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The Impact of Corporate Venture Capital CVC Investment Strategy on the Innovation Performance of the Parent Company

MENG Jiafu

Doctor of Management

Supervisors:
PhD Álvaro Lopes Dias, Associate Professor,
ISCTE University Institute of Lisbon
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UESTC - University of Electronic Science and Technology of China

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Declaration

I declare that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university and that to the best of my knowledge it does not contain any material previously published or written by another person except where due reference is made in the text.

Signed:  Date: 2025.04.28

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Abstract

Corporate Venture Capital (CVC) plays an important role in boosting technological capabilities and innovation. However, its impact is difficult to measure—especially for state-owned enterprises (SOEs)—due to the lack of clear benchmarks linking CVC investment to innovation outcomes. To address this, the thesis examines how different CVC strategies affect parent company innovation performance, using intellectual property rights as the main indicator. Drawing on Innovation Diffusion Theory and Configuration Theory, the study uses a mixed-method approach, including case studies, linear regression, and fuzzy-set Qualitative Comparative Analysis (fsQCA). Data were sourced from ITjuzi, Eastmoney Choice, and CBInsights (2022), resulting in a sample of 231 listed companies (187 domestic, 44 international). Key findings include: 1. Case studies show that firms at different industry stages benefit from different strategies. 2. Regression results confirm that all three CVC strategies significantly enhance innovation performance, although lead investment shows less consistency. 3. fsQCA analysis reveals that strong innovation outcomes depend on a combination of strategies, with strategic, lead, and co-investments reinforcing each other. This study fills key gaps in the quantitative analysis of CVC strategy, especially regarding strategy combinations and differences between SOEs and private firms. It offers practical guidance for Chinese listed companies—especially SOEs—on how to tailor CVC strategies to industry context, align CVC with R&D, and boost innovation through cross-industry collaboration. The results provide valuable insights for innovation management, SOE reform, and policy design.

Keywords： Corporate Venture Capital (CVC); Innovation Performance; Investment Strategy; fsQCA

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Resumo

O Capital de Risco Corporativo (CVC) desempenha um papel importante no aumento das capacidades tecnológicas e na inovação. No entanto, seu impacto é difícil de medir, especialmente para empresas estatais (SOEs), devido à falta de benchmarks claros que relacionem o investimento em CVC aos resultados da inovação. Para resolver isso, a tese examina como diferentes estratégias de CVC afetam o desempenho inovador das empresas mães, utilizando os direitos de propriedade intelectual como principal indicador. Com base na Teoria da Difusão da Inovação e na Teoria da Configuração, o estudo utiliza uma abordagem mista, incluindo estudos de caso, regressão linear e Análise Comparativa Qualitativa com Conjuntos Fuzzy (fsQCA). Os dados foram obtidos de ITjuzi, Eastmoney Choice e CBInsights (2022), resultando em uma amostra de 231 empresas listadas (187 nacionais e 44 internacionais). Os principais achados incluem: 1. Os estudos de caso mostram que empresas em diferentes estágios da indústria se beneficiam de estratégias diferentes. 2. Os resultados da regressão confirmam que todas as três estratégias de CVC melhoram significativamente o desempenho inovador, embora a estratégia de investimento líder mostre menos consistência. 3. A análise de fsQCA revela que resultados inovadores fortes dependem de uma combinação de estratégias, com investimentos estratégicos, líderes e conjuntos se reforçando mutuamente. Este estudo preenche lacunas-chave na análise quantitativa de estratégias de CVC, especialmente em relação às combinações de estratégias e às diferenças entre SOEs e empresas privadas. Ele oferece orientação prática para empresas listadas na China, especialmente SOEs, sobre como adaptar estratégias de CVC ao contexto da indústria, alinhar CVC com P&D e impulsionar a inovação por meio de colaboração interindustrial. Os resultados fornecem insights valiosos para gestão da inovação, reforma de SOEs e design de políticas.

Palavras-chave: Capital de Risco Corporativo (CVC); Desempenho Inovador; Estratégia de Investimento; fsQCA

JEL: G24; O31

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摘　要

企业风险投资（CVC）是提升技术创新能力的关键工具，但其有效性面临困境：上市公司难以评估 CVC 对母公司创新的投入产出效益；国有企业缺乏通过 CVC 实现转型的清晰对标路径。本论文整合创新扩散理论与配置理论，以中国上市公司为研究对象，通过案例研究、线性回归和模糊集定性比较分析（fsQCA）的混合方法，解析战略投资、领投与合投三种 CVC 策略对创新绩效（以知识产权数量衡量）的影响机制。基于 IT 桔子、东方财富 Choice 和 CBInsight 数据库的 2022 年度数据，选取 231 家上市公司样本（187 家境内，44 家境外）进行实证检验。核心发现表明：（1）案例揭示不同产业阶段企业需采用差异化策略；（2）回归分析证实三类策略均显著提升创新绩效，但领投策略稳定性较弱；（3）fsQCA 发现创新绩效提升依赖多策略协同组合，需综合运用战略投资、领投与合投的交互效应。研究填补了 CVC 策略定量分析、组合效应及国企-民企路径比较的理论空白，为中国上市公司（尤其是国有企业）提供关键实践启示：依据产业背景适配策略组合，建立 CVC 与研发部门的协同机制，并通过跨行业投资组合优化创新产出。成果对企业创新管理、国企改革及政策制定具有显著参考价值。

关键词：企业风险投资（CVC）；创新绩效；投资策略；模糊集定性比较分析（fsQCA）
JEL: G24; O31

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List of Abbreviations

CVC	Corporate Venture Capital
fsQCA	fuzzy-set Qualitative Comparative Analysis
IVC	Independent Venture Capital
SOE	State-owned Enterprises

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Chapter 1: Introduction

1.1 Research background

Globally, Corporate Venture Capital (CVC) has emerged as a crucial component of open innovation strategies, serving as a key mechanism for companies to integrate external innovation resources, capture new technologies, enter new markets, and build strategic ecosystems (Chesbrough, 2002). This model of innovation, distinct from traditional research and development, emphasizes the incorporation of external knowledge into a firm's innovation processes. By doing so, firms can enhance their product offerings, improve operational efficiencies, and respond more flexibly to market changes. Unlike Independent Venture Capital (IVC), CVC not only focuses on investment returns but also aligns strategic investments with broader corporate goals (Dushnitsky & Lenox, 2005). In this way, CVC serves both as a financial tool and a strategic enabler that enhances a firm's ability to adapt and thrive in an increasingly complex and competitive environment.

In the field of corporate venture capital (CVC), comparative analysis between independent venture capital (IVC) and CVC provides an important perspective for understanding the unique value of CVC. Unlike IVC, which focuses primarily on financial returns, CVC's investment objectives are more focused on strategic aspects such as technological innovation, market expansion, and industry chain integration. CVC's funding sources are usually the company's own funds or parent company funds, while IVC mainly relies on social capital. In the investment stage, CVC tends to intervene early in order to establish strategic connections in the early stages of enterprise growth, while IVC focuses more on the mid to late stages, pursuing more stable financial returns. In terms of investment strategy, CVC often focuses on leading investments and actively participates in the governance of invested companies to ensure the achievement of strategic goals; IVC adopts a more diversified investment approach. This difference gives CVC a unique advantage in driving long-term strategic development and innovation for enterprises, but it also faces challenges that differ from traditional financial return orientation.

The growing role of CVC in fostering innovation has been particularly significant in high-tech industries, where rapid technological advancements and business model disruptions are

constant. As industries such as biotechnology, artificial intelligence, and clean energy continue to evolve at a rapid pace, companies need to leverage external technological advancements to maintain or gain competitive advantage. According to CBInsight data, from 2015 to 2024, the proportion of AI startups supported by CVC funds increased from 7% in 2015 to 37% in 2024; The proportion of quantity has increased from 8% in 20215 to 21% in 2024. CVC allows corporations to access these innovations early, providing them with a first-mover advantage in developing and commercializing new products or services. In this context, CVC serves as a means for large corporations to diversify their innovation portfolios, mitigating the risks associated with in-house development efforts that may not always yield successful outcomes. This opens up a broader range of opportunities for firms to experiment with new business models and technologies without taking on the full financial risk associated with traditional R&D.

In developed markets such as the United States and Europe, CVC has become a significant pillar of innovation strategies for large corporations. Over the past few decades, firms such as Intel, Google, and BMW have heavily invested in CVC as a tool for not only financial gain but also accelerating their technological advancements. According to CB Insights, in recent years, there has been a steady increase in CVC investment volumes and deal counts, particularly in high-tech sectors such as technology, life sciences, and fintech. These companies leverage CVC investments to access cutting-edge technologies and emerging business models, thereby maintaining competitive advantages in rapidly evolving markets (Katila & Ahuja, 2002). In particular, CVC investments in sectors such as artificial intelligence, biotechnology, and blockchain are seen as critical for maintaining long-term competitive positions in global markets. By strategically investing in these sectors, companies can access transformative technologies that may otherwise be inaccessible or expensive to develop in-house.

The global trend of increasing CVC investment in high-tech sectors is not just driven by the potential financial returns, but also by the recognition that technological innovation is central to maintaining competitive advantage. Companies like Google and Intel, through their CVC arms, are actively involved in investments in disruptive technologies that are poised to reshape industries in the coming decades. For instance, Google's investment in AI startups not only helps the company stay at the forefront of developments in machine learning and deep learning but also provides it with an early opportunity to incorporate these technologies into its core business operations, from search algorithms to autonomous vehicles. Similarly, Intel's investments in semiconductor-related start-ups enable the company to tap into cutting-edge innovations in chip design and manufacturing, ensuring it maintains leadership in the highly

competitive semiconductor industry.

CVC investments, therefore, represent a strategic shift away from the purely financial motives associated with traditional venture capital. Instead, they emphasize the creation of synergies between start-ups and established firms, allowing companies to gain early access to innovations while also helping start-ups scale more rapidly. This reciprocal relationship enables both the investing corporations and the start-ups to gain competitive advantages in their respective industries. While the core financial objectives remain important, the broader corporate benefits of CVC often drive the investment decisions, with firms focusing on leveraging new knowledge to enhance their strategic positions.

In China, CVC has also experienced rapid growth, becoming an integral part of the innovation strategies of large enterprises. Driven by the maturation of capital markets and supportive innovation policies, CVC has gained significant traction among Chinese firms, especially listed companies. According to the Asset Management Association of China, by 2023, the number of Chinese listed companies engaging in CVC has grown substantially, with investments spanning technology innovation, green energy, and consumer upgrades. Unlike their Western counterparts, Chinese CVCs often emphasize strategic synergy in addition to financial returns, focusing on bridging technological gaps, exploring new business models, and establishing collaborative relationships along the value chain (Ma, 2020). This approach reflects the broader national strategy in China to encourage innovation and foster sustainable economic growth by integrating external technological advancements into domestic industries.

Moreover, Chinese listed companies are increasingly leveraging CVC to access global innovation networks. While domestic technology and start-up ecosystems in China are growing rapidly, many firms recognize the need to tap into international innovation hubs, such as Silicon Valley, to stay competitive in the global market. As such, Chinese CVCs are actively pursuing cross-border investment opportunities, collaborating with start-ups in developed markets to bring in new technologies and business models that align with domestic market needs. This global-local integration strategy allows Chinese firms to build comprehensive innovation capabilities that help them achieve both global competitiveness and localized market relevance. For instance, the Chinese tech giant Tencent has invested heavily in international gaming and entertainment startups, which not only expands its business portfolio but also facilitates the global spread of its technology.

In recent years, the level of CVC activity among Chinese listed companies has risen significantly, reflecting their urgent need to harness external innovation resources (Huang & Madhavan, 2021). As technological industries grow rapidly and capital market reforms advance,

more listed companies are establishing dedicated CVC arms or funds to more effectively participate in the innovation and entrepreneurial ecosystems. Data indicates that Chinese listed companies' CVC investments are primarily concentrated in strategic emerging industries such as internet technology, information technology, healthcare, and new energy, aligning with national industrial policies and future economic growth trajectories (Jeon & Maula, 2022). This shift is also facilitated by China's national policies, which aim to position the country as a leader in key technological areas. For instance, China's "Made in China 2025" initiative emphasizes the development of high-tech industries, including robotics, AI, and clean energy, which are areas where CVC investments are increasingly concentrated.

Chinese listed companies exhibit distinct localized characteristics in their CVC operations. First, policy guidance plays a significant role in shaping CVC development, with industrial policies, innovation incentives, and capital market reforms providing a supportive external environment (Sabel & Di Lorenzo, 2022). The Chinese government has implemented various policies that encourage corporate innovation, including tax incentives, subsidies, and preferential financing for CVC activities. These policies have played a pivotal role in driving the expansion of CVC activity, particularly in high-tech and strategic emerging sectors. The government's active role in shaping and guiding CVC activity is a defining characteristic of the Chinese market and sets it apart from other global markets where CVC is largely driven by market forces.

Second, Chinese firms place greater emphasis on strategic investments that align with their core businesses, using CVC to address technological deficiencies, explore new business models, and foster collaboration along the value chain (Park & Steensma, 2012). This investment logic not only enhances the companies' innovation capabilities but also strengthens their overall competitiveness (Chemmanur et al., 2014). For example, Chinese technology giants such as Alibaba, Tencent, and Huawei have made strategic CVC investments to expand their reach in artificial intelligence, big data, and cloud computing. By aligning CVC with their core business goals, these companies can both enhance their technological base and open new growth avenues in rapidly evolving industries. This strategic focus has been critical in enabling Chinese firms to bridge the technological gaps that exist in their domestic markets and enhance their global competitiveness.

However, Chinese listed companies still face several challenges in implementing CVC strategies. Although policy support and market demand have driven CVC development, the relative immaturity of the capital market and varying levels of risk awareness among investors pose ongoing challenges (Huang & Madhavan, 2021). The capital market in China remains

relatively young compared to the US or Europe, which creates challenges for CVCs in terms of market liquidity, exit options, and investor education. Moreover, while Chinese firms are increasingly aware of the strategic potential of CVC, there is still a gap in terms of management experience and expertise when it comes to integrating start-up investments with corporate innovation strategies.

Additionally, compared to leading global firms, Chinese companies still lag in terms of strategic positioning, team expertise, and management mechanisms within their CVC operations (Sahaym et al., 2010). Many Chinese firms are still in the early stages of developing CVC frameworks that can effectively identify, evaluate, and manage investments. A lack of experienced professionals in managing CVC investments and a focus on short-term financial returns may hinder the long-term success of CVC operations in China.

Enhancing CVC's investment effectiveness and strategic synergy remains a key area for future improvement (Jeon & Maula, 2022). In particular, the development of more advanced mechanisms for strategic integration and post-investment collaboration between CVC-backed firms and parent companies is critical. Companies must move beyond the financial aspects of CVC investments and focus more on how to leverage the technological and managerial resources provided by start-ups to drive innovation within the parent organization.

State-Owned Enterprises (SOEs) in China, as pillars of the national economy, are increasingly engaging in CVC activities. Through CVC, SOEs aim to acquire strategic technologies and innovation capabilities, aligning with the national strategy of innovation-driven development. However, SOEs face unique challenges in CVC implementation compared to private enterprises, such as administrative intervention and systemic constraints leading to lower decision-making efficiency and limited CVC flexibility and agility (Szalavetz & Sauvage, 2024). SOEs in China are often subject to more bureaucratic oversight, which can delay investment decisions and reduce the overall agility of their CVC operations. These structural challenges make it harder for SOEs to compete with private enterprises that have more flexible decision-making processes.

In recent years, the development of CVC on a global scale has shown obvious setbacks, but CVC investment in cutting-edge technologies such as artificial intelligence has continued to grow. This contradiction between the overall shrinkage of the industry and the prosperity of segmented fields highlights the important role and potential of CVC in specific fields. According to CBInsight data, the number of CVC investments in China gradually increased from 86 in 2009 to a peak of 1761 in 2021, and then began to fluctuate and decline, which is consistent with the overall trend of global CVC data. At the same time, it is increasingly

common for listed companies to enhance their parent company's innovation capabilities through CVC layout. However, how to scientifically evaluate the input-output ratio of CVC, and how to formulate effective CVC strategies in different contexts such as traditional industries and high-tech industries, state-owned enterprises and private enterprises, are still urgent problems to be solved. These issues not only affect the innovation and development of the enterprise itself, but also have a profound impact on the resource allocation and innovation ecology of the entire industry.

Moreover, SOEs often lack market-oriented incentive mechanisms within their CVC teams, making it difficult to attract and retain high-caliber investment talent (Ma, 2020). Unlike private firms, SOEs typically rely on more rigid, state-driven systems for performance management, which may not align well with the fast-paced, market-driven nature of venture capital. As a result, SOEs may struggle to compete with more dynamic and innovative private enterprises when it comes to identifying and nurturing high-potential start-ups.

Therefore, optimizing management mechanisms, enhancing team professionalism, and increasing market sensitivity are critical challenges that SOEs need to address in their CVC practices (Sahaym et al., 2010). Only by addressing these internal constraints can SOEs effectively leverage CVC to contribute to national innovation goals and maintain their competitiveness in an increasingly globalized economy.

1.2 Research problems and questions

Although the global and Chinese CVC industries have experienced tremendous development, there are also obvious internal contradictions, which is the research problems of this thesis:

Structural contradictions in industry development: Over the past decade, the overall investment scale of global CVC has shown a fluctuating downward trend (such as a significant decline after 2021), but CVC investment in cutting-edge technology fields such as artificial intelligence has grown against the trend, forming a significant contradiction between the overall shrinkage of the industry and the prosperity of segmented fields.

Lack of innovation performance evaluation mechanism: Listed companies generally enhance their parent company's innovation capabilities by establishing CVC institutions, but lack scientific quantitative tools to evaluate their input-output efficiency, resulting in the inability to verify the rationality of CVC resource allocation.

The transformation path of traditional enterprises is vague: a large number of state-owned enterprises in China are concentrated in traditional industries (such as home appliance

manufacturing). Although they actively layout CVC to seek a second growth curve, it is difficult to formulate differentiated investment strategies due to the lack of a suitable benchmark reference system (such as Changhong Venture Capital Machinery's strategic mismatch with Huawei/Xiaomi models).

Based on the above research problems, this doctoral thesis focuses on the following research questions:

What are the significant differences in the impact of CVC strategy on the innovation performance of parent companies in different industry types (such as traditional manufacturing and high-tech industries) and enterprise types (such as state-owned enterprises and private enterprises)?

2. Do different types of CVC investment strategies (strategic investment, lead investment, joint investment) have differentiated effects on the innovation performance of the parent company? How strong and stable is its function?

3. Which CVC investment portfolios (such as the synergy of strategic and joint investments) can constitute the optimal solution for the parent company's innovation performance? Does its action path have configuration dependency?

1.3 Research content

1.3.1 Research roadmap

The research roadmap of the thesis is illustrated in Figure 1.1. The figure outlines the complete process from theoretical thesis to data analysis, clarifying the logical relationships and thesis steps involved.

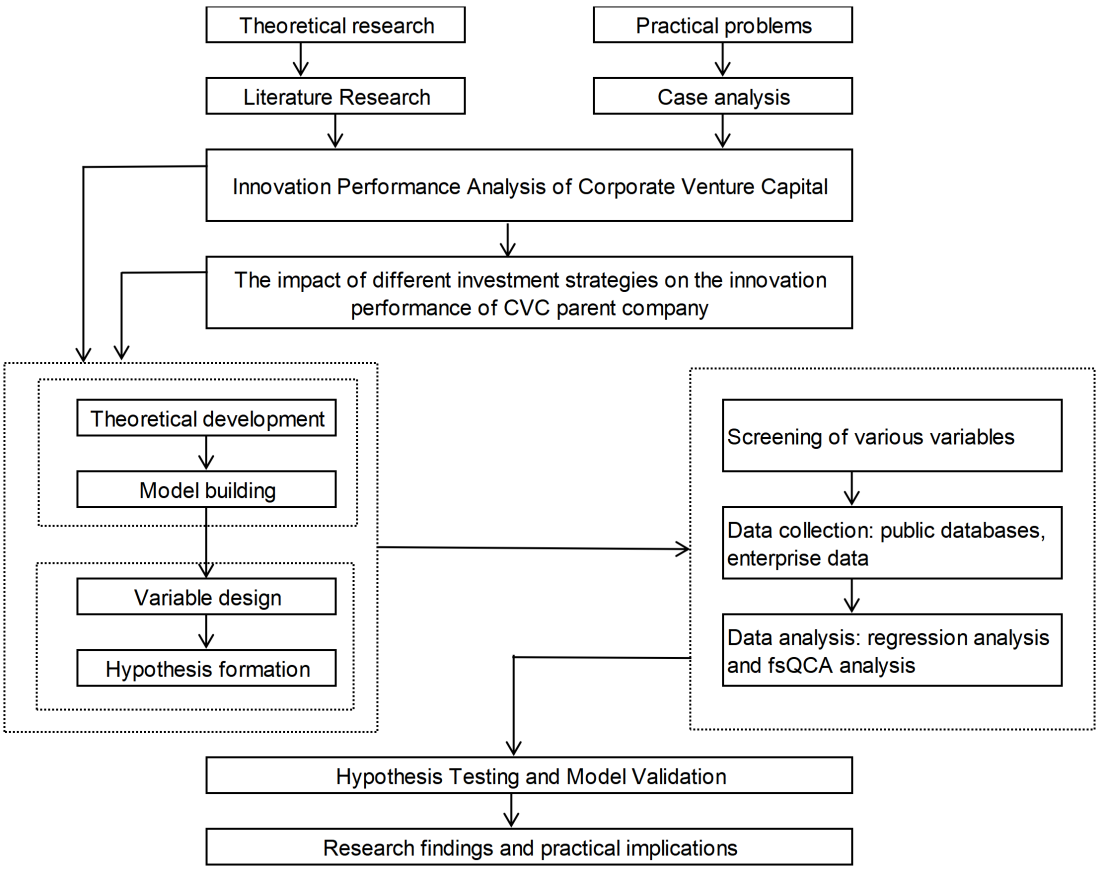

Figure 1.1 Thesis research roadmap

(1) Theoretical thesis and literature review: Start with theoretical thesis and literature review to identify key issues and thesis gaps related to CVC investment strategies and innovation performance, proposing the thesis roadmap.

