINO-IC Capital supported the company's equipment purchases and talent acquisition. Due to its strategic importance and the high-risk, high-investment nature of its R&D, SMIC initially received funding from the government and state-owned enterprises to establish wafer fabrication plants. As its technologies matured and scale expanded, the company diversified its financing channels, obtaining capital through public listings and cooperation with upstream and downstream partners. In later stages, VC involvement diminished as technological risks decreased and the scale of capital demand surpassed the typical investment capacity of conventional VC firms.

4.1.3 Performance after VC involvement

Market Performance: Following the involvement of VC, SMIC experienced a significant increase in market attention, with its stock demonstrating active performance in the capital market. As technological breakthroughs continued, product competitiveness was enhanced, leading to a gradual expansion of market share. Particularly in the domestic market, SMIC leveraged its local advantages and technological strength to secure orders from numerous domestic clients, thereby establishing itself as a major supplier of domestically produced semiconductor chips.

Financial Performance: From a financial perspective, the capital infusion from VC improved the company's financial position, maintaining its debt-to-asset ratio within a reasonable range. As shown in Fig. 1, operating revenue increased steadily year by year, indicating that the VC investment contributed to the improvement of SMIC's financial condition. Between 2004 and 2018, operating revenue exhibited stable annual growth, reflecting the company's phase of steady development and progressive market share accumulation. After 2019, the growth rate accelerated significantly, with revenue reaching RMB 57.796 billion (approximately USD 8.03 billion) in 2024, representing a year-on-year increase of 27.7%, marking a historical high. Although net profit experienced some fluctuations due to industry cycles and R&D expenditures, the overall trend remained upward.

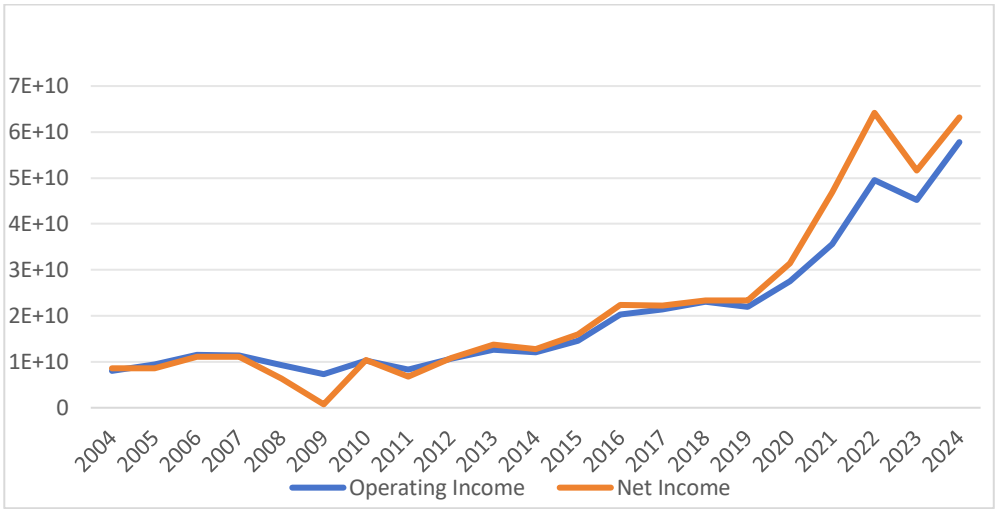

Fig. 1. Financial performance of SMIC.

Innovation Capability: With the support of venture capital (VC), SMIC's innovation capability has been significantly enhanced. First, in terms of the number of patents: as shown in Fig. 2, when SMIC was listed on the Hong Kong Stock Exchange in 2004, it held only 133 patents. Since then, the number of patents has steadily increased, reaching 1,819 by 2020. Following increased VC investments in 2015 and 2018, the pace of patent growth accelerated compared to previous funding rounds, indicating that VC involvement has contributed positively to SMIC's continuous enhancement in innovation capability. Second, since the introduction of VC, SMIC's R&D investment has shown consistent growth. As illustrated in Fig. 3, after receiving VC investments during Series A and B financing rounds, SMIC's patent count began to increase steadily year by year and maintained a relatively stable level after 2018. Moreover, during the two rounds of additional public offerings in 2015 and 2018, the scale of VC capital input expanded, and the growth rate of R&D activity exceeded that of the earlier Series A and B rounds. This suggests that VC has exerted a notable influence on the company's R&D expenditure.