(2) Innovation performance analysis of CVC: Analyze the theoretical background and practical issues of how CVC strategies affect innovation performance, providing a basis for model construction.

(3) Theoretical analysis and model construction: Conduct theoretical analysis and modeling, forming hypotheses and variable designs to prepare for data analysis.

(4) Parameter selection and data collection: Determine key parameters required for empirical analysis and collect relevant information from public databases and corporate sources to ensure data completeness and representativeness.

(5) Data analysis (Regression analysis and fsQCA):

Regression analysis: Quantify the direct impact of different CVC strategies on innovation performance.

fsQCA analysis: Identify the sufficiency and necessity of strategy combinations, determining optimal strategy paths under various corporate contexts and market environments.

(6) Hypothesis testing and model validation: Validate theoretical hypotheses through data

analysis, ensuring scientific rigor and accuracy of the models.

(7) Thesis findings and practical implications: Provide CVC strategy optimization recommendations based on analysis results, discussing the practical applications of the findings for corporate management and policy-making.

1.3.2 Research outline

This doctoral thesis mainly focuses on the impact of different investment strategies of enterprise venture capital CVC on the innovation performance of the parent company. The outline of the thesis is as follows:

Chapter 1 Introduction: This chapter introduces the importance of Corporate Venture Capital (CVC) in improving innovation performance of enterprises, points out the difficulties faced by listed companies in evaluating the input-output benefits of CVC and state-owned enterprises in achieving transformation through CVC, and proposes research questions. And briefly outlined the significance of this study.

Chapter 2 Literature Review: This chapter systematically reviews the relevant literature on CVC investment strategy and innovation performance, sorts out the concept evolution, investment strategy types, innovation performance evaluation methods, and related theoretical foundations of CVC, summarizes the current application status and challenges of CVC in listed companies, and points out the limitations and gaps of existing research, laying a theoretical foundation for subsequent research.

Chapter 3 Research Methods and Design: This chapter provides a detailed introduction to the research methods used in the paper, including case analysis, linear regression analysis, and fuzzy set qualitative comparative analysis (fsQCA). It elaborates on the application purpose, design steps, and data processing methods of each method, and explains how to integrate multiple methods to comprehensively analyze the impact of CVC investment strategies on innovation performance. At the same time, it introduces the measurement methods and data sources of innovation performance.

Chapter 4 Case Analysis of CVC at Home and Abroad: This chapter explores the impact of different venture capital operation models and investment strategies on the innovation performance of parent companies by analyzing typical CVC cases at home and abroad. It reveals the successful experiences and challenges faced by CVC in different market environments, providing practical references for subsequent empirical research.

Chapter 5: The Impact of Different Investment Strategies on Corporate Innovation Performance - Based on Regression Analysis: This chapter uses linear regression analysis

method and data from 231 listed companies to empirically test the impact of different CVC strategies such as strategic investment, joint investment, and lead investment on the innovation performance of the parent company. The results show that these strategies significantly improve innovation performance, but the stability of the lead investment strategy is relatively weak.

Chapter 6: The Impact of Different Investment Strategies on Corporate Innovation Performance - Based on fsQCA Analysis: This chapter uses the fuzzy set qualitative comparative analysis (fsQCA) method to further explore the complex impact of CVC investment strategy combinations on innovation performance. It is found that the improvement of innovation performance depends on the collaborative combination of multiple strategies, revealing multiple paths to achieve high innovation performance and emphasizing the necessity and sufficiency of strategy combinations.

Chapter 7 Results and Discussion: This chapter comprehensively discusses the results of case analysis, regression analysis, and fsQCA analysis, compares the differences in results of different methods, explores the internal mechanism of the impact of CVC investment strategy on innovation performance, further verifies the research hypothesis, and interprets the research results in depth based on existing literature.

Chapter 8 Conclusion and Contribution: This chapter summarizes the main research conclusions of the paper and elaborates on its theoretical and practical contributions, including filling the theoretical gaps in quantitative analysis of CVC strategies, portfolio effects, and comparison of state-owned private enterprise paths. It provides key practical insights for Chinese listed companies and points out the limitations and future research directions of the study.

1.4 Research significance

Through an in-depth analysis of 242 samples, this thesis utilizes case study, linear regression and fuzzy-set Qualitative Comparative Analysis (fsQCA) to provide a more robust and objective basis for evaluating CVC performance within enterprises. By addressing existing theoretical gaps in the literature, this research aims to contribute not only to academic understanding but also to offer practical strategic guidance for CVC investment decisions in business settings. The following discussion highlights the significance of this study in two key areas: theoretical contributions and practical strategic implications.

1.4.1 Theoretical significance

Corporate Venture Capital (CVC) has long been recognized as a crucial mechanism for fostering innovation within firms. It serves as a bridge between established corporations and emerging technologies, startups, and entrepreneurial ventures, allowing firms to tap into external sources of innovation and integrate them with their internal capabilities. However, despite its growing prominence, the specific impact of CVC investment strategies on the innovation performance of parent companies remains underexplored, particularly in the context of listed companies (Dushnitsky & Lenox, 2005). While there is a substantial body of literature examining the financial returns and strategic synergies derived from CVC activities, the direct relationship between CVC strategies and innovation outcomes, as well as the underlying mechanisms through which these effects are realized, still needs further investigation (Keil et al., 2008).

Innovation is a multifaceted process influenced by a variety of factors, including internal R&D capabilities, market orientation, and strategic alignment. CVC strategies, which can be broadly categorized into strategic, financial, and hybrid approaches, play a significant role in shaping these factors. Strategic CVC focuses on acquiring complementary technologies or accessing new markets, while financial CVC aims primarily at generating financial returns through equity investments. Hybrid CVC, as the name suggests, combines elements of both strategic and financial approaches, offering a more balanced perspective. Each of these strategies can have a distinct impact on innovation performance, depending on the market conditions, firm characteristics, and industry dynamics (Katila & Ahuja, 2002).

This study addresses these gaps by exploring how different CVC strategies affect innovation performance under varying market conditions and firm types. It investigates the nuances of strategic, financial, and hybrid CVC approaches and examines how they influence innovation outcomes in different contexts. For instance, in highly competitive and fast-paced industries, strategic CVC may be more effective in driving innovation by providing access to cutting-edge technologies and fostering collaborative relationships. In contrast, in more stable and mature industries, financial CVC may play a dominant role by generating additional resources that can be reinvested in internal R&D activities. By analyzing these differences, this research aims to provide a comprehensive understanding of the role of CVC strategies in enhancing corporate innovation capabilities.

Employing linear regression, this thesis quantifies the direct impacts of CVC strategies on innovation performance, providing empirical evidence of the relationships between specific

strategy types and innovation outcomes (Chemmanur et al., 2014). This approach allows for the identification of the magnitude of influence of individual strategy factors, thereby clarifying the role of CVC strategies in enhancing corporate innovation capabilities (Huang & Madhavan, 2021). For example, by examining the coefficients of different CVC strategy variables, the study can determine whether strategic CVC has a stronger impact on innovation performance compared to financial CVC, or whether a hybrid approach offers a synergistic effect that surpasses the sum of its individual components. This quantitative analysis not only provides a clear picture of the direct effects but also helps in understanding the relative importance of each strategy type in driving innovation.

Moreover, since innovation performance is influenced by multiple interacting factors rather than single, isolated elements, this research also utilizes fuzzy-set Qualitative Comparative Analysis (fsQCA) to analyze the complex, multi-path, and asymmetric effects of CVC strategies on innovation outcomes (Ragin, 2008). This method uncovers optimal strategy combinations under different contexts, revealing both the sufficiency and necessity conditions required to achieve high innovation performance (Fiss, 2011). For instance, fsQCA can identify configurations where a combination of strategic CVC with strong internal R&D capabilities and a market-oriented culture leads to high innovation performance, even in the absence of significant financial CVC activities. Conversely, it can also reveal scenarios where financial CVC alone may not be sufficient to drive innovation but can contribute when combined with other factors such as strategic alliances or technological absorptive capacity. By offering a multi-dimensional perspective, the study not only identifies the direct effects of CVC strategies but also explores their complex interactive relationships in various market environments, thus providing comprehensive theoretical support for diversified CVC strategy applications (Park & Steensma, 2012).

Particularly for listed companies, this thesis examines the applicability of CVC strategies across different industries and stages of corporate development. Listed companies, with their robust capital operation capabilities and market orientation, have distinct motivations and execution approaches compared to state-owned enterprises (SOEs). While SOEs may prioritize long-term strategic goals and national interests, listed companies are often more focused on shareholder value creation and market competitiveness (J. Y. Kim & Park, 2017). By systematically analyzing these differences, this research expands the theoretical roadmap of CVC strategy studies, offering new insights into the multi-layered impacts of CVC on corporate innovation (Jeon & Maula, 2022). For example, listed companies may be more inclined to adopt financial CVC strategies to generate short-term returns and enhance shareholder value, whereas

SOEs may lean towards strategic CVC to achieve broader industry objectives and long-term technological advancements. Understanding these nuances is essential for developing a comprehensive theory of CVC that can be applied across different types of firms and industries.

1.4.2 Practical significance

Practically, this thesis provides significant guidance for management and decision-makers in listed companies. As they navigate rapidly changing markets and technological landscapes, listed companies can leverage CVC investments to swiftly access external innovation resources, thereby enhancing their innovation capabilities and market competitiveness (Chesbrough, 2002). However, the impact of different CVC strategies on innovation performance can vary significantly. This thesis identifies which strategies are most effective in achieving innovation goals, offering empirical evidence to support strategic decision-making in CVC investment and resource allocation (Dushnitsky & Lenox, 2005). For example, a listed company in the technology sector may find that strategic CVC investments in startups with complementary technologies yield higher innovation returns compared to purely financial investments. These findings assist managers in making more informed choices about CVC strategy selection, ultimately improving investment efficiency and innovation outcomes (Katila & Ahuja, 2002).

Furthermore, listed companies must balance financial returns with strategic synergies when implementing CVC strategies. The results of this research provide specific recommendations for optimizing these strategies, such as how to better integrate external innovation resources through strategic investments or how to secure direct financial returns while supporting parent company innovation (Keil et al., 2008). By analyzing various strategy combinations, this thesis offers diverse practical pathways for listed companies, aiding them in flexibly adjusting CVC strategies under different market conditions and strategic objectives to maximize innovation performance (Park & Steensma, 2012). For instance, a company facing intense competition may prioritize strategic CVC to gain a technological edge, while another company with ample financial resources may focus on financial CVC to diversify its investment portfolio and generate additional revenue streams. The findings of this thesis help managers navigate these trade-offs and make strategic decisions that align with their firm's unique circumstances and goals.

Although the primary focus is on listed companies, the findings also have reference value for SOEs. As SOEs increasingly engage in CVC, they face unique challenges, such as limited decision-making flexibility, conservative risk appetites, and inadequate incentive mechanisms, which can affect the effectiveness of their CVC strategies (Szalavetz & Sauvage, 2024). The

findings of this thesis can help SOEs adopt best practices from listed companies, particularly in strategy combinations and post-investment management, to enhance the market orientation and innovation performance of their CVC activities (K. Kim et al., 2016). Specifically, SOEs can adjust strategy combinations to reduce administrative intervention and enhance market-driven investment decisions. Additionally, the findings can help SOEs identify and overcome unique barriers in CVC implementation, such as enhancing incentive mechanisms through market-based approaches to attract and retain high-quality investment and management talent (Ma, 2020).

For policymakers, this thesis also offers valuable insights. Governments have consistently encouraged enterprises to drive industrial upgrading through technological innovation, and CVC, as a key tool of open innovation strategies, can effectively support this national agenda (Nelson, 1974). By revealing how different CVC strategies impact innovation performance, this research provides empirical support for policymakers in formulating relevant support policies. For example, policymakers could encourage enterprises to adopt more effective CVC strategy combinations or provide targeted support in specific industries and sectors to stimulate corporate innovation. Additionally, the findings can help policymakers identify common issues in CVC implementation, such as regulatory shortcomings and insufficient market mechanisms, enabling them to develop more precise policy measures that promote the healthy development of the CVC market (Ragin, 2008).

Chapter 2: Literature Review

2.1 Overview of CVC investment strategy and innovation performance

2.1.1 The concept and evolution of corporate venture capital (CVC)

Corporate Venture Capital (CVC) has emerged as a strategic tool for established firms to foster innovation and maintain competitive advantage in rapidly evolving markets. This section provides an in-depth exploration of the concept and evolution of CVC, highlighting its role in enhancing corporate innovation and the strategic motivations behind such investments.

(1) Early foundations and strategic motivations

Dushnitsky and Lenox (2005) were among the first to systematically explore the role of CVC investments in enhancing corporate innovation. Their research emphasized that established firms can significantly bolster their innovation capabilities by strategically investing in startups. These investments grant firms access to cutting-edge technologies and valuable market insights that may not be readily available internally. By integrating external knowledge resources into their internal innovation processes, firms can accelerate technological advancements and product development. However, this integration is not without challenges. Resource allocation, for instance, requires a delicate balance between supporting external ventures and maintaining core internal operations. Additionally, cultural differences between established firms and agile startups can pose obstacles to seamless collaboration. Despite these hurdles, Dushnitsky and Lenox (2005) underscored the transformative potential of CVC in bridging the gap between corporate strategy and entrepreneurial innovation. They argued that the ability to access and integrate external innovation resources is crucial for firms seeking to remain competitive in dynamic markets.

Building on this foundation, Katila and Ahuja (2002) further examined how CVC enhances a company's technological performance through external technology acquisition and product innovation. Their research highlighted that in technology-intensive industries, where rapid technological advancements are the norm, companies often need external collaborations to complement their internal R&D efforts. CVC investments serve as a strategic conduit for acquiring new technologies and integrating them into existing product lines, thereby maintaining a competitive edge. This is particularly crucial in industries such as information

technology, biotechnology, and advanced manufacturing, where the pace of innovation is swift, and the ability to adapt quickly can determine market success. Katila and Ahuja (2002) demonstrated that CVC is not merely a financial investment but a strategic move to secure a continuous flow of innovative ideas and technologies. They also pointed out that the success of such investments depends on the firm's ability to effectively absorb and utilize the acquired technologies, which requires a robust internal innovation infrastructure.

(2) Comparative analysis with independent venture capital

Chemmanur et al. (2014) expanded the discourse by comparing the effects of CVC and Independent Venture Capital (IVC). Their study revealed that startups supported by CVC tend to exhibit higher levels of innovation, particularly in terms of patent output. This finding suggests that the strategic guidance and resource-sharing capabilities of corporate investors can catalyze innovation within startups. However, these firms may also face higher risks and lower profitability in their early stages due to the experimental nature of their innovations. This dual-edged nature of CVC investments highlights their strategic value to parent companies, which can leverage these investments to tap into emerging markets and technologies. Moreover, Chemmanur et al. (2014) emphasized that CVC plays a crucial role in fostering innovation within the broader ecosystem by nurturing startups that may eventually disrupt traditional industries. They argued that while IVC primarily focuses on financial returns, CVC investments are often driven by strategic objectives, such as accessing new markets, technologies, and business models. This distinction underscores the unique role of CVC in driving both corporate and ecosystem-level innovation.

(3) Experimental investment strategies and flexibility

Keil et al. (2008) introduced the concept of "experimental investment" in the context of CVC. They proposed that firms can develop new capabilities and drive technological innovation through experimental exploration and small-scale trial-and-error approaches. This strategy allows firms to pursue innovation with reduced risk, especially in fast-changing markets where flexibility is paramount. By making small, exploratory investments, firms can test new technologies and business models without committing significant resources upfront. This approach is particularly effective in industries characterized by high uncertainty and rapid technological shifts, such as the digital and biotech sectors. Keil et al. (2008) argued that the ability to pivot and adapt based on experimental outcomes is a key factor in the success of CVC investments. They also highlighted that this strategy enables firms to learn from failures and successes, thereby refining their innovation processes and improving their overall strategic agility. This emphasis on flexibility and learning aligns with the broader trend of open

innovation, where firms increasingly rely on external resources to drive internal innovation.

(4) The role of CVC investors in startup development

Park and Steensma (2012) highlighted the critical role of CVC investors in selecting and nurturing innovative startups. Their research indicated that CVC investors go beyond mere financial support by offering strategic guidance and resource sharing. This relational investment model significantly enhances the innovative capacity of the investee firms. By providing access to the parent company's networks, technology, and market channels, CVC investors help startups scale their innovations more effectively. Park and Steensma (2012) emphasized that this close collaboration enables long-term strategic alignment between the parent company and the startup, fostering a symbiotic relationship where both parties benefit from the innovation ecosystem. They also pointed out that the success of such relationships depends on the quality of the interactions between the investor and the startup, as well as the alignment of strategic goals. This relational aspect of CVC investments underscores the importance of building trust and mutual understanding between the parties involved.

(5) Lifecycle management and strategic adjustments

Ma (2020) conducted a comprehensive analysis of the different stages of the CVC lifecycle, revealing that investment strategies at each stage can have varying impacts on innovation performance. The early stages of CVC investments typically focus on technology scouting and market exploration, while later stages may emphasize integration and scaling. Ma (2020) suggested that companies need to continuously adjust their CVC strategies to adapt to evolving market and technological landscapes. This is especially crucial during periods of intense competitive shifts, where strategic agility can determine the long-term success of CVC initiatives. By aligning investment strategies with market dynamics, firms can optimize their innovation outcomes and sustain competitive advantage. Ma (2020) also highlighted that the lifecycle management of CVC investments requires a deep understanding of both the internal and external factors influencing innovation. This includes monitoring technological advancements, market trends, and competitive dynamics, as well as managing internal resources and capabilities effectively.

(6) Contextual factors and market conditions

Huang and Madhavan (2021) conducted a meta-analysis to assess the effectiveness of CVC investments across diverse market conditions. Their study found that while CVC generally yields positive innovation returns, the magnitude of these returns varies significantly based on market conditions and corporate strategies. For instance, in highly competitive and technologically dynamic markets, CVC investments may generate higher innovation returns

compared to more stable markets. Huang and Madhavan (2021) recommended that companies tailor their CVC strategies to specific market contexts, taking into account factors such as industry trends, regulatory environments, and technological maturity. This contextual approach ensures that CVC investments are optimized for maximum innovation impact. They also pointed out that the effectiveness of CVC investments can be influenced by the firm's existing innovation capabilities and its ability to integrate external resources effectively. This underscores the importance of a holistic approach to innovation strategy, where CVC investments are aligned with the firm's overall innovation goals and capabilities.

(7) Technological and social networks in CVC

J. Y. Kim et al. (2019) explored the importance of technological connections and social relationships in shaping CVC investments. Their study concluded that robust technological and social networks enable CVC investments to more effectively influence the innovation trajectories of startups. By leveraging existing networks, CVC investors can facilitate knowledge transfer, technology diffusion, and collaborative opportunities. J. Y. Kim et al. (2019) argued that these networks serve as critical enablers for startups, helping them navigate complex innovation ecosystems and accelerate their growth. The interplay between technological and social networks underscores the multifaceted nature of CVC investments, highlighting the importance of both hard and soft factors in driving innovation. They also pointed out that the strength and quality of these networks can vary across industries and regions, emphasizing the need for context-specific strategies in CVC investments.

(8) Timing and strategic decision-making

Sabel and Di Lorenzo (2022) investigated the timing of CVC investments, finding that selecting the right investment timing can significantly impact innovation performance. Their research emphasized that firms should strategically choose when to invest based on market conditions, technological readiness, and competitive dynamics. By timing their investments optimally, firms can maximize innovation returns while minimizing risks. This requires a nuanced understanding of market trends and the ability to anticipate future technological breakthroughs. Sabel and Di Lorenzo (2022) highlighted that timing management is a critical component of CVC strategy, requiring firms to balance urgency with patience to achieve optimal innovation outcomes. They also pointed out that the timing of investments can influence the nature of collaborations between the parent company and the startup, as well as the ultimate success of the innovation initiatives.

(9) Dual roles of CVC in strategic anticipation

Jeon and Maula (2022) provided a comprehensive review of recent developments in the

CVC field, arguing that CVC serves not only as an innovation catalyst but also as a strategic mechanism for anticipating technological shifts and market changes. Their study underscored the dual roles of CVC in both fostering innovation and defending against competitive threats. In rapidly changing environments, CVC investments enable firms to stay ahead of technological trends and adapt to evolving market demands. Jeon and Maula (2022) highlighted that CVC is a multifaceted tool that combines offensive and defensive strategies, allowing firms to navigate complex market landscapes effectively. They also pointed out that the success of CVC investments depends on the firm's ability to balance these dual roles, ensuring that innovation initiatives are aligned with broader strategic goals.

(10) Synthesis and future directions

Haslanger et al. (2023) synthesized 32 CVC studies encompassing 105,950 observations, revealing that while CVC investments positively impact strategic performance for both startups and investors, they show no significant effect on financial outcomes. This finding suggests that the primary value of CVC lies in its strategic contributions rather than direct financial returns. The impact of CVC investments is moderated by factors such as investment timing, country, and industry-specific contexts. For instance, CVC investments in North America and the ICT sector demonstrate significant positive effects, whereas no statistical significance was found for the healthcare sector. This highlights the importance of contextual factors in determining the success of CVC initiatives.

T. Wang (2023) further explored the impact of CVC on technological innovation in entrepreneurial firms, finding that the ownership structure of CVC firms plays a crucial role. Using propensity score matching to compare private and public CVC-backed companies, T. Wang (2023) showed that firms backed by private CVCs exhibit higher levels of innovation. This superior innovation performance is attributed to private CVC investors' greater tolerance for failure compared to their public counterparts. This finding underscores the importance of investor characteristics in shaping the innovation outcomes of CVC investments. T. Wang (2023) also highlighted that the governance structure of CVC firms can influence the effectiveness of innovation initiatives, suggesting that private CVCs may have more flexibility to support high-risk, high-reward innovation projects.

Szalavetz and Sauvage (2024) examined whether recent trends in CVC investment diverge from incumbents' traditional strategic focus on enhancing core business competitive advantage. Through interviews with 12 Silicon Valley-based CVC units of global industrial firms, they explored the relationship between strategic and financial motivations of CVC investing. Their findings suggest that while financialization is observed at the extensive margin, it does not hold

at the intensive margin. This highlights the ongoing evolution of CVC motivations and strategies in response to changing market dynamics. Szalavetz and Sauvage (2024) also pointed out that the increasing complexity of global markets requires CVC investors to continuously reassess their strategies to ensure alignment with corporate goals and market conditions.

The overview of CVC investment strategies and their impact on innovation performance demonstrates that CVC is widely recognized as a powerful tool for enhancing corporate innovation. Early seminal studies, such as those by Dushnitsky and Lenox (2005) and Katila and Ahuja (2002), focused on the role of CVC in accessing external innovation resources. Recent research has expanded to explore the diversity of CVC strategies, lifecycle management, and alignment with market conditions. These studies reveal that the effectiveness of CVC investments varies across different strategies and timing choices and is significantly influenced by market environments and corporate strategies. Current research gaps include the need for systematic analyses of the long-term effects of CVC and a comprehensive understanding of how CVC interacts with various innovation performance metrics. Future research should delve deeper into the long-term innovation impacts of CVC and strategy optimization, particularly in the context of intensifying global competition, to support companies in sustaining their innovation capabilities through CVC. Additionally, future studies should explore the role of emerging technologies, such as artificial intelligence and blockchain, in shaping the future of CVC investments and their impact on corporate innovation.

2.1.2 CVC investment strategy

Corporate Venture Capital (CVC) has emerged as a multifaceted strategic tool for corporations to drive innovation and maintain competitive advantage in dynamic markets. Unlike traditional venture capital, CVC investments are often motivated by a combination of strategic and financial objectives, aiming to integrate external innovation into the parent company's core business while generating financial returns. This section provides an in-depth analysis of various CVC investment strategies and their impact on innovation performance, highlighting the nuanced roles of lead investments, joint investments, and strategic investments in shaping corporate innovation trajectories.

(1) Strategic investment: Aligning innovation with core business objectives

Park and Steensma (2012) emphasized the importance of Strategic Investment, which focuses on achieving synergies with the parent company's core business by investing in startups with strategic relevance. This strategy aims to enhance the firm's competitive positioning in new markets by acquiring technological innovations that complement existing capabilities.

Strategic investments are particularly effective in industries where technological convergence is driving rapid changes in market dynamics.

Strategic investments offer several advantages for CVC investors. First, by investing in startups that align with the parent company's core business, corporations can directly benefit from technological advancements and market opportunities. For example, a technology company might invest in a startup developing cutting-edge artificial intelligence algorithms to integrate these capabilities into its own products and services. This integration can lead to significant improvements in product performance, customer satisfaction, and market competitiveness.

Second, strategic investments provide access to new customer segments and distribution channels. By partnering with innovative startups, corporations can expand their market reach and gain insights into emerging trends and customer needs. This can help the parent company stay ahead of market changes and adapt more quickly to new opportunities.

However, strategic investments also come with challenges. Ensuring that the startup's innovation aligns with the parent company's strategic goals can be complex, requiring careful due diligence and ongoing management. Additionally, integrating the startup's technology into the parent company's existing operations can be technically and culturally challenging. Despite these challenges, Park and Steensma (2012) found that strategic investments can significantly enhance the parent company's innovation capabilities and competitive positioning.

Based on the above the following hypothesis isformed:

H1:strategic investment quantity as a significant effect on intellectual property quantity

(2) Joint investment strategy: Balancing risk and innovation through collaboration

Keil et al. (2008) explored the Joint Investment strategy, where corporations co-invest with other investors to mitigate risk and share resources. This collaborative approach leverages the strengths of multiple investors, combining financial resources, technical expertise, and market insights to support the growth and innovation of portfolio companies. Joint investments are particularly effective in high-risk, high-reward industries, where the uncertainty of technological success and market adoption can be significant.

The primary advantage of joint investments is risk mitigation. By sharing the financial burden with other investors, corporations can reduce their exposure to the inherent risks of early-stage ventures. This allows CVC investors to support innovative projects that might otherwise be too risky to pursue independently. Additionally, joint investments facilitate resource integration and technological synergy. By collaborating with other investors, CVC firms can access a broader range of expertise and capabilities, enhancing the innovation

potential of the portfolio companies.

Keil et al. (2008) highlighted that joint investments also promote collaborative networks, which can lead to more robust and diverse innovation outcomes. For example, a joint investment between a CVC investor and an independent venture capital firm can combine the strategic insights of the corporate investor with the financial acumen of the venture capitalist. This partnership can create a powerful ecosystem for innovation, supporting the development of new technologies and business models that might not emerge in isolation.

However, joint investments also present challenges. Coordinating investment decisions and post-investment management can be complex, requiring careful alignment of goals and expectations among multiple stakeholders. Additionally, the division of influence and control over the portfolio company can sometimes lead to conflicts or inefficiencies. Despite these challenges, Keil et al. (2008) demonstrated that the benefits of joint investments in terms of risk management and resource integration often make them a valuable strategy for CVC investors.

Based on the above the following hypothesis isformed:

H2:Joint investment quantity as a significant effec on intellectual property quantity

(3) Lead investment strategy: Driving innovation through active participation

Katila and Ahuja (2002) were among the first to systematically examine the Lead Investment strategy in the context of CVC. They argued that by taking a prominent role in the investment process, CVC investors can actively shape the direction of innovation within portfolio companies. This strategy is particularly effective in rapidly changing, technology-intensive industries, where the ability to steer innovation aligns with the parent company's strategic goals. For example, in industries such as information technology, biotechnology, and advanced manufacturing, lead investments can help startups develop technologies that directly complement the parent company's existing product lines or strategic initiatives.

Lead investments provide several advantages for CVC investors. First, by leading investment rounds, corporations can exert significant influence over the startup's strategic direction, ensuring that R&D efforts are aligned with the parent company's technological roadmap. This alignment is critical for facilitating the integration of new technologies into existing products or business models. Second, lead investments often involve a deeper level of engagement with the startup, allowing the CVC investor to provide strategic guidance, technical expertise, and market access. This hands-on approach can accelerate the startup's growth and innovation capabilities, ultimately benefiting the parent company through technology transfer and market expansion.

However, lead investments also come with challenges. The active role of the CVC investor

can sometimes lead to conflicts of interest or misalignment between the startup's goals and those of the parent company. Additionally, the financial burden of leading investment rounds can be substantial, requiring significant resources from the CVC investor. Despite these challenges, Katila and Ahuja (2002) demonstrated that the strategic benefits of lead investments often outweigh the costs, particularly in industries where rapid technological change is the norm.

Based on the above the following hypothesis isformed:

H3:lead investment quantity as a significant effect on the quantity of intellectual property rights

(4) Flexibility in dynamic markets: Adapting investment strategies to market conditions

Ma (2020) highlighted the critical role of flexibility in CVC investment strategies, especially in dynamic market environments. He argued that the ability to adapt investment strategies to changing market conditions is essential for sustained innovation performance. Lead investments, for example, allow firms to quickly adapt to market changes and directly impact innovation capabilities by setting the agenda for startups' R&D efforts. This approach is particularly effective in rapidly evolving markets, where the ability to steer innovation can provide a significant competitive advantage.

On the other hand, joint investments help maintain innovation development by sharing risks in uncertain conditions. By collaborating with other investors, corporations can pool resources and expertise, reducing the financial burden and associated risks of investing in high-potential startups. This collaborative approach is particularly beneficial in emerging industries where the technological landscape is uncertain, and the risks of investment are high.

Ma (2020) emphasized that the ability to switch between these strategies based on market conditions is essential for sustained innovation performance. For example, in a rapidly evolving market, a lead investment strategy might be more effective in driving innovation, while in a more stable environment, joint investment could provide a more balanced approach to risk management and resource allocation. This flexibility allows CVC investors to optimize their innovation outcomes and maintain competitive advantage in dynamic markets.

(5) Innovation orientation and strategic goals: Tailoring CVC strategies to corporate objectives

Huang and Madhavan (2021) found that the innovation orientation of CVC strategies largely depends on the firm's strategic goals. They demonstrated that lead investments excel in pushing the boundaries of technological innovation, often resulting in breakthrough technologies and new business models. In contrast, joint investments tend to focus more on market opportunities and resource integration, making them suitable for more conservative

innovation strategies.

This distinction is crucial for firms seeking to balance their innovation portfolios between high-risk, high-reward projects and more incremental, market-driven innovations. Lead investments, for example, are particularly effective in industries where rapid technological change is the norm, such as artificial intelligence, biotechnology, and advanced manufacturing. In these industries, the ability to drive technological breakthroughs can provide a significant competitive advantage, allowing firms to disrupt existing market dynamics and create new opportunities.

Joint investments, on the other hand, are more suitable for industries where market adoption and resource integration are critical factors for success. By focusing on market opportunities and resource integration, joint investments can help firms expand their market reach and enhance their operational capabilities. This approach is particularly effective in industries such as consumer goods, healthcare, and financial services, where market-driven innovations are essential for maintaining competitiveness.

Huang and Madhavan (2021) recommended that firms tailor their CVC strategies based on their specific innovation objectives, market position, and risk tolerance. By aligning CVC investments with corporate strategy, firms can optimize their innovation outcomes and maintain competitive advantage in dynamic markets.

(6) Balancing strategic and financial objectives: Aligning CVC investments with corporate goals

Jeon and Maula (2022) examined the balance between strategic and financial objectives in CVC investments, noting significant differences in how various strategies achieve innovation goals. They found that strategic investments are more effective in supporting long-term technological innovation, as they focus on integrating new technologies into the parent company's core business. In contrast, financially driven strategies are oriented towards short-term returns and risk management, often prioritizing investments with quicker payoffs.

This dual focus underscores the complexity of CVC investments, where firms must balance long-term strategic gains with short-term financial performance. Strategic investments, for example, are particularly effective in industries where technological convergence is driving rapid changes in market dynamics. By investing in startups that align with the parent company's core business, corporations can directly benefit from technological advancements and market opportunities, enhancing their long-term competitive positioning.

Financially driven strategies, on the other hand, are more suitable for firms seeking to generate short-term financial returns. By focusing on investments with quicker payoffs, these

strategies can provide a steady stream of financial returns, helping to offset the risks associated with more speculative innovation projects. However, this approach may come at the expense of long-term strategic gains, as firms may miss out on opportunities to integrate transformative technologies into their core business.

Jeon and Maula (2022) highlighted that the ability to align these objectives is critical for maximizing the innovation impact of CVC investments. Firms must carefully balance their investment portfolios to ensure that strategic and financial objectives are aligned, optimizing innovation outcomes and maintaining competitive advantage in dynamic markets.

(7) Building innovation ecosystems: The role of joint investments in collaborative innovation

Francisco and Yang (2021) emphasized the role of joint investments in building innovation ecosystems. They argued that by collaborating with other investors, CVC firms can better capture market and technological intelligence, thereby strengthening their position and influence within the innovation ecosystem. This collaborative approach enables firms to leverage the diverse expertise and resources of their partners, creating a more robust environment for innovation.

Joint investments facilitate the creation of collaborative networks, which can lead to more robust and diverse innovation outcomes. For example, a joint investment between a CVC investor and a government-backed venture capital fund can combine the strategic focus of the corporate investor with the public interest objectives of the government. This partnership can create a powerful ecosystem for innovation, supporting the development of new technologies and business models that might not emerge in isolation.

Moreover, joint investments can enhance the innovation capabilities of portfolio companies by providing access to a broader range of resources and expertise. By collaborating with other investors, startups can benefit from the combined technical, market, and financial insights of their investors. This collaborative environment can accelerate the development and commercialization of new technologies, leading to more impactful innovation outcomes.

Francisco and Yang (2021) highlighted that the strength and quality of these collaborative relationships are critical factors in determining the success of joint investments. Firms must carefully select their investment partners and manage these relationships to ensure that they are aligned with their strategic goals and innovation objectives.

(8) Social networks and relationship-oriented investments: The role of social ties in CVC success

J. Y. Kim et al. (2019) explored the impact of social networks in strategic CVC investments,

finding that strong social and technological ties can significantly enhance the effectiveness of CVC investments. By establishing and nurturing these relationships, CVC investors can more effectively integrate resources and drive innovation within their portfolio companies. This relationship-oriented investment approach not only enhances the innovative orientation of firms but also fosters a collaborative culture that supports long-term innovation.

Social networks play a crucial role in the success of CVC investments. By leveraging existing relationships and connections, CVC investors can gain access to valuable market and technological intelligence, enhancing their ability to identify and support innovative startups. Additionally, strong social ties can facilitate the transfer of knowledge and resources between the parent company and the portfolio company, accelerating the integration of new technologies and business models.

J. Y. Kim et al. (2019) highlighted that the strength and quality of these relationships are critical factors in determining the success of CVC investments. Firms must invest time and effort in building and maintaining these relationships, ensuring that they are aligned with their strategic goals and innovation objectives. This relationship-oriented approach can lead to more impactful innovation outcomes, enhancing the parent company's competitive position in dynamic markets.

(9) Accessing innovation through minority investments: The role of CVC in sustainability and corporate strategy

Döll et al. (2022) examined CVC as a strategy for accessing innovation through minority-share investments, with goals that can be financial or strategic. Their research, which analyzed companies on the ISE B3 Corporate Sustainability Index, used a systematic review, secondary data assessments, and surveys via Investor Relations channels. The findings revealed that 27 companies had CVC programs with initiatives beyond mere investment, with over 70% of ISE B3 firms involved in CVC activities.

The study highlighted that companies invest 10% to 15% of their capital in sustainable ventures to enhance competitiveness, linking CVC to sustainability efforts. This approach allows corporations to support innovative startups that are developing sustainable technologies and business models, contributing to broader environmental and social goals. By investing in sustainable ventures, corporations can enhance their reputation, attract environmentally conscious customers, and prepare for future regulatory requirements.

Döll et al. (2022) demonstrated that minority investments can be a powerful tool for corporations to achieve both strategic and financial objectives while contributing to sustainability efforts. By supporting innovative startups in the sustainability space, corporations

can gain access to cutting-edge technologies and business models that can enhance their long-term competitiveness. This research underscored the importance of aligning CVC investments with corporate sustainability strategies, optimizing innovation outcomes and contributing to broader environmental and social goals.

(10) Competitive dynamics and CVC investments: Signaling and strategic interactions

T. X. Chen et al. (2023) examined CVC investments from a competitive dynamics perspective, arguing that these investments send competitive signals to rivals, prompting matching responses. Their research explored how investment size, industry relatedness, and the corporate investor's reputation affect rivals' perception of competitive threat and motivation to respond. The empirical results supported the model, highlighting the strategic role of CVC investments in competitive interactions.

CVC investments can serve as a powerful signaling mechanism, communicating a firm's strategic intentions and technological capabilities to competitors. By investing in high-potential startups, corporations can signal their commitment to innovation and market leadership, deterring potential competitors and protecting their market position. Additionally, CVC investments can provide valuable intelligence on emerging technologies and market trends, helping firms stay ahead of competitors and adapt more quickly to market changes.

T. X. Chen et al. (2023) demonstrated that the size and industry relevance of CVC investments play a crucial role in shaping competitive dynamics. Larger investments in closely related industries are more likely to be perceived as a threat by competitors, prompting them to respond with matching investments or strategic actions. The reputation of the corporate investor also plays a significant role, with well-known firms generating more attention and concern among rivals.

This research highlighted that CVC investments can be a powerful tool for firms to manage competitive dynamics and protect their market position. By carefully managing their investment portfolios and signaling their strategic intentions, firms can deter potential competitors and maintain a competitive advantage in dynamic markets.

(11) Ecosystem building through CVC: The role of platform companies in driving innovation

Yan et al. (2023) explored how internet platform companies, such as Tencent, use CVC to foster ecosystems around core technologies, contributing to value creation, particularly in emerging markets like China. Through a case analysis, the authors identified seven strategic objectives of Tencent's CVC activities that drive value within its platform ecosystem. The research proposed a product-platform-ecosystem model, offering insights into the role of CVC

in value creation and implications for managers and policymakers.

Platform companies like Tencent use CVC investments to build and nurture innovation ecosystems around their core technologies. By investing in startups that complement their platform capabilities, these companies can extend their technological reach and create a more robust ecosystem for innovation. For example, Tencent's investments in fintech, e-commerce, and digital entertainment startups have helped to expand its platform capabilities and create a more integrated ecosystem for users and developers.

Yan et al. (2023) highlighted that CVC investments can play a crucial role in driving value creation within platform ecosystems. By supporting innovative startups, platform companies can enhance their core technologies, expand their market reach, and create new opportunities for growth. This ecosystem-building approach not only benefits the parent company but also fosters a collaborative environment for innovation, supporting the development of new technologies and business models.

(12) Influence on venture acquisitions: The role of CVC in shaping exit strategies

Z. Chen and Yu (2024) extended research on the strategic role of CVC investments by examining their influence on venture acquisitions. They proposed that CVC investments can increase the visibility and acquisition likelihood for ventures, a relationship moderated by the strength of ties between corporate investors and ventures. Analyzing data from 221,204 triads of acquirers, CVCs, and ventures in high-tech industries, the research found that stronger ties reduce the likelihood of external acquisitions, highlighting the complex dynamics between CVC investments and corporate strategy.

CVC investments can play a significant role in shaping the exit strategies of startups. By investing in high-potential ventures, corporations can increase their visibility and attractiveness to potential acquirers, facilitating more favorable exit outcomes. Additionally, strong relationships between CVC investors and startups can enhance the likelihood of internal acquisitions, allowing corporations to integrate innovative technologies and capabilities more effectively.

Z. Chen and Yu (2024) demonstrated that the strength and quality of relationships between CVC investors and startups are critical factors in determining exit outcomes. Firms must carefully manage these relationships to ensure that they are aligned with their strategic goals and innovation objectives. This research underscored the importance of relationship management in CVC investments, particularly in the context of strategic exits and acquisitions.

(13) Facilitating disruptive innovation: The role of CVC in driving transformative change

Song et al. (2024) investigated the role of CVC in promoting disruptive innovation, using

case studies of Google and Huawei's investments in AI and 5G. The research identified the periodic characteristics, dual motivations, and approaches of CVC in different stages of disruptive innovation. It found that CVC motives include both external drivers, such as market competition and technological trends, and internal drivers, such as strategic alignment and resource integration.

CVC investments can play a crucial role in driving transformative technological changes that disrupt existing market dynamics. By supporting innovative startups in emerging technologies such as AI and 5G, corporations can gain early access to breakthrough technologies and business models, enhancing their long-term competitive positioning. Song et al. (2024) demonstrated that CVC investments can support disruptive innovation through strategies at the industrial, informational, and policy levels, providing valuable insights into the mechanisms of CVC in facilitating transformative change.

This research highlighted that CVC investments can be a powerful tool for corporations to drive disruptive innovation and maintain competitive advantage in dynamic markets. By supporting innovative startups and integrating new technologies into their core business, corporations can create transformative changes that disrupt existing market dynamics and create new opportunities for growth.

The literature shows that CVC investment strategies vary significantly in their innovation orientations. Classic studies like those by Katila and Ahuja (2002) highlighted the advantages of Lead Investment strategies in fostering innovation, while Keil et al. (2008) underscored the role of Joint Investments in risk management and resource integration. Recent studies have expanded on these insights, emphasizing the importance of flexibility and alignment with corporate strategy in dynamic markets (Jeon & Maula, 2022; Ma, 2020).

While these strategies each have their strengths and weaknesses, existing literature still lacks comprehensive analysis of the long-term relationship between CVC strategies and corporate innovation performance. Future research should further investigate how different investment strategies can be optimized to achieve sustained innovation returns and maintain competitive advantage in rapidly evolving markets. Additionally, future studies should explore the role of emerging technologies, such as artificial intelligence and blockchain, in shaping the future of CVC investments and their impact on corporate innovation.

In conclusion, CVC investments offer a powerful tool for corporations to drive innovation and maintain competitive advantage in dynamic markets. By carefully selecting and managing their investment strategies, corporations can optimize their innovation outcomes and contribute to broader technological and market advancements.