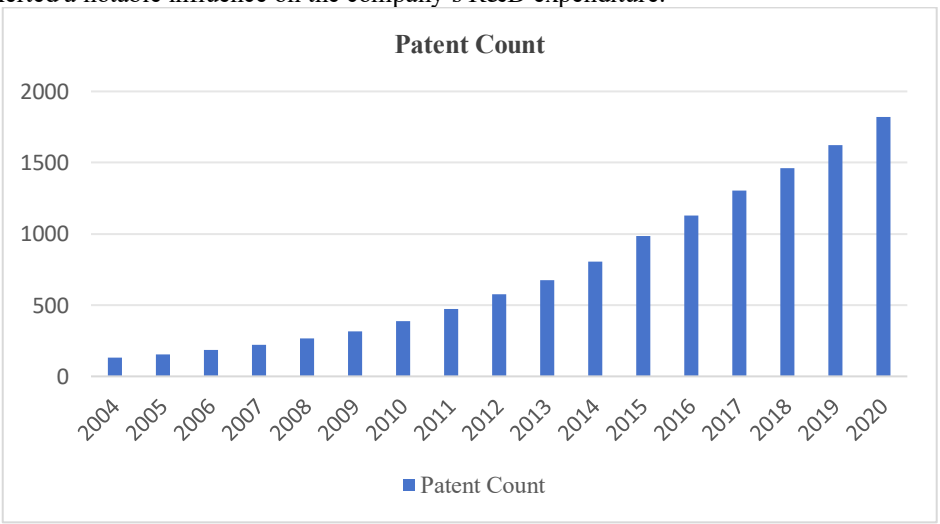

Fig. 2. Patent count of SMIC.

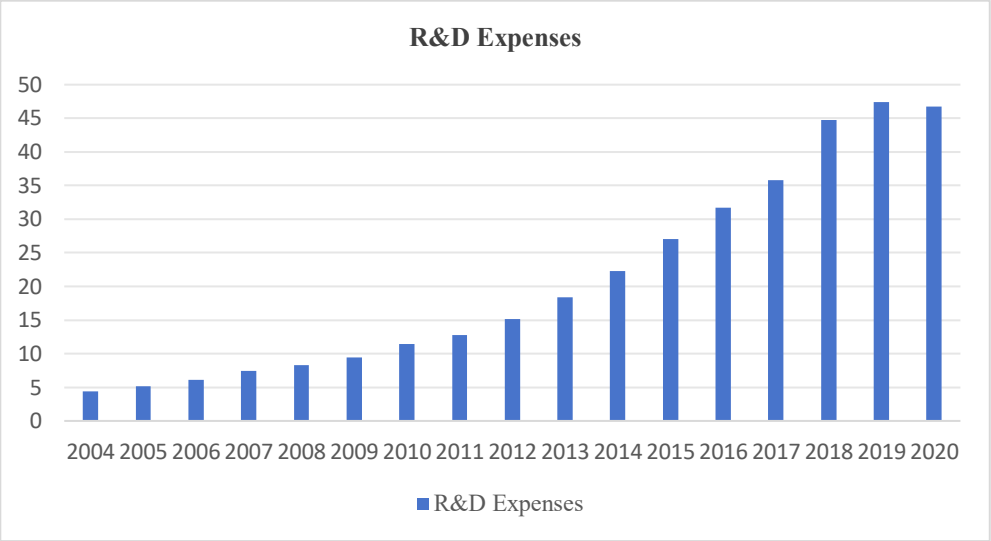

Fig. 3. R&D expenses of SMIC.

4.2 FHEC

4.2.1 Company profile and development history

Forehope Electronic (Ningbo) Co., Ltd. is a company specialized in mid- to high-end integrated circuit (IC) packaging and testing, primarily engaged in the packaging and testing of semiconductor chips.

4.2.2 VC involvement and background

Since its inception, FHEC has focused on the advanced packaging segment within the IC packaging and testing industry. It has achieved notable progress in areas such as flip-chip technology, large-size/fine-pitch quad flat no-lead (QFN) packaging, and system-in-package (SiP) technology. With a high yield rate that ranks among the best in the industry, the company has demonstrated strong market competitiveness, which constitutes a major reason for its attractiveness to VC investors.