2.1.3 Innovation performance evaluation

Evaluating the innovation performance resulting from Corporate Venture Capital (CVC) investments is essential for understanding their effectiveness in driving technological advancements and maintaining competitive advantage. This section provides an in-depth analysis of how CVC investments impact innovation outcomes, both within the parent companies and the investee firms. The discussion will cover various studies that highlight the importance of strategic alignment, technological fit, and other contextual factors in determining the success of CVC investments.

(1) The role of CVC in technological advancements

Katila and Ahuja (2002) emphasized the significance of evaluating the innovation outcomes of CVC investments by examining their impact on technological advancements in recipient firms. Their research demonstrated that companies backed by CVC often achieve higher innovation outputs, such as increased patenting activities, compared to those backed by Independent Venture Capital (IVC). This suggests that CVC can be a crucial mechanism for promoting technological innovation, especially in industries where rapid innovation is critical.

Technological advancements in CVC-backed firms

CVC investments provide startups with more than just financial resources; they offer strategic guidance, technical expertise, and access to the parent company's extensive network. These additional resources can significantly accelerate the innovation process within the startup. For example, a CVC-backed firm in the biotechnology sector may benefit from the parent company's R&D infrastructure and regulatory expertise, enabling it to bring new drugs to market more quickly. Similarly, a tech startup backed by a large software company may gain access to advanced algorithms and data analytics capabilities, enhancing its product development process.

Industry-specific impact

The impact of CVC investments on innovation is particularly pronounced in technology-intensive industries such as information technology, biotechnology, and advanced manufacturing. In these sectors, rapid technological change is the norm, and the ability to quickly adapt and innovate is crucial for survival. CVC investments can provide startups with the resources and strategic direction needed to stay ahead of the curve. For instance, in the semiconductor industry, CVC investments have been instrumental in driving advancements in chip design and manufacturing processes. By investing in startups with cutting-edge technologies, established companies can integrate these innovations into their existing product

lines, enhancing their overall competitiveness.

Comparative advantage of CVC over IVC

Drover et al. (2017) further explored the strategic role of CVC as a tool for incumbent firms to monitor and engage with emerging technologies, acting as a "window on new technologies." Their study highlighted that CVC investments not only provide financial resources but also enhance corporate learning and technology adoption within the parent company. This dual role of CVC in supporting innovation within investee firms and driving strategic renewal within parent companies underscores its importance in fostering sustainable technological advancements.

CVC investments often have a more significant impact on innovation compared to IVC investments. While IVC firms primarily focus on financial returns, CVC investors have a vested interest in the strategic success of the startups they invest in. This strategic focus allows CVC-backed firms to achieve higher levels of innovation output. For example, a study by Ahuja and Lampert (2001) found that CVC-backed firms in the information technology sector had a higher rate of patenting activities compared to their IVC-backed counterparts. This suggests that CVC investments are particularly effective in driving technological innovation in industries where rapid technological change is critical.

(2) Strategic alignment and innovation performance

Maula et al. (2009) examined the relationship between CVC investments and the innovation performance of parent companies, suggesting that strategic alignment between the CVC unit's objectives and the broader corporate strategy significantly impacts the effectiveness of CVC as an innovation driver. The research showed that when CVC investments are closely aligned with the parent company's strategic goals, they are more likely to yield positive innovation outcomes.

Strategic alignment in CVC investments

Strategic alignment is a critical factor in determining the success of CVC investments. When the objectives of the CVC unit are closely aligned with the broader corporate strategy, the investments are more likely to result in tangible innovation outcomes. For example, a CVC unit focused on acquiring complementary technologies can directly enhance the parent company's innovation capabilities by integrating new technologies into existing product lines. This alignment ensures that the resources invested in CVC activities are effectively utilized to drive innovation within the parent company.

Impact on parent company innovation

The impact of CVC investments on the innovation performance of parent companies is multifaceted. On one hand, CVC investments provide access to new technologies and business

models that can be integrated into the parent company's operations. This integration can lead to enhanced product features, improved operational efficiency, and new market opportunities. On the other hand, CVC investments also facilitate corporate learning and knowledge transfer. By engaging with innovative startups, parent companies can gain insights into emerging technologies and market trends, enabling them to adapt more quickly to changing market conditions.

Case studies and empirical evidence

Empirical studies have consistently shown the importance of strategic alignment in CVC investments. For example, a study by Maula et al. (2009) analyzed the CVC activities of several large corporations and found that those with a high degree of strategic alignment achieved better innovation outcomes compared to those with less alignment. The study highlighted that strategic alignment is not just about selecting the right investment targets but also about effectively integrating the acquired technologies and capabilities into the parent company's operations.

(3) The impact of CVC on different phases of firm growth

Song et al. (2024) investigated the performance implications of CVC investments for entrepreneurial ventures, highlighting differing effects before and after Initial Public Offerings (IPOs). Their findings indicated that while CVC investment positively influences entrepreneurial firms' performance both pre- and post-IPO, the moderating role of R&D intensity differs. Pre-IPO, higher R&D intensity strengthens the positive relationship, whereas post-IPO, the effect reverses. This suggests that the impact of CVC investments is nuanced and varies across different phases of a firm's growth.

Pre-IPO phase: Accelerating innovation

The pre-IPO phase is characterized by high uncertainty and the need for rapid technological development. During this phase, CVC investments can provide startups with the necessary resources to accelerate R&D activities, leading to higher innovation outputs. For example, a CVC-backed startup in the renewable energy sector may use the investment to develop new solar panel technologies or energy storage solutions. The financial support from the CVC investor allows the startup to hire top talent, invest in advanced research equipment, and conduct extensive testing and validation of its technologies.

Post-IPO phase: Balancing innovation and commercialization

Post-IPO, the focus shifts to commercialization and market expansion. In this context, the role of CVC investments may become more complex, as the startup needs to balance innovation with the demands of public markets. While CVC investments can still provide valuable strategic

guidance and resources, the startup may face additional pressures to deliver short-term financial results. This can sometimes lead to a slowdown in innovation activities as the company focuses on optimizing its existing products and services for market adoption.

R&D intensity as a moderating factor

R&D intensity plays a crucial role in mediating the impact of CVC investments on innovation performance. In the pre-IPO phase, higher R&D intensity is positively correlated with innovation outcomes. This is because startups with higher R&D intensity are more likely to develop breakthrough technologies and new business models. However, post-IPO, the effect of R&D intensity reverses. This may be due to the increased focus on commercialization and the need to allocate resources towards market expansion and operational efficiency.

(4) Comparative analysis of CVC and IVC investments

L. Wang et al. (2019) conducted a comparative study of CVC and IVC investments in Chinese listed companies, focusing on their effects on technological innovation and value creation. The research found that CVC-backed firms tend to outperform IVC-backed firms in terms of innovation metrics, largely due to the complementary assets and strategic guidance provided by the parent corporations. This underscores the strategic value of CVC in fostering sustainable innovation.

Comparative advantage of CVC investments

CVC investments have several advantages over IVC investments in driving innovation. First, CVC investors often have a deep understanding of the industry and market dynamics, allowing them to provide strategic guidance and resources that are tailored to the specific needs of the startup. This strategic alignment can significantly enhance the innovation capabilities of the startup. Second, CVC investors can leverage their existing networks and resources to accelerate the commercialization of new technologies. For example, a CVC-backed startup in the automotive industry may gain access to the parent company's manufacturing facilities, distribution channels, and customer base, enabling it to bring its products to market more quickly.

Empirical evidence from China

The study by L. Wang et al. (2019) provides valuable insights into the comparative performance of CVC and IVC investments in the context of Chinese listed companies. The research found that CVC-backed firms achieved higher levels of innovation output, as measured by patent applications and new product launches. This suggests that CVC investments are particularly effective in driving technological innovation in emerging markets like China, where rapid technological change and market dynamics require close alignment between the

parent company and the startup.

(5) The role of geographical proximity and technological fit

Gutmann et al. (2023) explored the varying impacts of CVC investments on firms' innovation performance, noting that geographical proximity and technological fit between the investing and recipient firms play critical roles in the effectiveness of CVC. The research concluded that close strategic and operational alignment enhances the innovation outcomes of CVC investments. This suggests that careful partner selection and strategic alignment are key to maximizing the benefits of CVC.

Geographical proximity and knowledge transfer

Geographical proximity can facilitate knowledge transfer and collaboration between the parent company and the startup. When both entities are located in the same region or industry cluster, they can more easily share resources, technical expertise, and market insights. This proximity can accelerate the innovation process and reduce the time-to-market for new products and services. For example, a CVC-backed startup in Silicon Valley may benefit from the extensive network of engineers, investors, and industry experts in the region, enabling it to develop and commercialize its technologies more quickly.

Technological fit and integration

Technological fit is another crucial factor in determining the success of CVC investments. When the technologies developed by the startup align closely with the parent company's core business, the integration process is smoother and more effective. For example, a CVC investment in a startup developing artificial intelligence algorithms can significantly enhance the parent company's capabilities in data analytics and automation. This alignment ensures that the innovations generated by the startup can be quickly absorbed and utilized by the parent company, leading to enhanced innovation performance.

Empirical evidence and case studies

Empirical studies have consistently shown the importance of geographical proximity and technological fit in CVC investments. For example, a study by Gutmann et al. (2023) analyzed the CVC activities of several large corporations and found that investments with high geographical proximity and technological fit achieved better innovation outcomes compared to those with lower alignment. The study highlighted that careful partner selection and strategic alignment are key to maximizing the benefits of CVC investments.

(6) Long-term impacts and future research directions

The literature on CVC innovation performance evaluation reveals a complex landscape where the success of CVC investments is influenced by factors such as strategic alignment,

technological fit, and R&D intensity. Classic studies, such as those by Katila and Ahuja (2002) and Maula et al. (2009), emphasize the importance of aligning CVC activities with the broader corporate strategy to maximize innovation outcomes. Recent research has further explored how factors like investment timing, strategic alignment, and the interaction between CVC and R&D intensity influence the performance of both parent and investee firms.

Methodological approaches

Future research could also benefit from adopting a mixed-methods approach, combining quantitative analysis with qualitative case studies. This would allow researchers to gain a deeper understanding of the mechanisms through which CVC investments drive innovation and the contextual factors that influence their success. For example, a longitudinal study tracking the innovation performance of CVC-backed startups over several years could provide valuable insights into the long-term impact of these investments. Additionally, qualitative case studies of successful CVC investments could highlight the key factors that contribute to their success.

Innovation performance evaluation is a critical aspect of understanding the effectiveness of CVC investments. The studies discussed in this section highlight the importance of strategic alignment, technological fit, and R&D intensity in determining the success of CVC as an innovation driver. While CVC investments have been shown to enhance innovation outcomes in various contexts, the long-term impacts and the role of contextual factors remain areas for further exploration. By developing a more comprehensive evaluation framework, future research can better predict and enhance the innovation performance of CVC investments, providing valuable insights for both practitioners and policymakers.

2.1.4 Research model

The formulation of hypotheses in CVC research is deeply rooted in the interplay between strategic intent and innovation outcomes. Prior studies suggest that strategic CVC investments, characterized by technology complementarity and long-term strategic alignment, are more likely to enhance parent firms' innovation performance compared to financial-oriented CVC activities (Dushnitsky & Lenox, 2006). This distinction stems from the knowledge absorption mechanisms inherent in strategic CVC, where parent companies actively integrate portfolio firms' technologies through structured learning routines and resource redeployment (Wadhwa et al., 2016).

Our hypotheses further differentiate between investment strategies based on market contexts. Emerging research indicates that lead investor positions in CVC syndicates amplify innovation spillovers through governance rights and technology roadmap alignment (Hsu et al.,

2014), particularly in high-tech industries where rapid iteration cycles demand closer operational integration. Conversely, joint investment strategies may prove more effective in traditional industries where risk-sharing and complementary market access dominate strategic objectives (Maula et al., 2009).

The configurational perspective, informed by organizational ambidexterity theory, posits that optimal innovation outcomes emerge from specific combinations of CVC characteristics. For instance, the simultaneous pursuit of exploratory investments in adjacent technologies and exploitative investments in core domains creates synergistic effects on patent output (Benson et al., 2010). This theoretical foundation supports our hypothesis that non-linear interactions between investment strategy variables (e.g., stage focus, geographic scope, and technological proximity) collectively determine innovation performance rather than operating through isolated main effects.

Recent empirical work on Chinese CVC provides critical context for hypothesis refinement. Studies demonstrate that state-owned enterprises achieve superior innovation returns from CVC when combining government innovation mandates with market-driven investment criteria, suggesting unique configuration patterns in transitional economies. These findings necessitate hypotheses that account for institutional factors in moderating the CVC-innovation relationship, particularly regarding policy-driven vs. market-driven investment motivations.

Based on the theory of technology alliance and resource dependence, this thesis analyzes the role of CVC fund in the innovation and upgrading performance of state-owned enterprises. Accordingly, this thesis designs a theoretical analysis model, as shown in the following Figure 2.1.

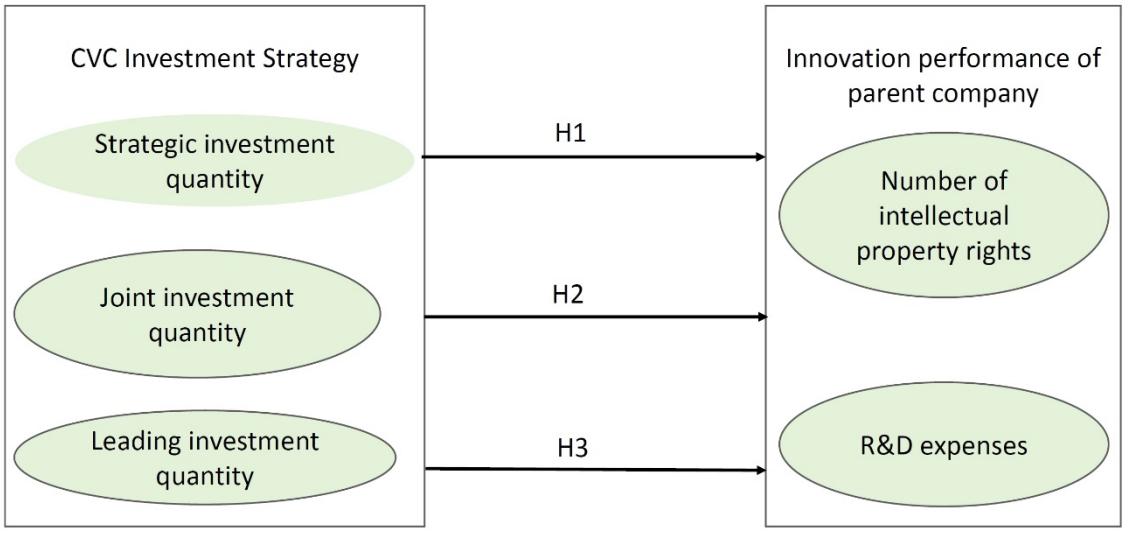

Figure 2.1 Thesis research model

2.2 Overview of CVC related theoretical foundations

2.2.1 CVC related theories

Corporate Venture Capital (CVC) has become a significant mechanism for companies to drive innovation and maintain competitive advantage. Understanding the theoretical foundations underlying CVC investments is crucial for comprehending their impact on innovation performance. This section explores several key theories that provide insights into the role of CVC in fostering innovation within parent companies and the broader ecosystem.

(1) Agency theory: Aligning interests and reducing costs

Meckling and Jensen (1976) introduced the Agency Theory, which serves as a foundational perspective in CVC research. This theory explains how CVC acts as a bridge between the parent company and startups, reducing information asymmetry and providing oversight to foster innovation performance. Agency Theory suggests that CVC investments can enhance overall innovation efficiency by structuring equity and governance to align interests and reduce agency costs (Meckling & Jensen, 1976).

Reducing information asymmetry

In the context of CVC, information asymmetry refers to the difference in knowledge and information between the parent company and the startup. This asymmetry can lead to inefficiencies and suboptimal decision-making. CVC investments can mitigate this by providing the parent company with direct access to the startup's operations, technologies, and market insights. This transparency allows the parent company to make more informed decisions and provide strategic guidance to the startup, ultimately enhancing innovation outcomes.

Aligning interests through governance

Agency Theory also emphasizes the importance of governance structures in aligning the interests of the parent company and the startup. By participating in the startup's governance, the parent company can ensure that the startup's goals are aligned with its own strategic objectives. This alignment can be achieved through equity structures, board representation, and performance-based incentives. Effective governance mechanisms can reduce agency costs, which are the costs associated with monitoring and aligning the interests of different parties.

Empirical evidence and case studies

Empirical studies have consistently shown that CVC investments with strong governance structures achieve better innovation outcomes. For example, a study by Meckling and Jensen (1976) analyzed the impact of CVC investments on innovation performance and found that

companies with well-aligned governance structures had higher levels of innovation output. This suggests that the principles of Agency Theory are effective in practice, particularly in reducing information asymmetry and aligning interests.

(2) Open innovation theory: Leveraging external resources

Chesbrough (2002) developed the Open Innovation Theory, highlighting how companies use external investments, such as CVC, to supplement and expand their internal R&D capabilities. Within this framework, CVC is viewed as a critical method for accessing external knowledge and technologies, helping parent companies achieve technological breakthroughs and market innovations, thus strengthening their position in the innovation ecosystem (Chesbrough, 2002).

Accessing external knowledge

Open Innovation Theory emphasizes the importance of leveraging external resources to drive internal innovation. CVC investments provide parent companies with access to new technologies, ideas, and business models that may not be available internally. By investing in startups, parent companies can tap into emerging technologies and innovative practices, enhancing their own R&D capabilities. This external knowledge can lead to technological breakthroughs and new product development, ultimately improving the parent company's innovation performance.

Enhancing market innovations

CVC investments also play a crucial role in driving market innovations. By supporting startups with strategic relevance, parent companies can create new market opportunities and expand their customer base. For example, a CVC investment in a fintech startup can help a traditional bank develop new digital banking solutions, attracting younger and more tech-savvy customers. This market-driven innovation can enhance the parent company's competitive position and drive long-term growth.

Empirical evidence and case studies

Empirical studies have demonstrated the effectiveness of Open Innovation Theory in the context of CVC investments. For example, a study by Chesbrough (2002) analyzed the impact of CVC investments on innovation performance and found that companies with a strong focus on open innovation achieved higher levels of innovation output. This suggests that leveraging external resources through CVC investments can significantly enhance a company's innovation capabilities.

(3) Dynamic capabilities theory: Adapting to changing environments

Teece et al. (2009) proposed the Dynamic Capabilities Theory, which elaborates on the

strategic value of CVC. The theory posits that firms must continuously adapt their resources and capabilities to respond to rapidly changing environments. CVC is seen as a tool that enhances a firm's dynamic capabilities by acquiring emerging technologies and market insights, supporting sustained innovation and strategic adjustment (Teece et al., 2009).

Adapting resources and capabilities

Dynamic Capabilities Theory emphasizes the importance of continuous adaptation in a rapidly changing business environment. Firms must be able to sense and seize new opportunities, reconfigure their resources, and develop new capabilities to maintain competitive advantage. CVC investments provide a strategic tool for acquiring emerging technologies and market insights, enabling firms to adapt more quickly to changing conditions.

Supporting sustained innovation

CVC investments also support sustained innovation by providing startups with the resources and strategic guidance needed to develop new technologies and business models. This support can lead to a continuous flow of innovative ideas and products, enhancing the parent company's long-term innovation performance. For example, a CVC investment in a biotech startup can help the parent company stay at the forefront of medical advancements, driving sustained innovation in the healthcare sector.

Empirical evidence and case studies

Empirical studies have consistently shown the importance of dynamic capabilities in driving innovation performance. For example, a study by Teece et al. (2009) analyzed the impact of dynamic capabilities on innovation performance and found that firms with strong dynamic capabilities achieved higher levels of innovation output. This suggests that CVC investments can significantly enhance a firm's ability to adapt and innovate in a rapidly changing environment.

(4) Diffusion of innovation theory: Accelerating technology adoption

Rosenkopf and Nerkar (2001) utilized Diffusion of Innovation Theory to explain how CVC facilitates the spread and application of new technologies. Their research shows that CVC investments not only accelerate the technology development process in startups but also drive broader adoption and marketization through synergistic effects with the parent company, resulting in wider innovation diffusion (Rosenkopf & Nerkar, 2001).

Accelerating technology development

Diffusion of Innovation Theory highlights the importance of accelerating the development and adoption of new technologies. CVC investments provide startups with the resources needed to develop and commercialize their technologies more quickly. This acceleration can lead to

faster market entry and greater commercial success, enhancing the overall innovation performance of the startup.

Driving broader adoption

CVC investments also drive broader adoption of new technologies through synergistic effects with the parent company. By integrating the startup's technology into the parent company's operations, CVC investments can create a ripple effect, leading to wider adoption and marketization of the technology. For example, a CVC investment in a renewable energy startup can help the parent company develop new energy solutions, driving broader adoption of renewable energy technologies in the market.

Empirical evidence and case studies

Empirical studies have consistently shown the importance of diffusion in driving innovation performance. For example, a study by Rosenkopf and Nerkar (2001) analyzed the impact of CVC investments on innovation diffusion and found that companies with strong diffusion capabilities achieved higher levels of innovation output. This suggests that CVC investments can significantly enhance the spread and adoption of new technologies in the market.

(5) Configuration theory: Balancing innovation strategies

Henderson (1993) introduced Configuration Theory, which explains the role of CVC in integrating diverse innovation strategies. This theory suggests that through careful management of investment portfolios, CVC can achieve strategic resource allocation, balancing short-term financial returns with long-term innovation goals, thereby optimizing overall innovation performance for the parent company.

Managing investment portfolios

Configuration Theory emphasizes the importance of managing investment portfolios to achieve strategic resource allocation. By carefully selecting and managing their investments, parent companies can balance short-term financial returns with long-term innovation goals. This balance is crucial for optimizing overall innovation performance and maintaining competitive advantage.

Balancing financial and innovation goals

CVC investments also play a crucial role in balancing financial and innovation goals. By investing in startups with strategic relevance, parent companies can achieve both financial returns and technological advancements. This balance is essential for maintaining long-term growth and innovation performance. For example, a CVC investment in a tech startup can provide financial returns while also enhancing the parent company's technological capabilities.

Empirical evidence and case studies

Empirical studies have consistently shown the importance of configuration in driving innovation performance. For example, a study by Henderson and Clark (1990) analyzed the impact of configuration on innovation performance and found that companies with well-managed investment portfolios achieved higher levels of innovation output. This suggests that careful management of CVC investments can significantly enhance a company's innovation capabilities.

(6) Absorptive capacity: Enhancing innovation performance

De Groote and Backmann (2020) emphasized the role of CVC in enhancing a firm's absorptive capacity, which is crucial for driving innovation performance. They argued that increased absorptive capacity allows parent companies to more effectively integrate and leverage external innovations, helping them maintain a technological edge in competitive markets (De Groote & Backmann, 2020).

Enhancing absorptive capacity

Absorptive capacity refers to a firm's ability to recognize, assimilate, and utilize external knowledge and innovations. CVC investments can enhance absorptive capacity by providing startups with the resources and strategic guidance needed to develop and commercialize their technologies. This enhanced capacity allows parent companies to more effectively integrate and leverage external innovations, driving their own innovation performance.

Maintaining technological edge

Enhanced absorptive capacity is crucial for maintaining a technological edge in competitive markets. By investing in startups with cutting-edge technologies, parent companies can stay ahead of market trends and develop new products and services more quickly. This technological edge can lead to greater market share and long-term growth.

Empirical evidence and case studies

Empirical studies have consistently shown the importance of absorptive capacity in driving innovation performance. For example, a study by De Groote and Backmann (2020) analyzed the impact of absorptive capacity on innovation performance and found that companies with high absorptive capacity achieved higher levels of innovation output. This suggests that CVC investments can significantly enhance a company's ability to integrate and leverage external innovations.

(7) Financialization theory: Balancing financial and strategic goals

Huang and Madhavan (2021) explored Financialization Theory, noting that CVC investments are increasingly driven not only by strategic goals but also by financial returns.

Their research found that the trend towards financialization may sometimes undermine the innovation-promoting effects of CVC, especially when short-term financial objectives are prioritized (Huang & Madhavan, 2021).

Increasing financialization

Financialization Theory highlights the growing importance of financial returns in CVC investments. While traditional CVC investments were primarily driven by strategic goals, modern CVC investments increasingly focus on financial returns. This shift can lead to a greater emphasis on short-term financial objectives, potentially undermining the innovation-promoting effects of CVC.

Balancing financial and strategic goals

Balancing financial and strategic goals is crucial for maximizing the innovation performance of CVC investments. While financial returns are important, strategic goals such as technological advancements and market innovations should not be overlooked. This balance is essential for maintaining long-term growth and innovation performance. For example, a CVC investment in a biotech startup can provide financial returns while also enhancing the parent company's technological capabilities.

Empirical evidence and case studies

Empirical studies have consistently shown the importance of balancing financial and strategic goals in CVC investments. For example, a study by Huang and Madhavan (2021) analyzed the impact of financialization on innovation performance and found that companies with a balanced approach achieved higher levels of innovation output. This suggests that CVC investments should focus on both financial and strategic goals to maximize their innovation performance.

(8) Multifaceted role of CVC in innovation performance

Andonov et al. (2023) analyzed the multifaceted role of CVC in innovation performance, highlighting that CVC serves as both a means of acquiring external technologies and a vehicle for enhancing the market performance of investee companies through capital and strategic guidance. They noted that the success of CVC lies in effectively balancing strategic and financial goals (Andonov et al., 2023).

Acquiring external technologies

CVC investments provide a strategic tool for acquiring external technologies. By investing in startups with cutting-edge technologies, parent companies can enhance their own technological capabilities and drive innovation. This acquisition of external technologies is crucial for maintaining a competitive edge in rapidly changing markets.

Enhancing market performance

CVC investments also play a crucial role in enhancing the market performance of investee companies. By providing capital and strategic guidance, CVC investors can help startups develop and commercialize their technologies more effectively. This enhanced market performance can lead to greater market share and long-term growth for both the startup and the parent company.

Empirical evidence and case studies

Empirical studies have consistently shown the importance of balancing strategic and financial goals in CVC investments. For example, a study by Andonov et al. (2023) analyzed the impact of CVC investments on innovation performance and found that companies with a balanced approach achieved higher levels of innovation output. This suggests that CVC investments should focus on both acquiring external technologies and enhancing market performance to maximize their innovation performance.

The core theories related to CVC include Agency Theory, Open Innovation Theory, Dynamic Capabilities Theory, Diffusion of Innovation Theory, Configuration Theory, and Financialization Theory. These theories offer diverse perspectives on how CVC influences the innovation performance of parent companies. Agency and Open Innovation theories emphasize CVC’s role in reducing information asymmetry and leveraging external resources, while Dynamic Capabilities and Configuration theories focus on how CVC enhances a firm's adaptability and strategic alignment. Recent studies, such as those by Huang and Madhavan (2021) and Andonov et al. (2023), explore the balance between financial and strategic objectives in CVC, revealing how the increasing financialization of CVC can impact its innovation outcomes.

Although existing theories provide perspectives for understanding the impact of CVC on innovation performance (such as agency theory to address governance structure issues and absorptive capacity theory to explain knowledge internalization mechanisms), this article focuses on selecting Diffusion of Innovation Theory and Configuration Theory as the core supporting frameworks, mainly based on triple compatibility:

(1) Problem oriented fit: The innovation diffusion theory directly responds to the structural contradiction of "counter trend growth of CVC in the AI industry" in the research dilemma, and its technology dissemination mechanism can explain how local innovation breakthroughs accelerate diffusion through CVC; The analysis of strategic combinations by configuration theory (Henderson, 1993) can precisely solve the "state-owned enterprise benchmarking confusion" and provide a framework support for the design of differentiated investment

strategies.

(2) Methodological adaptability: The innovation diffusion theory emphasizes the interaction of multiple factors (Rogers & Cartano, 1962), which is consistent with the logic of the fsQCA analysis of multiple factor configuration effects in this article; Configuration theory focuses on the "exploration development" strategy balance (Hill & Birkinshaw, 2008), which can effectively connect the single strategy effects (such as weak lead stability) discovered by regression analysis with the necessity of combination strategies revealed by fsQCA.

(3) Practical Explanation Depth: The two jointly cover the entire CVC value creation chain - Innovation Diffusion Theory elucidates the migration path of technology from startups to parent companies (Rosenkopf & Nerkar, 2001), while Configuration Theory optimizes strategy combination design (Keil et al., 2008), which has integrated explanatory power for solving the "input-output evaluation deficiency". Sections 2.2.2 and 2.2.3 will further deconstruct these two theories to construct a two wheel driven analysis framework of "technology diffusion strategy configuration" that runs through the entire text.

2.2.2 Innovation diffusion theory of CVC

The diffusion of innovations is a critical process that determines how new ideas and technologies are adopted and integrated within industries and markets. This section explores the application of the Innovation Diffusion Theory to Corporate Venture Capital (CVC) investments, highlighting how CVC can accelerate the adoption and spread of innovations, thereby influencing the innovation performance of both parent companies and the broader market.

(1) Foundational concepts of innovation diffusion theory

Rogers and Cartano (1962) introduced the Diffusion of Innovations Theory, which has become foundational in understanding how new ideas and technologies spread within social systems. Rogers outlined key elements such as the innovation itself, communication channels, time, and social systems. In the context of CVC, this theory explains how innovations funded by CVC investments are adopted and diffused within industries, facilitating broader market acceptance and integration of new technologies (Rogers & Cartano, 1962).

(2) Key elements of diffusion

Innovation: The nature and characteristics of the innovation itself play a crucial role in its diffusion. Innovations that are perceived as superior, compatible with existing practices, and easy to use are more likely to be adopted quickly.

Communication Channels: The pathways through which information about the innovation

is communicated are essential. In CVC, these channels may include formal reports, informal networks, and direct interactions between the parent company and the startup.

Time: The diffusion process unfolds over time, and the rate of adoption can vary significantly. CVC investments can accelerate this timeline by providing startups with the resources needed to develop and market their innovations more quickly.

Social Systems: The social and organizational context in which the innovation is introduced affects its diffusion. In the case of CVC, the parent company's culture, structure, and relationships with other firms can influence how quickly and effectively the innovation is adopted.

(3) Application of diffusion theory in CVC

Rosenkopf and Nerkar (2001) applied Diffusion of Innovations Theory to corporate settings, highlighting the role of CVC in bridging gaps between internal and external innovations. They argued that CVC investments enable firms to extend their innovation boundaries by integrating external ideas and technologies, thereby accelerating the diffusion process within the parent company and across the market.

Bridging internal and external innovations

CVC investments act as a bridge between a firm's internal R&D efforts and external sources of innovation. By investing in startups, corporations gain access to cutting-edge technologies and innovative ideas that may not be available internally. This integration of external innovations can lead to faster technological advancements and market adoption.

Accelerating diffusion within the parent company

Once integrated, these external innovations can spread quickly within the parent company, influencing its product development, operational processes, and strategic direction. CVC investments can also facilitate the diffusion of innovations across the market by providing startups with the resources and strategic guidance needed to scale their technologies.

(4) The importance of speed and extent of diffusion

Geroski (2000) discussed how innovation diffusion is critical for market competition and technological leadership. His work emphasized that the speed and extent of diffusion determine the competitive advantage gained from CVC investments. Firms that can effectively manage and accelerate diffusion through CVC are better positioned to leverage first-mover advantages and disrupt market norms.

Competitive advantage through diffusion

The speed at which an innovation is adopted and diffused can provide a significant competitive advantage. Firms that can quickly integrate and commercialize new technologies

are more likely to gain market share and establish leadership positions. CVC investments can play a crucial role in accelerating this process by providing startups with the necessary resources and strategic support.

Disrupting market norms

Effective diffusion can also disrupt existing market norms and create new opportunities for growth. By supporting startups with innovative technologies, corporations can challenge traditional business models and drive industry transformation. This disruptive potential is a key driver of CVC investments.

Enhancing absorptive capacity through CVC

De Groote and Backmann (2020) focused on how CVC enhances firms' absorptive capacities, facilitating the diffusion of innovations into core operations. They highlighted that CVC not only acts as a financial supporter but also as a strategic enabler, enhancing the speed and scope of innovation adoption, which is crucial for maintaining technological leadership.

Absorptive capacity

Absorptive capacity refers to a firm's ability to recognize, assimilate, and utilize external knowledge and innovations. CVC investments can enhance this capacity by providing startups with the resources and strategic guidance needed to develop and commercialize their technologies. This enhanced capacity allows parent companies to more effectively integrate and leverage external innovations, driving their own innovation performance.

Strategic enabler

CVC investments not only provide financial support but also act as strategic enablers. By offering strategic guidance and access to the parent company's resources, CVC can accelerate the diffusion of innovations into core operations. This strategic role is crucial for maintaining technological leadership in competitive markets.

(5) Financial implications of innovation diffusion

Huang and Madhavan (2021) examined the financial implications of innovation diffusion facilitated by CVC. Their research found that while CVC investments drive innovation diffusion, the extent of financialization within the CVC unit can influence the balance between strategic innovation goals and financial returns, potentially impacting long-term innovation outcomes.

Balancing strategic and financial goals

The financialization of CVC investments can influence the balance between strategic innovation goals and financial returns. While financial returns are important, an overemphasis on short-term financial objectives can undermine the innovation-promoting effects of CVC.

Effective CVC strategies must balance these goals to achieve long-term innovation success.

Long-term innovation outcomes

The long-term impact of CVC-driven innovation diffusion on a firm's competitive position is a critical area for future research. Understanding how financialization affects the diffusion process and the resulting innovation outcomes can provide valuable insights for both practitioners and policymakers.

Application in digital platforms

Lee et al. (2021) explored the application of Diffusion of Innovations Theory in the context of digital platforms, such as mobile applications, supported by CVC investments. They found that successful diffusion requires not only technological readiness but also strategic alignment with market needs and user expectations, highlighting the role of CVC in navigating these complexities.

Technological readiness

For innovations to be successfully diffused, they must be technologically ready and capable of being integrated into existing systems. CVC investments can provide startups with the resources needed to achieve this readiness, facilitating faster market adoption.

Strategic alignment

In addition to technological readiness, successful diffusion requires strategic alignment with market needs and user expectations. CVC investments can help startups navigate these complexities by providing strategic guidance and access to the parent company's market insights.

2.2.3 Configuration theory of CVC

The strategic and organizational configurations of Corporate Venture Capital (CVC) investments play a crucial role in shaping the innovation performance of parent companies. Configuration theory provides a framework for understanding how companies can optimize their innovation performance through diversified strategy combinations in CVC. This section explores the application of configuration theory in CVC, emphasizing the impact of strategic and organizational configurations on corporate innovation performance.

(1) Strategic and organizational configurations

Hill and Birkinshaw (2008) explored the application of configuration theory in CVC, emphasizing the impact of strategic and organizational configurations on corporate innovation performance. Their research found that different CVC strategic configurations, such as balancing exploration and exploitation, can significantly affect the performance and survival of

CVC units. Proper strategic configuration allows CVC to achieve sustained innovation in dynamic environments.

(2) Balancing exploration and exploitation

One of the key insights from Hill and Birkinshaw's (2008) research is the importance of balancing exploration and exploitation in CVC strategies. Exploration refers to the search for new opportunities and technologies, while exploitation involves leveraging existing capabilities and resources. A well-balanced configuration can help CVC units navigate the complexities of dynamic markets, ensuring that they can both discover new innovations and effectively integrate them into the parent company's operations.

(3) Organizational flexibility and innovation advantages

Gaba and Meyer (2008) examined how CVC integrates internal and external innovation resources by crossing organizational boundaries. Configuration theory was used to explain the impact of CVC under different organizational setups, particularly in the information technology sector. They noted that CVC enables firms to achieve organizational flexibility and gain innovation advantages in highly competitive markets.

Organizational flexibility is crucial for firms operating in rapidly changing environments. By integrating internal and external resources through CVC, companies can adapt more quickly to market changes and technological advancements. This flexibility allows firms to leverage the strengths of both their internal R&D capabilities and the innovative ideas from external startups, creating a more robust innovation ecosystem.

Diversified strategy combinations

Keil et al. (2008) highlighted the “disembodied experimentation” strategy in CVC, allowing firms to explore new technologies through small-scale innovation trials. Configuration theory here explains how diversified CVC strategy combinations drive capability development and help firms maintain competitiveness in technologically uncertain environments.

Small-scale innovation trials

The concept of “disembodied experimentation” involves testing new technologies and business models on a small scale before committing significant resources. This approach allows firms to learn from failures and successes without incurring substantial costs. By experimenting with different strategies and technologies, companies can develop new capabilities and identify the most promising opportunities for further investment.

Driving capability development

Diversified CVC strategy combinations are essential for driving capability development within firms. By investing in a variety of startups across different sectors and stages of

development, companies can build a diverse portfolio of technologies and business models. This diversity helps firms stay ahead of technological trends and market changes, ensuring that they remain competitive in the long term.

Application in digital platforms

Lee et al. (2021) applied configuration theory to CVC in digital platforms, particularly in facilitating value creation in mobile applications and other digital innovations. Their research found that CVC accelerates innovation diffusion and enhances market responsiveness in digital transformation by integrating diverse technological and market resources (Lee et al., 2021).

Accelerating innovation diffusion

In the context of digital platforms, CVC investments can significantly accelerate the diffusion of innovations. By supporting startups with cutting-edge technologies, CVC can help these companies develop and commercialize their products more quickly. This accelerated diffusion can lead to faster market adoption and greater commercial success, enhancing the overall innovation performance of the ecosystem.

Enhancing market responsiveness

CVC investments also enhance market responsiveness in digital transformation. By integrating diverse technological and market resources, companies can better understand and meet the needs of their customers. This responsiveness is crucial in the fast-paced digital environment, where user expectations and market demands can change rapidly.

Enhancing innovation performance through absorptive capacity

De Groote and Backmann (2020) investigated how CVC enhances innovation performance by increasing a firm's absorptive capacity. Configuration theory was employed to explain how various CVC strategy combinations optimize resource allocation, allowing firms to maintain technological leadership in rapidly changing markets.

Increasing absorptive capacity

Absorptive capacity refers to a firm's ability to recognize, assimilate, and utilize external knowledge and innovations. CVC investments can enhance this capacity by providing startups with the resources and strategic guidance needed to develop and commercialize their technologies. This enhanced capacity allows parent companies to more effectively integrate and leverage external innovations, driving their own innovation performance.

Optimizing resource allocation

Effective resource allocation is crucial for maintaining technological leadership in competitive markets. By employing various CVC strategy combinations, firms can optimize their allocation of resources, ensuring that they are investing in the most promising

opportunities. This optimization helps firms stay ahead of technological trends and market changes, ensuring long-term success.

(4) Financialization and strategic innovation goals

Huang and Madhavan (2021) explored the trend of financialization in CVC investments, highlighting the rising importance of financial motives. Configuration theory was used to analyze the balance between strategic innovation goals and financial returns, especially when firms seek short-term financial gains through CVC.

Rising importance of financial motives

The financialization of CVC investments reflects a growing emphasis on financial returns alongside strategic objectives. While financial motives can drive short-term gains, they may also conflict with long-term strategic innovation goals. Balancing these objectives is crucial for maximizing the overall impact of CVC investments.

Balancing strategic and financial goals

Effective CVC strategies must balance strategic innovation goals with financial returns. By employing configuration theory, firms can identify the optimal mix of strategies that align with their long-term objectives. This balance ensures that CVC investments not only generate financial returns but also drive sustainable innovation and market leadership.

Configuration theory provides a comprehensive framework for understanding how companies can optimize their innovation performance through diversified strategy combinations in CVC. Early classic studies by Hill and Birkinshaw (2008) and Gaba and Meyer (2008) explored the relationship between CVC strategic configurations and innovation, highlighting the importance of flexibility and diversity in configurations to navigate uncertain environments. Recent studies have expanded to include the application of CVC in digital platforms and financial contexts, revealing how different strategy combinations impact innovation and market responsiveness (Huang & Madhavan, 2021; Lee et al., 2021).

Despite extensive research, gaps remain in understanding the long-term effects of CVC strategy configurations across different industry contexts and the multi-level impacts. Future research should focus on developing systematic methods to evaluate the configuration effects of CVC under complex market conditions and explore how optimized strategy combinations can enhance a firm's sustained innovation capabilities. By providing a more comprehensive evaluation framework, future research can better predict and enhance the innovation performance of CVC investments, providing valuable insights for both practitioners and policymakers.

2.3 Application and challenges of CVC in listed companies

2.3.1 Current status and trends of global CVC development

Corporate Venture Capital (CVC) has evolved significantly over the past few decades, reflecting changes in global economic dynamics, technological advancements, and strategic corporate priorities. Understanding the current status and trends of CVC development is crucial for evaluating its impact on innovation performance and identifying future research directions. This section provides an overview of the global CVC landscape, highlighting key trends and regional differences.

(1) Early growth and strategic use of CVC

Gompers and Lerner (2000) analyzed the early growth of CVC globally, highlighting the strategic use of CVC to access emerging technologies and new markets. Their research identified the US and Europe as key regions where CVC helped firms remain competitive through strategic investments, especially in the tech sector, aligning CVC activities with broader corporate goals. This foundational work emphasized the importance of CVC in driving innovation and maintaining a competitive edge in rapidly evolving markets.

(2) Shift towards open innovation

Chesbrough (2002) emphasized the role of CVC in fostering open innovation. By examining various CVC units in North America and Europe, Chesbrough (2002) found that companies increasingly used CVC as a strategic tool to access external innovations. He noted a shift from purely financial motives to more strategic objectives, as firms sought synergies with their core businesses. This shift towards open innovation has become a hallmark of modern CVC practices, enabling firms to leverage external ideas and technologies to drive internal innovation.

(3) Expansion into emerging markets

Richter et al. (2015) reported that Asia, particularly China and Japan, emerged as strong players in the global CVC landscape. The research observed an increase in CVC activities focusing on strategic partnerships, technology integration, and local market expansion, with significant investments in e-commerce, fintech, and healthcare sectors. This diversification of global CVC activities beyond traditional Western markets represented a significant shift in the strategic focus of CVC investments.

(4) Recent trends and challenges

El-amine and Mohammed (2023) reported a significant decline in global CVC activity since

2021, with deal counts and new CVC formations reaching multi-year lows. Despite this, the US maintained a strong lead, particularly in Silicon Valley, where a majority of CVC-backed funding continued. Conversely, CVC funding in Asia and Europe saw notable decreases, reflecting regional economic challenges and shifts in investment priorities. This downturn in CVC activity has been influenced by a combination of macroeconomic factors, including inflation pressures, elevated interest rates, and economic challenges in key markets such as China.