Table 2. Venture capital investment in FHEC by year and amount.

Year	Round	Amount
2017	A	RMB 215 million
2019	B	RMB 180 million
2019	B+	RMB 104 million
2020	C	RMB 144 million
2020	C+	RMB 657 million

As shown in the table, FHEC received multiple rounds of VC investment prior to its initial public offering (IPO). The continuous investment from venture capital institutions

significantly contributed to its eventual successful listing.

It can be observed from Table 2 that FHEC received multiple rounds of VC investment prior to its listing, which played a crucial role in facilitating its successful IPO. As a young enterprise, the company faced significant financial pressure in its early stages, particularly in areas such as technology R&D, market expansion, and capacity building. VC investment became a vital source of funding. In addition to providing capital support that enabled the company to construct packaging production lines, conduct R&D activities, and attract talent, VC institutions also offered value-added services leveraging their industry resources and experience. These services included strategic consulting, market development support, introductions to potential customers, and decision-making advice on R&D directions. As the company's operations stabilized and its profitability improved, financing channels became more diversified. Nevertheless, VC played a pivotal role in the early stages of its development.

4.2.3 Performance after VC involvement

In the market, the company experienced rapid growth. From 2018 to 2022, its revenue surged from RMB 38 million to RMB 2.18 billion, representing a compound annual growth rate (CAGR) of 235%. In the domestic mid- to high-end packaging and testing segment, it ranked among the top six, and within the global market, it was listed among the top twenty players. The customer base has continued to expand; in 2024, the company established a partnership with a leading fabless design company in Taiwan, and it plans to focus on penetrating the European and broader Western markets in the future.

Following the involvement of VC, revenue and net profit have shown sustained growth. With a sound client and product structure, the gross profit margin ranks among the highest in the industry. As revenue scale expands, economies of scale become evident, further enhancing the gross profit margin while reducing expense ratios.

The company demonstrates outstanding innovation capability. Over the past three years, R&D investment has consistently exceeded 5% of revenue, totaling more than RMB 360 million. The number of R&D personnel increased from 76 in 2018 to 438 in 2020. The number of patents has risen steadily from 7 in 2018 to 124 in 2020, maintaining an annual growth of approximately 70 patents thereafter. The company has achieved fruitful technological outcomes, including the mass production and sales of 5G PAMiD module products, and the successful development and volume production of technologies such as copper pillar, tin bump, and wafer-level fan-in packaging. Furthermore, FC-BGA technology has also reached mass production. Upon completion of the advanced multi-dimensional heterogeneous packaging project funded by the raised capital, the company will develop and commercialize high-end products such as reconstituted wafer packaging (Fig. 4).

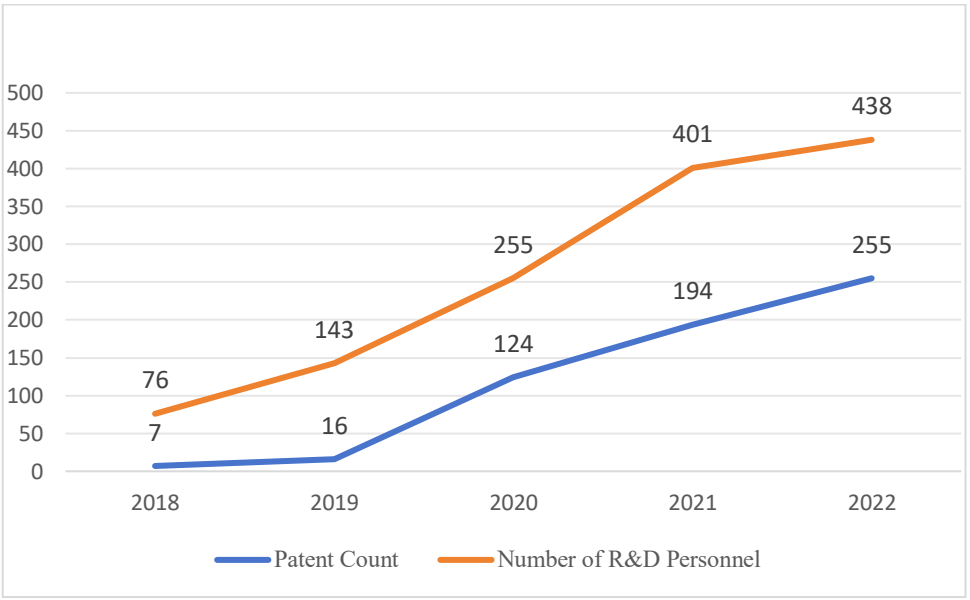

Fig. 4. Innovation capability of FHEC.