(5) Regional differences and resilience

Gutmann et al. (2023) noted that while the CVC market faced challenges globally, the US continued to show resilience, with investment activities focusing on emerging technologies like AI and sustainability. In contrast, Asia's CVC market, despite being robust in earlier years, faced downturns due to geopolitical tensions and regulatory changes, affecting the overall growth trajectory of CVC investments in the region. This highlights the importance of regional economic and political contexts in shaping CVC trends and outcomes.

(6) Future trends and opportunities

Despite recent challenges, future trends in CVC point towards continued expansion into emerging technologies such as AI, biotechnology, and sustainable energy. These sectors offer significant opportunities for innovation and disruption, attracting substantial interest from CVC investors. Additionally, strategic partnerships and collaborations between corporations and startups are expected to become more prevalent, driven by mutual benefits and synergies. Impact investing and corporate social responsibility (CSR) are also emerging as key themes, with CVC investors prioritizing startups that have a positive social or environmental impact.

(7) Long-term impacts and research gaps

The current research gaps include understanding the long-term impacts of recent downturns on global CVC strategies and the potential for recovery in key markets such as Asia. Future research should also explore how global CVC can adapt to evolving market conditions and maintain its strategic relevance amidst changing economic landscapes. Additionally, there is a need for more in-depth studies on the mechanisms through which CVC influences innovation in developing countries, where economic and institutional contexts may differ significantly from those in developed regions.

Global CVC has evolved through various phases, marked by regional differences in growth patterns and strategic focus. Early studies, such as those by Gompers and Lerner (2000) and Chesbrough (2002), highlighted the foundational role of CVC in accessing new technologies and fostering innovation, primarily in the US and Europe. Recent trends indicate a shift towards

more strategic and diversified CVC activities, with Asia emerging as a significant player until recent declines. Understanding these trends and their implications is essential for both practitioners and policymakers aiming to leverage CVC for sustainable innovation and growth.

2.3.2 Development status of CVC in China

Corporate Venture Capital (CVC) in China has experienced significant growth and transformation over the past two decades, driven by government policy support, economic development, and the active participation of both state-owned and private enterprises. Understanding the current status and trends of CVC in China is crucial for evaluating its impact on innovation performance and identifying future research directions. This section provides an in-depth analysis of the development of CVC in China, highlighting key trends, policy influences, and market dynamics.

(1) Early development and policy support

Hall and Lerner (2010) studied the early development of CVC in China, finding that Chinese CVC rapidly grew under government policy support, particularly in the information technology and manufacturing sectors. The research highlighted the significant role of state-owned enterprises (SOEs) in driving CVC activities, using investments in startups to acquire new technologies and expand market share. This early phase of development was characterized by strong government backing and strategic investments aimed at fostering technological innovation and market competitiveness.

(2) The golden decade of Chinese CVC

Szalavetz and Sauvage (2024) reported that since 2010, China’s CVC has experienced a "golden decade," with tech giants like Tencent, Alibaba, and Baidu being major players in the market. These companies used CVC investments to foster domestic innovation and expand their global footprint. During this period, CVC activities in China were marked by significant investment volumes, strategic acquisitions, and the emergence of new business models. However, in recent years, due to regulatory pressures and market uncertainties, some major tech companies have begun scaling back their CVC investments.

(3) Differences between state-owned and private CVCs

Gao et al. (2023) compared the differences between state-owned and privately-owned CVCs in nurturing innovation in China. The research found that state-owned CVCs, constrained by stronger policy and administrative restrictions, provide weaker technical support and lower tolerance for failure compared to privately-owned CVCs. This leads to less innovative outcomes in their portfolio companies. In contrast, private CVCs tend to focus on market-driven

innovation, which often results in more agile and risk-tolerant investment strategies.

(4) Rapid growth and market maturity

Bargon et al. (2020) emphasized the rapid growth of China's CVC market, particularly in the technology and consumer goods sectors. The report noted that policy support and the active participation of SOEs have made CVC a crucial component of China's innovation ecosystem. SOEs have leveraged CVC to gain strategic resources that help them maintain competitiveness in global markets. This period of rapid growth has also seen the maturation of the CVC market, with more sophisticated investment strategies and a focus on high-tech and strategic industries.

(5) Unique position of state-owned CVCs

Jia et al. (2012) explored the unique position of state-owned CVCs in the Chinese market, highlighting their innovation roles under policy guidance. The research found that state-owned CVCs play an irreplaceable role in supporting innovation in strategic emerging industries, particularly in green energy and high-end manufacturing. These CVCs often align their investment strategies with national development goals, focusing on areas such as sustainable technologies and advanced manufacturing.

(6) Diversification of CVC market

Zhang (2021) examined the diversity of the CVC market in China and found that as the market matures, the roles of private and state-owned CVCs have become more distinct. Private CVCs tend to focus on market-driven innovation, while state-owned CVCs are more aligned with the development of nationally strategic industries. This diversification has led to a more complex and dynamic CVC landscape in China, with different types of CVCs pursuing different strategic objectives.

(7) Recent trends and challenges

Recent trends in China's CVC market reflect both growth and challenges. According to the 2024 CVC Barometer, the Chinese CVC market has seen a slowdown in investment activity, with many CVC institutions reducing their investment pace in 2023. However, the overall market sentiment is gradually improving, and CVCs are still accumulating significant capital for future investments. The focus of CVC investments has shifted towards hard technology, new energy, and advanced manufacturing, reflecting a strategic emphasis on emerging industries.

(8) Policy influence and future directions

The Chinese government has continued to support CVC activities through various policy initiatives. For example, the "Guiding Opinions on Promoting the Development of Venture Capital" issued in 2024 emphasized the importance of CVC in driving innovation and economic

growth. These policies aim to create a more favorable environment for CVC activities, including simplifying regulatory procedures and providing financial incentives for strategic investments.

China's CVC market has seen significant growth over the past decade, driven by policy support and the active involvement of SOEs. Early studies such as those by Lerner (2022) highlighted the critical role of SOEs in promoting CVC activities, while recent studies like Gao et al. (2023) and L. Wang et al. (2021) emphasize the differences in innovation effectiveness between state-owned and private CVCs. However, there are still gaps in understanding how state-owned CVCs can achieve sustainable innovation and long-term competitiveness in the global market. Future research should further explore the long-term impacts of state-owned CVCs in various market environments and how strategic optimization can enhance their innovation effectiveness.

2.4 Literature review summary and research gaps

2.4.1 Summary and limitations of existing research.

The literature on CVC investment strategies and their impact on parent company innovation performance have yielded a wealth of insights, highlighting both consistent findings and notable divergences across studies.

2.4.1.1 Summary of key findings

(1) Strategic importance of CVC: Many studies underscore the strategic role of CVC in enhancing the innovation performance of parent companies. Chesbrough (2002) and Gompers and Lerner (2000) emphasize that CVC serves as a key mechanism for accessing external innovations and new technologies, which can complement internal R&D efforts. This alignment between CVC activities and corporate strategy is consistently identified as critical for maximizing innovation outcomes.

(2) Variation in CVC Strategies: research has identified various CVC investment strategies, such as strategic vs. financial motives, leading investments, and syndicated investments. For instance, Katila et al. (2008) and Huang and Madhavan (2021) explored how different configurations of strategic and financial motives influence innovation performance. The consensus is that strategically driven CVCs, which focus on long-term innovation synergies rather than short-term financial returns, tend to yield better innovation outcomes for the parent company.

(3) CVC as a tool for open innovation: The concept of open innovation, where firms leverage external ideas to drive internal innovation, is frequently linked to CVC. Chesbrough (2002) and later studies like De Groote and Backmann (2020) argue that CVC allows firms to bridge internal and external innovation efforts, enhancing their absorptive capacity and ability to integrate new technologies.

(4) Impact of ownership structure: Several studies, such as those by Gao et al. (2023), highlight the differences in innovation performance between state-owned and privately-owned CVCs. These studies consistently find that privately-owned CVCs are more effective in fostering innovation due to fewer bureaucratic constraints and higher risk tolerance compared to state-owned counterparts.

(5) Sectoral and regional differences: The literature also notes that the impact of CVC on innovation can vary significantly across sectors and regions. For example, studies have shown that technology and healthcare sectors, where the pace of innovation is rapid, benefit more from CVC investments. Regionally, the US and Europe have historically dominated CVC activities, but recent years have seen Asia, particularly China, emerging as a significant player despite recent slowdowns due to regulatory changes (KPMG, 2023).

2.4.1.2 Consistencies and divergences

(1) Consistencies: A consistent theme across the literature is the positive relationship between well-aligned CVC strategies and enhanced innovation performance. Most studies agree that CVC's strategic alignment with the parent company's innovation goals is crucial. Additionally, there is broad consensus that CVC investments that prioritize strategic over purely financial objectives tend to be more successful in driving innovation.

(2) Divergences: Despite these consistencies, there are notable divergences, particularly concerning the mechanisms through which CVC impacts innovation. For example, while some studies emphasize the role of CVC in increasing the parent company's absorptive capacity (Fiss, 2011), others argue that the primary benefit lies in providing direct access to new markets and technologies (Dushnitsky & Lenox, 2005). There is also debate over the effectiveness of CVCs in different ownership contexts, with some studies highlighting the limitations of state-owned CVCs due to bureaucratic inefficiencies, as noted by Gao et al. (2023).

2.4.2 Research gaps

The literature on CVC investment strategies and their impact on the innovation performance of parent companies, while extensive, still reveals significant research gaps. Existing studies often

focus on the overall effect of CVC strategies on innovation performance but fall short in exploring the nuanced impacts of specific strategies and the complex relationships between strategy combinations and innovation outcomes. This research aims to address these gaps by employing linear regression and fuzzy set Qualitative Comparative Analysis (fsQCA) to provide a more detailed and nuanced understanding of the intricate linkages between CVC strategies and innovation performance.

(1) Insufficient segmentation of CVC strategies: Although prior research broadly categorizes CVC strategies into financial and strategic types (Chesbrough, 2002; Gompers & Lerner, 2000), there is a lack of in-depth exploration into more specific strategies such as leading investments, syndicated investments, and staged investments. Most studies tend to treat CVC as a monolithic entity, overlooking how different strategy combinations might lead to varying innovation outcomes (Katila et al., 2008). This simplified classification fails to capture the complex effects of CVC strategy diversity on innovation performance.

(2) Limited exploration of strategy combinations and complex relationships: Existing literature primarily employs linear models to analyze the relationship between CVC and innovation performance, neglecting the potential impact of multi-strategy combinations and their interactions on innovation. For instance, Fiss (2011) highlighted the nonlinear and complex configurational relationships between organizational strategies and performance, suggesting the need for advanced methods like fsQCA to analyze the combined effects of multiple conditions. However, few studies have utilized these methods within the CVC domain to reveal the intricate relationships between strategy combinations and innovation outcomes.

(3) Inadequate cross-industry and cross-regional analyses: Most CVC studies focus on specific industries (such as technology or healthcare) or regions (like the US or Europe), overlooking the impact of cross-industry and cross-regional strategy differences on innovation performance. The implementation and effectiveness of CVC strategies may vary significantly across different markets and cultural contexts (Huang & Madhavan, 2021). The lack of systematic analysis of these differences limits the broader applicability of current research findings.

(4) Insufficient examination of state-owned vs. privately-owned CVC pathways: While some literature explores the innovation performance differences between state-owned and privately-owned CVCs (Gao et al., 2023), there is a lack of systematic comparisons in terms of strategy choices, risk tolerance, and innovation resource allocation. Particularly in the Chinese market, the unique role of state-owned CVCs under policy directives remains underexplored, especially regarding their performance in multi-strategy configurations.

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Chapter 3: Research Method and Research Design

3.1 Research method

This thesis employs a mixed-method approach by integrating Case Analysis, Linear Regression Analysis and Fuzzy-Set Qualitative Comparative Analysis (fsQCA) to systematically investigate the impact of CVC strategies on the innovation performance of parent companies. By combining these two methodologies, the thesis not only identifies the direct causal relationships between different CVC strategies and innovation outcomes but also explores the complex causal pathways involving multiple condition configurations. This mixed-method approach provides robust insights into the diversity of CVC strategies and their impact mechanisms on innovation performance.

3.1.1 Case analysis

Case analysis is a research method that reveals the essence of complex phenomena through in-depth study of specific examples. In this paper, case analysis is used to analyze the impact mechanism of corporate venture capital (CVC) strategy on the innovation performance of the parent company. Through the analysis of typical CVC cases at home and abroad, this study reveals the specific impact of different enterprise venture capital operation models and investment strategies on the innovation performance of the parent company.

Specifically, the case analysis will focus on typical CVC cases in Europe and America (such as Google Venture Capital, IBM Venture Capital Group, Intel Capital) as well as typical CVC cases in China (such as Xiaomi Ecological Investment, Lenovo Capital and Incubator Group, Huawei Hubble Investment, Haier Capital, TCL Ventures), exploring their practical experience and successful models in investment strategy selection, strategic docking with parent companies, innovation resource integration, and post investment management. Through in-depth analysis of these cases, this study can provide rich background information and theoretical inspiration for subsequent empirical research from a practical perspective, while also providing valuable practical examples for listed companies to formulate and optimize CVC strategies.

3.1.2 Linear regression analysis

Linear Regression Analysis is a classical statistical method used to explore the linear relationships between independent and dependent variables. In this thesis, linear regression is employed to identify and quantify the direct causal effects of various CVC strategies on the innovation performance of parent companies. By applying regression analysis, the thesis estimates the magnitude and direction of the impact of different types of CVC strategies (e.g., lead investment, co-investment, staged investment) on innovation performance indicators, specifically focusing on patent counts.

(1) Purpose of application:

Linear Regression Analysis in this thesis aims to:

Quantify the direct impact of different CVC strategies on innovation performance (patent counts), identifying which strategies have statistically significant effects on enhancing innovation outcomes.

Use regression coefficients to assess the direction (positive or negative) and strength of the influence of independent variables (CVC strategies) on the dependent variable (innovation performance).

Control for confounding variables such as firm size, industry characteristics, and firm age to ensure the robustness of the results.

(2) Variable specification:

Independent variables: Types of CVC investment strategies, including lead investment, co-investment, and staged investment.

Dependent variable: Innovation performance, primarily measured by patent counts.

Control variables: Firm size, industry characteristics, firm age, and other relevant factors.

(3) Data processing:

Standardize data before analysis to eliminate the effects of different scales among variables.

Diagnose multicollinearity among independent variables to ensure the accuracy and reliability of the regression model.

(4) Analysis and interpretation:

Estimate regression coefficients to interpret the specific impacts of different CVC strategies on innovation performance.

Evaluate the explanatory power of the model using R-squared (R^2) and adjusted R-squared values, and assess the statistical significance of the regression results using t-tests and F-tests.

Perform robustness checks, including alternative model specifications and sensitivity

analyses, to validate the consistency and reliability of the findings.

Linear Regression Analysis provides a foundational understanding of the direct causal relationships between CVC strategies and innovation performance, helping to identify the most influential strategies under various conditions.

3.1.3 Fuzzy-set qualitative comparative analysis (fsQCA)

Fuzzy-Set Qualitative Comparative Analysis (fsQCA) is a method that combines the strengths of both qualitative and quantitative approaches, making it particularly suitable for uncovering complex causal relationships and configurations of multiple conditions. Unlike traditional regression methods, fsQCA allows for the identification of both sufficiency and necessity conditions for outcomes, revealing how different combinations of strategies can lead to high innovation performance.

(1) Purpose of application:

The application of fsQCA in this thesis aims to:

Identify optimal configurations of CVC strategies under various conditions, such as different industry settings and firm types, and explore the best strategic pathways.

Analyze the sufficiency and necessity of different strategy combinations in achieving high innovation performance, providing tailored strategic recommendations.

Reveal complex causal pathways, allowing firms to understand how differentiated strategy combinations can achieve innovation goals in similar market environments.

(2) Calibration and data processing:

Calibration Process: Convert raw data into fuzzy sets by defining thresholds (full membership, full non-membership, and crossover point) to determine the degree of membership for each variable.

Condition Settings: Include core conditions (CVC strategy types) and contextual conditions (industry characteristics, firm type, market environment).

Outcome Variable: Innovation performance, primarily measured by patent counts.

(3) Analytical steps:

Construct Truth Table: List all possible combinations of conditions to create a truth table that outlines the presence or absence of high innovation performance.

Necessity Testing: Assess whether individual strategies are necessary conditions for achieving high innovation performance.

Sufficiency Analysis: Use complex, intermediate, and parsimonious solutions to identify which combinations of strategies are sufficient for high innovation performance.

(4) Interpretation of results:

Determine which combinations of CVC strategies significantly enhance innovation performance under specific conditions using fsQCA solutions.

Contrast the effectiveness of single-path versus multi-path approaches, discussing the advantages and disadvantages of different strategy combinations.

Provide strategic optimization suggestions based on fsQCA findings, emphasizing the importance of context-specific strategy configurations.

3.2 Design of case analysis

3.2.1 Case selection criteria

The selection of CVC cases for analysis in this thesis follows a set of rigorous criteria to ensure comparability and relevance, particularly in relation to ChangHong CVC. Firstly, the cases must involve industry-leading corporations that have established a significant presence in their respective markets, particularly those with a strong manufacturing base. This criterion ensures that the selected CVCs are representative of firms that not only lead their industries but also drive sectoral innovation, mirroring ChangHong's position in the electronics and manufacturing sectors.

Secondly, the CVC units selected for analysis must demonstrate notable innovation performance, evidenced by metrics such as increased patent filings, successful new product launches, or significant technological advancements that have impacted their parent company’s competitive positioning. This focus on innovation performance aligns with the thesis’s core objective of understanding how CVC strategies contribute to corporate innovation.

Thirdly, the chosen cases should involve CVCs that operate in industries closely related to or directly impacting manufacturing and industrial technologies. This criterion ensures that the cases are contextually comparable to ChangHong CVC, which is heavily integrated with its parent company's core manufacturing operations. By selecting CVCs within similar industrial domains, the analysis can more accurately explore the interaction between CVC investments and the innovation efforts of the parent company’s core business units (Katila et al., 2008).

Finally, a key selection criterion is the comparability of the CVC's operational and strategic framework to that of ChangHong CVC. This includes similarities in investment strategies, such as leading investments, syndicated investments, and staged financing. Additionally, the management structure of the CVC—how it is governed, the degree of autonomy, and its

alignment with the parent company's strategic goals—must be sufficiently analogous to provide meaningful comparative insights.

3.2.2 Case analysis method

The analysis of the selected CVC cases will employ a qualitative, comparative approach, focusing on several key dimensions: investment cases, investment strategies, and the relationship between the CVC unit and the parent company's innovation departments. Specifically, the analysis will explore how the CVC's investment decisions align with the strategic objectives of the parent company and how these investments facilitate or hinder the parent company's innovation initiatives.

(1) Investment case analysis: Each selected CVC's investment portfolio will be examined to identify patterns in the types of startups funded, the technologies targeted, and the stage of development at which investments are made. This analysis will help to elucidate how these investments are intended to support the parent company's innovation goals, whether through direct technology acquisition, market expansion, or enhancing the competitive landscape (Fiss, 2011). The examination will also consider how these investments have performed over time, focusing on the realized innovation outcomes and the strategic value brought back to the parent company.

(2) Investment strategy analysis: This component will delve into the specific investment strategies employed by each CVC, such as the preference for leading versus co-investing, the use of staged financing, and the balance between strategic versus financial investment motives. By comparing these strategies across cases, the thesis aims to reveal how different approaches influence the effectiveness of CVC in fostering innovation within the parent company. The analysis will include a review of strategic shifts over time, driven by changes in market conditions or corporate priorities, and how these shifts impact innovation outcomes (De Groote & Backmann, 2020).

(3) CVC and parent company interaction: A critical aspect of the analysis is understanding the interaction between the CVC unit and the parent company's core innovation departments. This includes examining governance structures, reporting lines, and the degree of integration or independence between the CVC and the parent. The focus will be on how these organizational dynamics facilitate knowledge transfer, resource sharing, and the strategic alignment of CVC activities with broader corporate innovation agendas. The analysis will consider both formal mechanisms, such as joint task forces or innovation councils, and informal interactions that drive collaborative innovation efforts.

(4) Comparative evaluation: To synthesize the findings, a comparative evaluation will be conducted to identify common patterns and divergent practices among the selected CVC cases. This will involve benchmarking the performance and strategies of the cases against ChangHong CVC, providing a detailed comparison of how different CVC models contribute to or detract from innovation performance in similar industrial contexts.

The selected CVC cases and their analysis method provide a comprehensive framework for understanding the complex interplay between CVC strategies and corporate innovation. By focusing on industry leaders with strong innovation track records and examining the strategic alignment of their CVC investments with corporate goals, this thesis seeks to uncover the critical success factors for CVCs in driving innovation. The findings will offer valuable insights into the role of CVCs in manufacturing and technology-driven industries, highlighting best practices and potential pitfalls. Moreover, this approach will contribute to a deeper understanding of how CVCs can be structured and managed to effectively support the innovation objectives of their parent companies, particularly in sectors comparable to those of ChangHong CVC. Future thesis should continue to refine these comparative analyses, exploring how variations in market conditions, regulatory environments, and technological landscapes influence the efficacy of different CVC models.