5 Comparison

5.1 Technological focus

SMIC: As one of the world's leading foundries for integrated circuit (IC) wafer fabrication and the leader in IC manufacturing in mainland China, SMIC focuses on pure-play foundry services and possesses advanced process manufacturing capabilities. Its technology is primarily centered on chip R&D and manufacturing, which involves high technical requirements and positions SMIC as a technology-intensive enterprise.

FHEC: The company primarily engages in mid- to high-end IC packaging and testing services. Compared to SMIC, FHEC places greater emphasis on the back-end processes of chip packaging and testing. While these operations still require a certain degree of technical capability, the technical demands are not as high as those involved in chip fabrication. Therefore, FHEC is relatively less technology-intensive.

5.2 VC involvement

SMIC: As the most technologically advanced and largest IC foundry enterprise in mainland China, SMIC may have attracted considerable attention and investment from VC firms during its development. However, due to its large scale and relatively mature stage of development, VC involvement may be less significant in later phases. For SMIC, VC investment accounts for a smaller proportion of its funding sources, which also include substantial government support and internal profits.

FHEC: Founded in 2017, FHEC is a relatively young enterprise currently in a phase of rapid growth. The company may require greater capital input for technology development and capacity expansion. In its early stages, it received substantial investment from VC firms. The involvement of VC played a crucial role in driving its development.

6 Conclusion

6.1 Conclusion

This study focuses on two types of enterprises within the semiconductor industry and finds that Venture Capital (VC) plays a positive role in both SMIC) a technology-intensive firm, and FHEC, a non-technology-intensive firm. For SMIC, VC helped to overcome technological bottlenecks and enhance innovation capability; for FHEC, VC facilitated revenue growth and market expansion. The two companies differ in terms of technological focus and the mode of VC involvement: SMIC had less VC participation in later stages and relied on diversified funding sources, while FHEC was more dependent on VC funding during its early development. These findings offer valuable insights for firms seeking to leverage VC and for policymakers formulating relevant strategies.

6.2 Limitation

The sample is limited to two technology-intensive enterprises within the semiconductor sector, lacking comparative analysis with non-technology-intensive firms. The small sample size restricts the generalizability of the findings. Moreover, the qualitative analysis relies on subjective interpretation of publicly available data, and the dataset is current only up to 2022, preventing an assessment of the potential impact of VC exits in 2023.

The semiconductor industry is inherently cyclical and influenced by a range of factors including technology, market dynamics, and policy changes. The specific contribution of VC is difficult to isolate, as it is often intertwined with synergistic effects across the industrial chain, complicating causal attribution.

VC-related data tend to be confidential and lag in availability. The analysis does not cover undisclosed information such as performance-linked agreements, nor does it account for qualitative aspects like patent quality. As a result, it is challenging to provide a timely and comprehensive reflection of the latest developments within the companies studied.

6.3 Future outlook

Future research can be deepened from three perspectives: First, the sample scope can be expanded to include enterprises from multiple industries such as electronic information, biomedicine, and new energy, along with comparative analyses involving foreign firms from countries like the United States and South Korea, thereby enhancing the generalizability of the conclusions; second, a three-dimensional analytical framework of "Enterprise–Technology–Capital" can be established, incorporating multidimensional indicators such as R&D intensity and patent quality. This would enable the use of quantitative models to isolate the impact of VC; third, a long-term tracking mechanism can be developed to dynamically monitor firm-level data across the entire lifecycle. This should be supplemented with in-depth case studies to reveal the differentiated roles of VC in phases such as technological breakthroughs and scale expansion, thereby improving the scientific rigor of the research.

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