3.3 Design of regression analysis

3.3.1 Variable definition

This chapter measures the innovation performance of enterprises using the number of intellectual property rights (IntProRight). The indicators used to measure the innovation performance of enterprises using the quantity of intellectual property have the following significant advantages:

(1) Objectivity and quantifiability: The quantity of intellectual property is a specific and quantifiable indicator. The number of intellectual property rights such as patents, trademarks, and copyrights can be counted and verified through public records, providing an objective measure of enterprise innovation performance.

(2) Direct reflection of innovation output: The number of intellectual property applications and authorizations directly reflects the achievements of enterprises in thesis and innovation. The number of patents can particularly reflect the ability and investment of enterprises in technological innovation, and is the direct output of enterprise innovation activities.

(3) Possess market credibility: Investment institutions both domestically and internationally, including banks, recognize the value of the number of patents when approving corporate loans. Rich intellectual property reserves can enhance the market attractiveness of enterprises. Investors and partners are more inclined to collaborate with enterprises with a large amount of intellectual property rights, as this represents the strength and potential of the enterprise in technological innovation.

Therefore, this thesis uses the quantity of intellectual property rights to measure the innovation performance of enterprises. It not only provides an objective and quantifiable indicator that directly reflects the innovation output and technological progressiveness of enterprises, but also enhances the market competitiveness and attractiveness of enterprises, improves the overall value and market position of enterprises, and encourages sustainable innovation activities and obtains policy support. Overall, the quantity of intellectual property is an important tool for evaluating the innovation performance of enterprises.

The strategic investment data of listed companies is sourced from the Oriental Wealth Choice database. For each listed company in the sample, calculate their strategic investment situation by the end of 2022, and set the number of strategic investments (StraInvNum), lead investments (LeadInvNum), and joint investments (JoinInvNum). Referring to relevant thesis literature, the selected control variables include: market value (TotValue), company age (AGE), and number of employees (EmployNum). The definitions and calculation methods of these control variables are detailed in Table 3.1.

Table 3.1 Variable definition

Variable	Definition	Name	Variable Definition
Dependent variable	Number of intellectual property rights	IntProRight	Number of intellectual property rights held by IntProRight Investment Company Group
Explanatory variable	Strategic investment quantity	StraInvNum	number of investment projects in which the invested object has a synergistic relationship with the business of the investment company group (belonging to the upstream and downstream industry chain)
	Lead investment quantity	LeadInvNum	The investment company is the cornerstone investor, leading the investment quantity of the investment agreement terms in this round
	Joint investment quantity	JoinInvNum	The number of projects in which the investment company collaborates with other investment institutions to participate in investment
Control variable	Total market value	TotValue	Total market value of the company
	Age of Company	AGE	Investment Company Group's Years of Establishment

	Number of employees	EmployNum	Company's number of employees

3.3.2 Model settings

To analyze the impact of different strategic investments on corporate innovation performance, the following regression model (3.1) is established:

$$\boldsymbol{IntProRight_i = \alpha_0 + \beta_1 X_i + \lambda_1 Controls + \varepsilon_i} \quad (3.1)$$

Among them, the dependent variable $IntProRight_i$ is the number of intellectual property rights of enterprise i, and the larger its value, the better the innovation performance. X is used to describe the strategic investment situation of a listed company, which includes the number of strategic investments (StraInvNum), the number of lead investments (LeadInvNum), and the number of joint investments (JoinInvNum). The regression coefficient β_1 represents the impact of strategic investment on firm innovation performance. If the value is significantly positive, it indicates that the strategic investment is beneficial for improving the innovation performance of the enterprise, while if it is significantly negative, it indicates that it will inhibit the innovation performance of the enterprise. Controls are the various control variables selected earlier (see Table 3.1).

3.4 Design of fsQCA analysis

3.4.1 Research design

The rigorous application of fuzzy-set Qualitative Comparative Analysis (fsQCA) involves several key steps: variable measurement, calibration of variables, setting frequency thresholds for fuzzy set evaluation, assessing the consistency of fuzzy subsets, constructing a truth table, conducting fuzzy set analysis of necessary conditions, analyzing the fuzzy set configurations, and performing typical case studies. The fundamental concept behind fuzzy sets is the allowance of graded membership scores, enabling partial membership within a set. After measuring the variables, thesisers must calibrate the membership scores using both empirical data and theoretical knowledge, assigning values between 0 and 1—this process is known as variable calibration. Calibration methods vary depending on the type of data; in this thesis, all data types are interval-scaled, and the fsQCA 4.0 software was used for calibration.

Once all variables are calibrated, the next step is to generate the truth table, where thesisers should set the case frequency threshold based on the specific context of the thesis. The final step before running the fsQCA analysis involves setting the consistency threshold, with a value

of 0.75 typically considered the minimum acceptable standard in mainstream management thesis. Any threshold below this value may call into question the thesis's validity and significance.

Subsequently, the program runs analyses to determine the necessity and sufficiency of conditions in relation to the outcomes, engaging in iterative dialogue with theoretical frameworks and empirical cases to derive meaningful insights. Finally, a robustness check is required to ensure the reliability and validity of the thesis's findings, confirming that the conclusions are consistent and robust against potential variations in the data or analysis approach.

3.4.2 Sample selection and data sources

To ensure consistency with Chapter 4 and 5, the sample selection for this thesis was conducted with rigorous attention to maintaining data alignment and integrity. The data sources utilized include a primary market paid venture capital database, IT Juzi (www.itjuzi.com), and public databases for listed companies such as the East Money Choice database (choice.eastmoney.com). These sources provided comprehensive and reliable data for the thesis of CVC strategies and their impact on innovation performance.

Data Selection Process: Since venture capital databases do not specifically differentiate between CVC and Independent Venture Capital (IVC), we initially identified 1,864 funds that received corporate investments from the VentureXpert database. Further verification was conducted using business information provided by Google, Dow Jones, and other commercial data sources to match each fund with its corresponding parent company. After excluding funds associated with financial firms, multiple companies, or foreign-owned companies, we identified 926 CVC funds. Of these, 562 funds were linked to publicly listed parent companies. Additional matching with other databases, such as Compustat and D&B, provided critical information on each parent company's industry and size. This information is crucial for determining whether a technological link exists between a CVC fund's parent company and its portfolio startups.

Data preprocessing: The data preprocessing steps included several key filters to ensure the quality and relevance of the sample:

Exclusion of non-listed companies' CVCs: CVCs whose parent companies were not publicly listed were excluded from the analysis. This exclusion was due to the lack of publicly available and accurate data for non-listed companies, making it impossible to collect complete and reliable information.

Minimum investment threshold: Funds with fewer than two total investment events were

excluded from the sample. The rationale for this threshold was that companies with fewer than two investment events lack sufficient data for meaningful analysis and do not provide a reliable basis for evaluating CVC strategy impacts.

Through this thorough selection and preprocessing process, the thesis aims to maintain a high level of data consistency and relevance, ensuring that the results are both robust and reflective of the true nature of CVC activities among listed companies. The focus on listed companies with sufficient investment activity allows for a comprehensive examination of the impact of CVC strategies on innovation performance, aligning with the thesis's overall thesis objectives.

This section outlines the sample selection and data sources used in this thesis, emphasizing the consistency with prior chapters and the rationale behind the chosen criteria. By using robust and reliable data sources, and applying stringent preprocessing steps, this thesis aims to ensure the accuracy and relevance of its findings on the complex relationships between CVC strategies and corporate innovation performance. The methodological rigor in sample selection enhances the validity of the thesis, providing a solid foundation for the subsequent fsQCA analysis in exploring the multi-faceted impacts of CVC on innovation outcomes.

3.4.3 Variable selection and calibration

Based on the obtained dataset, we constructed the following variables as core references, as in Table 3.2. The configuration analysis method is mainly aimed at making systematic comparisons between cases possible while carefully analyzing the internal complexity of the case, especially when designing small or intermediate sample surveys. QCA does not have specific requirements for sample size and can be applied to 7-80 sample sizes. It has a significant advantage in the thesis of small and medium-sized samples with variables mainly composed of binary forms. Drawing on the sample size determined by previous thesis using QCA for management thesis (7-15 small samples and 10-40 medium samples), the final thesis object determined in this thesis is 232 corporate investment cases that occurred from 2018 to 2021.

Table 3.2 The variable groups used in this thesis

Variable classification	indicator type	
The dependent variable	financial performance	exit rate IPO rate
	comprehensive performance	Market value
	Innovation performance	cost thesis and development intensity

		profit rate
	financing situation	alternate round financing rate
		Investment rate before round A
		Strategic investment rate
Independent variable	Investment type	Lead investment rate
		Joint investment rate
		Company age
	Company size	Company revenue
		Number of employees

In fsqca, each condition and result can be considered as a set, and each case has membership scores in many sets. Calibration is the process of assigning set scores to cases. Firstly, based on the actual situation of the case and the distribution of variable values, determine the three breakpoints of "complete membership", "intersection", and "complete non membership", namely the "anchor point". Then, calibrate the case as a fuzzy set with values between 0 and 1. Set 7 conditions and 1 result with complete membership, intersection, and 3 calibration points with complete non membership as the 95% quantile, 50% quantile, and 5% quantile of the sample data, respectively. Based on fsqca 4.0 software, calibrate the result and condition variables and generate a truth table (not shown in the main text). By calibrating and analyzing the indicator set, the financial performance, innovation performance, comprehensive performance, financing situation, investment type, and company size of 231 enterprises were obtained, as in Table 3.3, including their membership points, intersection points, and non-membership points. Prepare for subsequent analysis.

Table 3.3 Calibration of antecedent and outcome variables selected in this thesis

Variable classification	Indicator Description	Variable name and description		Complete affiliation	Inter section	Not affiliated
Dependent variable	Financial Performance	Y1	exit rate	0.40	0.13	0.04
		Y2	IPO rate	0.25	0.05	0.00
	Comprehensive performance	Y3	Market value	3707.55	141.64	4.71
	Innovation performance	Y4	R&D cost ratio	0.39	0.04	0.00
		Y5	profit rate	0.30	0.02	(0.95)
Independent variable	Financing situation	X1	Interval investment rate	1.00	0.60	0.32
		X2	The proportion of financing before Series A	0.90	0.52	0.14
	Investment type	X4	Strategic investment ratio	0.45	0.13	0.00
		X5	Lead investment rate	0.54	0.18	0.00
		X6	Joint investment rate	1.00	0.90	0.67
	company size	X7	Company age	34.00	23.00	9.50
		X8	Company revenue	4793.15	61.91	1.63
		X9	Number of employees	182658.00	4270.00	271.50

Data calibration is an important step in calculating the membership degree of the set of antecedent variables. This thesis used mainstream 95%, 50%, and 5% sites for calibration.

Necessity condition testing is the main step in evaluating the relationship between subset conditions and result conditions. If there is a constant conditional intersection in the result set, it is a necessary condition. The necessity condition test is calculated through consistency and coverage algorithms, which should be greater than 0.9 and 0.5, respectively. Calculate the calibrated data and obtain the results. "~" means logical "not". It can be seen that the consistency between high-level and low-level numerical abilities is between 0.500 and 0.833, less than 0.9, and the single variable does not meet the necessary condition standard. It is necessary to further explore the synergistic configuration of multiple conditions. Configuration is a combination of conditions that cause a specific result or phenomenon.

3.5 Data Collection and Processing

3.5.1 Data collection

The data collection for this doctoral thesis mainly comes from the following two databases: the first level PE data is from IT Orange (www.itjuzi. com); The data of the listed company is sourced from Dongfang Wealth Choice (choice. eastmoney. com) and partially referenced from CBInsight.

Select data from 2022 as the research data. After data cleaning, a sample of 231 observed companies was finally obtained, including 56 companies listed on the Shanghai Stock Exchange, 121 companies listed on the Shenzhen Stock Exchange, 10 companies listed on the New Third Board, and 44 companies listed overseas. The individual stock trading data and financial data used by the research institute are sourced from the Oriental Wealth Choice database.

3.5.2 Data processing

The data processing process is as follows:

(1) Data proofreading

Due to the lack of a specific distinction between CVC and IVC properties in the venture capital database, we first obtained 1864 funds that accepted corporate investments from the VentureXpert database, and used commercial information provided by Google, Dow Jones, and others to find their corresponding parent companies for each fund. After removing several types of funds with parent companies being financial companies, multiple companies, and foreign-funded companies, a total of 926 enterprise venture capital funds were identified, of which 562 funds corresponded to listed companies. By matching with other databases (Compustat

database, D&B database), we obtained basic information such as industry and scale for each parent company.

(2) Data preprocessing

CVCs of companies that are not listed are excluded (reason for exclusion: data of non listed companies is not disclosed, and accurate and complete data cannot be collected)

Companies with less than 2 total investment events will be excluded (reason for exclusion: the data of companies with less than 2 total investment events is not referenceable)

(3) Perform corresponding data processing for regression analysis

Standardize the data before analysis to eliminate the impact of scale differences between variables.

Diagnose multicollinearity between independent variables to ensure the accuracy and reliability of the regression model.

(4) Perform corresponding data processing for fsQCA

Build a truth table: List all possible combinations of conditions, create a truth table, and outline the presence or absence of high innovation performance.

Necessity test: Evaluate whether a single strategy is a necessary condition for achieving high innovation performance.

Adequacy analysis: Identify which strategy combinations are sufficient to achieve high innovation performance using complex, intermediate, and minimalist solutions.

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Chapter 4: Case Analysis of CVC China and Abroad

4.1 Analysis of domestic and international CVC operation models

CVC has evolved significantly since its inception in the 1960s in the United States, particularly within industries characterized by high innovation cycles, such as pharmaceuticals. The initial stage, referred to as the 1.0 model, primarily involved direct investments aimed at mergers and acquisitions (M&A). Large corporations established dedicated venture capital arms to invest in small and medium-sized enterprises (SMEs) within their strategic focus areas or supply chains, functioning as an extension of their M&A activities (Gompers & Lerner, 2001). Prominent examples include major U.S. corporations such as Hewlett-Packard, Intel, and Microsoft, as well as early Chinese internet giants like Alibaba, which made its first significant CVC investment in Haier's smart home subsidiary in 2000. However, the 1.0 model's emphasis on M&A-driven direct investments faced challenges such as substantial capital requirements and high post-acquisition integration costs, compounded by increasing regulatory scrutiny on antitrust matters (Chesbrough, 2002).

The 2.0 model marked a shift towards a collaborative approach with Independent Venture Capital (IVC) firms, focusing on indirect investments with strong business ties but limited capital involvement. A notable example is IBM's establishment of its Venture Capital Group (VCG) in 1999, which prioritized partnerships with IVCs rather than direct equity stakes. IBM's strategy allowed it to support cutting-edge technology ventures without exerting excessive control, which was critical to maintaining the flexibility and innovation of the startups (Katila et al., 2008). This "indirect investment plus strong business, weak capital" model has since become prevalent among CVCs, allowing parent companies to leverage their industry expertise and resources while minimizing direct financial involvement (Huang & Madhavan, 2021).

The latest development, the 3.0 model, sees CVCs transitioning into General Partners (GPs) roles, pursuing both business and financial returns. Unlike the earlier models, where companies primarily acted as capital providers, leading CVCs are now actively managing their funds and raising capital from the market independently. For instance, Huawei's Hubble Technology Investment recently obtained a GP license and began preparations for market fundraising as an independent entity. This model capitalizes on the inherent advantages of CVCs in fundraising,

given the strong brand credibility and industry influence of their parent companies, which often participate as anchor investors (De Groote & Backmann, 2020). Moreover, CVCs' deep industry knowledge positions them advantageously in identifying and nurturing portfolio companies that align closely with their core business strategies, thus fostering synergies that go beyond mere financial investment.

The 3.0 model also emphasizes post-investment management, wherein CVCs not only provide capital but also leverage their technological expertise, networks, and strategic insights to support the growth of their portfolio companies. This holistic support helps these companies scale and succeed in their respective markets, creating a dual value proposition for both financial returns and strategic benefits to the parent company. Additionally, CVCs acting as GPs are driven by dual incentives: enhancing the parent company's innovation capacity and achieving significant financial returns for the fund's investors, which fosters a more proactive and engaged approach to managing their investments (Gao et al., 2023).

The evolution of CVC models from the M&A-driven 1.0 model to the collaborative 2.0 model, and now the business and financial synergy-focused 3.0 model, reflects the growing complexity and strategic importance of CVC in corporate innovation ecosystems. The shift towards acting as GPs represents a significant transformation, positioning CVCs not just as passive investors but as active managers with a vested interest in the success of their portfolio companies. This trend underscores a broader movement towards integrating strategic and financial goals, thereby maximizing the impact of CVC activities on both corporate growth and market competitiveness. Future thesis should continue to explore the effectiveness of these evolving models, particularly in diverse regional and industry contexts, to fully understand the nuanced roles CVCs can play in driving sustainable innovation and value creation across different economic environments.

4.2 Global CVC case analysis

4.2.1 Typical CVC cases in Europe and the United States

(1) Google Ventures (GV): A symbiotic model of venture capital and technology companies

Google Ventures (GV), established in 2009, is the venture capital arm of Google, aiming to drive innovation through investments in startups while providing long-term strategic support to its parent company. GV's investments are primarily focused on the computer software and internet sectors, reflecting Google's depth and breadth in technology. Cabral et al. (2021) stated

that GV exists to help Google better integrate into the entrepreneurial ecosystem, thereby injecting new vitality and innovation into the company. This symbiotic relationship not only fosters technological advancement for Google but also infuses the broader technology ecosystem with fresh energy.

GV maintains high independence in its decision-making process. Although funded by Google, GV operates independently, avoiding direct interference from Google's business strategies in its investment decisions. GV's investment strategy emphasizes diversification, covering investments from seed to later stages, which mitigates risks associated with any single industry or technology. Additionally, GV provides comprehensive support, including consulting services and industry resources, to help startups accelerate their market entry, thereby enhancing potential investment returns.

GV's risk management is demonstrated through its diversified portfolio and in-depth support for startups. GV focuses not only on financial returns but also on strategic synergies. By investing in promising innovative companies, GV brings potential technological breakthroughs and market opportunities to Google. Successful investments such as Android exemplify this strategy; Google's 2021 data shows that Android devices have over 3 billion active monthly users worldwide, occupying 69.74% of the global smartphone market share. GV's investment strategy has established Google's dominance in the mobile internet space, continuously fueling the company's innovation through strategic venture capital investments (Lee et al., 2021).

(2) IBM Venture Capital Group (VCG): Building a global ecosystem of technological innovation

Established in 1999, IBM Venture Capital Group (VCG) aims to build a global ecosystem supporting technological innovation through partnerships with independent venture capital (VC) firms worldwide. Unlike traditional CVCs that start with direct equity investments, IBM VCG employs an indirect investment strategy by initially supporting startups through technological and resource sharing and later making equity investments when appropriate. This approach not only reduces initial financial risk but also allows IBM to shape the technological and market directions of these companies as they grow (Capellan et al., 2019).

IBM VCG's investment focus is on innovative companies that align with IBM's technological and market needs, integrating them into IBM's ecosystem to achieve technological integration and market expansion. The decision-making process emphasizes collaboration with independent VCs, who screen and recommend startups based on IBM's strategic requirements. IBM VCG then conducts due diligence and makes investment decisions.

This collaborative model not only improves the accuracy and efficiency of investment decisions but also allows IBM to leverage external venture capital expertise and market insights.

In terms of risk management, IBM VCG adopts a dual empowerment strategy: providing technological support and market channels to enhance the growth potential of invested companies, while IBM Consulting extracts frontier knowledge and expert advisors from these companies, creating a win-win situation. This complementary relationship enhances IBM's innovation capabilities while ensuring its leading position in technological innovation (Maas et al., 2020).

(3) Intel Capital: A pioneering investment strategy with deep post-investment empowerment

Intel Capital, founded in 1991, is the strategic investment and acquisition arm of Intel Corporation, focusing on areas such as artificial intelligence, smart technologies, data centers, and other disruptive technologies. Unlike most CVCs that often play a secondary investment role, Intel Capital leads investments and actively participates in the governance of invested companies, including securing seats on their boards. This strategy allows Intel to maintain leadership in investments and directly influence the development trajectory of these companies.

In its investment decision-making, Intel Capital employs a strict classification mechanism, categorizing projects into A, B, and C types, with A-type projects further subdivided into A, AA, and AAA levels. This grading system helps Intel Capital focus on the most promising investment targets and through deep post-investment support, aids these companies in growing from A to AA or AAA levels. Post-investment management emphasizes long-term partnership, providing continuous resource support and strategic synergy to assist the invested companies in achieving comprehensive growth from R&D to market expansion.

For risk management, Intel Capital emphasizes being a long-term partner, supporting companies through technological cycles and market fluctuations. This patient investment strategy is exemplified by its long-standing partnership with Montage Technology. Since its first investment in 2006, Intel Capital has continued to support Montage Technology through market ups and downs, helping it navigate transitions and strengthen strategic collaborations with Intel. This long-term approach has not only consolidated Intel's leadership in technology but also generated substantial financial returns.

The case analyses of Google Ventures, IBM Venture Capital Group, and Intel Capital reveal diverse and flexible strategies in CVC implementation by European and American companies. GV achieves a win-win scenario of technology and market gains through independent operations and broad investments; IBM VCG enhances its technological

integration capabilities by building a global innovation ecosystem while reducing direct investment risks; Intel Capital ensures sustained growth and transformation of its invested companies through deep post-investment management and a long-term investment strategy. These strategies demonstrate that successful CVC is not merely about financial investment but a combination of strategic synergy, technological empowerment, and long-term partnership. However, these companies also face challenges in their CVC implementation, such as balancing strategic goals with financial returns, maintaining technological advantages in rapidly changing markets, and managing diverse and uncertain investment risks. These issues test the innovation management capabilities of European and American companies and offer valuable lessons for others.

4.2.2 Typical CVC cases in China

(1) Xiaomi Ecosystem Investment: Key figures and the incubation model from 0 to 1

Xiaomi's CVC strategy is heavily shaped by its founder Lei Jun, who is not only the Chairman of Xiaomi but also a prominent figure in the investment community. Xiaomi's investment journey can be divided into three phases:

Phase one: Personal investment phase

Lei Jun began his investment journey during his tenure at Kingsoft, where he co-founded Joyo.com, a leading e-commerce platform in China at the time. Despite Joyo.com's success, it struggled with funding, eventually leading to its acquisition by Amazon in 2004 for $75 million. This experience deeply influenced Lei Jun's understanding of the critical role of investment in entrepreneurship. Thus, when Xiaomi was founded in 2010, investment became an integral part of its strategy right from the start, distinguishing Xiaomi from other companies that typically venture into investments only after stabilizing their main business (Wan et al., 2022).

Phase two: Shunwei Capital

In 2011, just a year after Xiaomi's founding, Lei Jun co-founded Shunwei Capital with former Kingsoft investor Xu Dalai. Shunwei Capital serves as both a financial and strategic investor, leveraging Xiaomi's extensive resources to provide value to its portfolio companies. The fund positions itself as an incubator, fostering startups from the ground up, especially those related to Xiaomi's core business areas like hardware and AIoT. This phase marked Xiaomi's shift towards creating its ecosystem, where it not only provided funding but also strategic guidance, technical support, and access to Xiaomi's vast supply chain and distribution networks. Examples include Zimi, which pivoted from ODM services to becoming a major supplier of Xiaomi's power banks under Lei Jun's encouragement (Zhou & Wang, 2017).

Phase three: New strategic directions and investment models

In 2021, Xiaomi announced its ambitious entry into the smart electric vehicle market, marking Lei Jun's last entrepreneurial endeavor. However, Xiaomi's strategic shift began earlier, around 2017, with the establishment of the Xiaomi Yangtze River Industrial Fund in collaboration with Hubei's industrial investment entities. This fund focuses on hard technologies such as semiconductors and sensors, reflecting Xiaomi's growing interest in core technologies that are critical to its expanding business lines, including smartphones, smart home devices, and electric vehicles. By 2021, Xiaomi had further advanced its investment efforts by founding the Xiaomi Private Equity Fund Management Company, which raised significant market-based capital, demonstrating Xiaomi's evolving role from an ecosystem-centric investor to a broader strategic participant in the high-tech sector.

(2) Lenovo Capital and Incubator Group (LCIG): Strategic investment with mutual empowerment

Lenovo Capital and Incubator Group (LCIG) traces its roots back to the Lenovo Joy Fund established in 2010 and was officially launched as a formal CVC unit in 2016. Often referred to as Lenovo's "lighthouse," LCIG has rapidly scaled its investment footprint, backing nearly 200 high-tech companies and achieving 10 IPOs within five years. Its portfolio includes prominent names such as CATL, Cambricon, NIO, and BYD Semiconductor. LCIG operates with an independent decision-making process akin to a market-driven VC, unimpeded by Lenovo's corporate hierarchy, thus maintaining flexibility and speed in its operations.

LCIG's investment strategy aligns broadly with Lenovo's vision but does not strictly confine itself to the company's current business areas. Instead, it adopts an "80-20 rule," where 80% of investments focus on core technology sectors, while 20% venture into innovative fields with high future potential. A unique aspect of LCIG is its philosophy of "helping without interfering," ensuring that the supported companies receive the benefits of Lenovo's resources and expertise without the constraints typically associated with CVC involvement. This approach has been pivotal in LCIG's support for companies like NIO during challenging times, where Lenovo's industry insights and strategic advice played a crucial role in stabilizing and guiding the company back on track.

(3) Huawei Hubble Investment: Building a self-sufficient semiconductor ecosystem

Huawei's Hubble Investment, established in 2019, marked a significant departure from Huawei's prior stance of avoiding equity investments, a change driven by the necessity to counteract U.S. sanctions that disrupted its supply chain. Hubble was set up with a clear mandate: to invest in and support the development of a domestic semiconductor industry that

could meet Huawei's needs independently of international suppliers. This included investments in semiconductor materials, manufacturing, packaging, and testing, essentially covering the entire semiconductor value chain.

Hubble's investment philosophy is characterized by a willingness to take on early-stage, high-risk projects that are crucial to establishing a robust domestic semiconductor ecosystem. A notable early investment was in Sirui Electronics, a company supplying signal chain chips for Huawei's 5G base stations, which significantly boosted Sirui's financial performance and market position following Hubble's support. Hubble's distinct approach avoids investing in companies that would directly compete with Huawei's own product lines, maintaining a focus on fostering complementary and supportive industries instead. The success of companies like Sirui, which saw rapid growth and an eventual listing on the STAR Market, exemplifies Hubble's strategic role in strengthening Huawei's supply chain resilience (Anokhin et al., 2022).

(4) Haier Capital: Precision VC for industry ecosystem building

Established in 2010 under Haier Financial Holdings, Haier Capital focuses on "deepening industry investment and cultivating industry ecosystems," with investments concentrated in three main areas: healthcare, smart technology, and innovative consumption. Haier Capital positions itself as an "industry full-ecosystem investment co-creation platform," aiming to connect, integrate, and innovate across industries. It emphasizes the importance of synergy between its investments and Haier's broader business ecosystem, prioritizing projects that demonstrate strong alignment and mutual value creation potential

Haier Capital's unique approach involves a deep commitment to ecosystem development, where it seeks out projects that not only promise financial returns but also contribute strategically to Haier's industry objectives. The fund's rigorous project selection criteria focus on innovative capacity, differentiated market positioning, and potential for significant collaboration with Haier's core businesses. For instance, Haier Capital's investments in advanced IoT technologies and smart home solutions align with Haier's vision of creating interconnected, smart ecosystems that enhance everyday living. This strategy has enabled Haier Capital to establish itself as a leader in industry-specific venture capital, combining financial investment with strategic ecosystem building (Zhou & Wang, 2017).

(5) TCL Ventures: A forward-looking approach to investment

TCL Ventures, founded in 2009, operates as TCL Group's strategic arm for exploring new business frontiers. Unlike typical CVCs that often focus on immediate business synergies, TCL Ventures adopts a forward-looking approach, investing in emerging technologies and innovative business models that align with TCL's vision for the next 3-5 years. This includes

areas such as artificial intelligence, advanced manufacturing, and cutting-edge display technologies. TCL Ventures aims to identify and nurture early-stage technologies that may not yet align directly with TCL's current operations but hold significant potential for future integration.

TCL Ventures' investment philosophy is guided by a strategic mandate to not merely support adjacent businesses but to actively seek out disruptive technologies that can redefine TCL's future market position. This approach is evident in its investments in companies like CATL and Cambricon, which are leaders in their respective fields and represent key components of TCL's long-term strategic vision. By maintaining a broad and flexible investment strategy, TCL Ventures ensures that it remains at the forefront of technological innovation, positioning TCL to capitalize on emerging opportunities as they arise. Furthermore, TCL Ventures enjoys significant autonomy within TCL Group, allowing it to make investment decisions based on both immediate and strategic considerations without the constraints of short-term performance pressures

Chinese CVCs such as Xiaomi, Lenovo, Huawei, Haier, and TCL illustrate a wide array of strategic approaches to corporate venture capital, each tailored to their unique corporate contexts and long-term objectives. Xiaomi's model of building an integrated ecosystem, Lenovo's mutual empowerment strategy, Huawei's urgent investment in semiconductor independence, Haier's focus on precision VC and ecosystem co-creation, and TCL's future-oriented investments in emerging technologies highlight the diversity and adaptability of Chinese CVC practices. While these strategies have yielded significant successes, they also face challenges, including balancing strategic and financial returns, managing complex regulatory environments, and sustaining competitive advantages in rapidly evolving sectors. These cases underscore the critical role of CVCs in driving corporate innovation and strategic positioning in China, offering valuable insights into the potential and limitations of corporate venture capital as a tool for business transformation and growth.

4.3 Single case analysis of ChangHong Venture Capital

4.3.1 Overview of ChangHong Venture Capital CVC

ChangHong Venture Capital (CVC) was established in 2015 with the aim of supporting the overall innovation and industrial upgrade of ChangHong Group through strategic investments and acquisitions. Facing intensified global competition and rapid technological advancements,

CVC focuses on investing in innovative companies and technologies to enhance the group's core competitiveness in areas such as smart home, IoT, semiconductors, and renewable energy. The establishment of CVC reflects ChangHong's commitment to leveraging external innovation resources, using capital to build a comprehensive ecosystem that spans from early-stage technology development to mature industry applications.

CVC's investment strategy primarily targets the following sectors: smart manufacturing, smart home, information technology, and renewable energy. In smart manufacturing, CVC focuses on technologies such as robotics, automated production lines, and smart factories to enhance the group's production efficiency and product quality. In the smart home sector, investments include smart hardware, home IoT, and smart appliance ecosystems, aiming to strengthen ChangHong's leadership in this market. Information technology investments concentrate on emerging fields like cloud computing, big data, and artificial intelligence, enhancing the group's digital capabilities. In the renewable energy sector, CVC actively invests in new battery materials, energy storage systems, and clean energy solutions to support the group's sustainable development strategy.

ChangHong CVC employs an "industry + capital" investment strategy, emphasizing deep synergy with ChangHong Group's core businesses. Its investment model includes direct investments, industrial funds, and joint establishment of special funds with government or other enterprises. Through the "fund + base" approach, CVC not only provides financial support but also offers comprehensive resource integration for invested companies, including technical R&D and market promotion, to accelerate project growth. To mitigate investment risks, CVC prioritizes projects that align closely with ChangHong's strategic direction and contribute to the group's future development. Additionally, CVC explores partnerships with renowned investment institutions, such as collaborating with Broad Capital and Eastern Bell Capital, to enhance its investment management capabilities by leveraging external expertise and resources.

Within ChangHong Group, CVC is positioned as a key driver of the group's innovation and industrial transformation. Its primary objective is to support the group's expansion into emerging industries and to facilitate the transition from traditional manufacturing to a technology-driven enterprise through investments and resource integration. CVC serves not only as a platform for capital operations but also as an incubator and accelerator for the group's emerging businesses, embodying ChangHong's dual mission of "industrial financialization" and "financial industrialization." By leveraging capital, CVC plays a vital role in optimizing ChangHong Group's industrial structure, driving technological innovation, and enhancing market competitiveness.

4.3.2 Analysis of ChangHong Venture Capital's investment strategies

ChangHong Venture Capital (CVC) operates with a strategy centered on serving ChangHong Group's strategic needs by driving innovation and industrial upgrading through a dual approach of "industry + capital." Established to enhance the Group's investment management capabilities, CVC leverages market-oriented mechanisms to improve investment efficiency. Its investments focus on sectors closely related to ChangHong's core businesses, such as smart manufacturing, information technology, smart home, and renewable energy, aiming for deep integration and synergy within the industry chain.

(1) Investment areas and strategies

ChangHong CVC's investment strategy is highly aligned with the Group's core businesses, particularly targeting early and growth-stage companies with high technological barriers and market potential. Key investment areas include:

Smart manufacturing: Investments focus on robotics, smart factories, and automated production lines to enhance production efficiency and product quality. This not only supports ChangHong's leadership in smart manufacturing but also optimizes its supply chain management and production processes.

Information technology: The focus is on cloud computing, big data, artificial intelligence, and the Internet of Things (IoT). These investments provide technological support for ChangHong Group's digital transformation and foster the development of new business models. For instance, CVC invests in innovative startups that introduce new digital solutions, thereby enhancing the Group's overall competitiveness.

Smart home: CVC targets smart hardware, home IoT, and integrated solutions to expand ChangHong's market presence in the smart home sector. The investment focus is not only on technological advancements in hardware but also on building an interconnected ecosystem that offers a comprehensive smart home experience.

Renewable energy: Investments include new battery materials, energy storage technologies, and clean energy solutions, aligning with the Group's sustainable development goals. CVC's investments in renewable energy reflect ChangHong's proactive approach to future energy transitions, supporting national policy directions and opening new growth avenues for the Group in emerging industries.

(2) Investment models and partnerships

ChangHong CVC employs a flexible and diversified investment model, including direct equity investments, industrial funds, and special funds co-established with renowned

investment institutions or government-guided funds. By collaborating with partners like Broad Capital and Oriental Fortune Capital, CVC enhances its operational capabilities by incorporating external expertise and advanced investment management practices. The "fund + base" model adopted by CVC not only provides financial support but also deeply integrates investments with ChangHong's resources, offering comprehensive support in technology, market access, and management to portfolio companies.

Moreover, post-investment management is a critical component of CVC's strategy. By establishing a dedicated post-investment management team, CVC conducts lifecycle tracking and support for its investments, including regular audits, performance evaluations, and strategic guidance. This approach ensures that investment projects are not only financially viable but also strategically aligned with ChangHong Group's business, enhancing the competitiveness and technological capabilities of portfolio companies.

(3) Investment decision-making and risk control

CVC places strong emphasis on risk control in its investment decisions, underpinned by a comprehensive decision-making and risk management framework. The Investment Committee, composed of professionals appointed by the Group, ensures that all investments undergo thorough due diligence and multi-level evaluations. CVC has established clear investment criteria and processes, from project selection and preliminary assessment to due diligence and final decision-making, all aligned with ChangHong's strategic direction and financial objectives. The decision-making process prioritizes projects that have high synergy with the Group's core businesses, focusing on those that can fill strategic gaps or offer significant future value

ChangHong CVC's investment strategies are deeply rooted in the Group's strategic transformation and innovation needs. Through precise sector selection and diversified investment models, CVC has effectively advanced ChangHong's positioning in key areas such as smart manufacturing, information technology, smart home, and renewable energy. Despite challenges in balancing strategic and financial goals and optimizing resource integration, CVC continues to refine its investment strategies and post-investment management, significantly enhancing the Group's market competitiveness and innovation capacity. Looking ahead, CVC plans to further strengthen external partnerships, leveraging the dual advantages of "industry + capital" to support ChangHong Group's comprehensive transformation from a traditional manufacturer to a technology-driven enterprise.

4.3.3 Impact of ChangHong Venture Capital (CVC) on ChangHong Group's innovation performance

ChangHong Venture Capital (CVC) has played a significant role in influencing the innovation performance of ChangHong Group by facilitating access to cutting-edge technologies, enhancing strategic alignment, and fostering a culture of innovation. Since its inception, CVC has invested in 40 projects across key areas such as smart manufacturing, information technology, and renewable energy, with a total investment amount of RMB 1.86 billion. Of these, 13 projects are closely aligned with ChangHong's core industrial sectors, directly contributing to the Group’s innovation ecosystem.

The strategic investments by CVC have facilitated ChangHong Group’s expansion into emerging technologies, such as AIoT (Artificial Intelligence of Things) and cloud computing, which have been crucial in driving digital transformation within the Group. For instance, investments in smart home technologies have enabled ChangHong to launch a range of interconnected devices, enhancing its market competitiveness. This integration of new technologies has not only expanded ChangHong’s product offerings but also improved its innovation output, as evidenced by the increased number of patents and new product launches in recent years.

Several factors have contributed to the success of CVC's impact on ChangHong Group’s innovation performance. First, the strategic alignment between CVC’s investment focus and ChangHong’s core business areas has ensured that investments are not only financially viable but also strategically beneficial. This alignment has been instrumental in fostering synergies between ChangHong’s existing operations and new ventures, facilitating smoother integration of innovations into the Group's broader strategy.

Second, CVC’s flexible investment models, which include direct investments, co-investments, and the establishment of joint funds, have allowed it to tap into a broader range of opportunities and share risks with partners. This collaborative approach has enabled CVC to leverage external expertise and resources, further enhancing the innovation capabilities of ChangHong Group. For example, the partnership with Broad Capital provided not only capital but also strategic insights that were critical in navigating complex market dynamics.

Third, CVC’s robust post-investment management practices, including active involvement in portfolio companies through board representation and strategic guidance, have been pivotal in driving the success of its investments. By providing continuous support and monitoring, CVC has been able to help portfolio companies overcome challenges and achieve strategic milestones

that align with ChangHong Group's innovation goals.

Despite the positive impacts, there are areas where CVC's influence on ChangHong Group's innovation performance has been less effective. One significant challenge is the alignment of short-term financial returns with long-term strategic goals. Some investments, while strategically aligned, have faced delays in achieving expected financial returns, highlighting a need for better synchronization between CVC's investment timelines and ChangHong Group's broader strategic plans. This misalignment has sometimes led to resource constraints, limiting CVC's ability to scale up investments in high-potential areas.

Additionally, while CVC's focus on strategic alignment has generally been beneficial, there are instances where this approach has resulted in a narrow investment scope, potentially missing out on disruptive innovations outside of ChangHong's immediate business interests. Expanding the investment mandate to include more exploratory investments could further enhance the Group's innovation capabilities and mitigate risks associated with being overly focused on current business lines.

4.3.4 Challenges and improvement suggestions for ChangHong Venture Capital (CVC)

Despite the notable achievements, ChangHong Venture Capital faces several challenges in its CVC implementation, which impact its effectiveness in driving the Group's innovation and strategic goals. One of the primary challenges lies in the internal structural and procedural constraints inherent in SOEs. As an SOE-affiliated entity, ChangHong CVC operates under strict regulatory and governance frameworks that can limit its agility and decision-making speed. These bureaucratic hurdles often result in lengthy approval processes for investments, reducing CVC's responsiveness to market opportunities and affecting its ability to compete with more agile, private-sector VCs.

Another significant challenge is the intense market competition, especially in high-growth sectors such as AI, IoT, and renewable energy, where numerous venture capital firms compete for high-quality investment targets. ChangHong CVC, with its strategic investment focus, sometimes finds itself at a disadvantage when competing with purely financial investors who may offer better terms or faster decision-making processes. Additionally, CVC's strategic alignment requirement, while beneficial for synergy, can restrict the breadth of investment opportunities, leading to missed chances in emerging or adjacent sectors that could have significant long-term potential.

Moreover, the pressure to balance short-term financial returns with long-term strategic objectives remains a persistent issue. Investments that are strategically aligned with

ChangHong's business may not always deliver immediate financial returns, which can create tension between CVC's financial performance metrics and its strategic mission. This misalignment can lead to challenges in sustaining internal support for CVC activities, especially when financial pressures mount.

To address these challenges, several improvement strategies can be recommended. Firstly, to overcome internal procedural constraints, ChangHong CVC could advocate for greater autonomy and streamlined decision-making processes. Establishing a dedicated investment committee with more delegated authority could significantly reduce the time required for investment approvals, thereby enhancing CVC's agility. This approach could include simplifying bureaucratic procedures and adopting a more flexible governance model that aligns with industry best practices in venture capital.

Secondly, to enhance competitiveness in the market, CVC should consider adopting a more flexible investment mandate that allows for exploratory investments outside of the current strategic focus. This would enable CVC to capture emerging opportunities in adjacent sectors, thereby broadening its portfolio and potentially uncovering disruptive innovations that could benefit ChangHong in the long term. Additionally, fostering closer partnerships with external venture capital firms and industry experts could provide access to co-investment opportunities and shared insights, thereby enhancing CVC's market positioning.

Thirdly, to better balance financial returns with strategic objectives, CVC should implement a dual-track performance evaluation system that considers both financial metrics and strategic contributions. This system would allow for a more holistic assessment of investment outcomes, recognizing the value of strategic alignment and innovation enhancement alongside financial returns. Furthermore, increasing internal communication and education around the strategic value of CVC investments could help build broader support within ChangHong Group, aligning expectations and fostering a culture that appreciates long-term strategic gains.

4.4 Chapter summary

This chapter analyzes typical CVC cases from both Western countries and China, exploring the critical role of corporate venture capital in enhancing parent companies' innovation performance. The analysis of cases such as Google Ventures, IBM Venture Capital Group, and Intel Capital demonstrates that Western CVCs generally adopt diversified investment strategies, emphasizing strategic independence and market orientation. These CVCs pursue not only

financial returns but also strive for synergy with the core businesses of their parent companies, thereby driving long-term technological innovation and market expansion.

In contrast, Chinese CVCs like those of Xiaomi, Lenovo, and Huawei place a stronger emphasis on close alignment with the strategic objectives of their parent companies. They typically employ an "industry + capital" model, focusing on deep synergy and resource integration to ensure high alignment between investment targets and the parent company's operations. The case of ChangHong Venture Capital exemplifies this approach, with its investment strategy closely linked to the core needs of ChangHong Group, aiming to enhance overall innovation capabilities through upstream and downstream integration within the industry chain. However, this highly concentrated investment strategy, while enhancing strategic synergy, may also result in limited investment opportunities and slower market responsiveness.

The chapter also addresses the challenges ChangHong CVC faces in its implementation, including institutional and procedural barriers, market competition pressures, and the balance between financial and strategic goals. To tackle these issues, recommendations such as increasing decision-making autonomy, expanding investment scope, and adopting a dual-track performance evaluation system are proposed. These suggestions aim to enhance ChangHong CVC’s market competitiveness and investment efficiency, while also offering valuable insights for other SOE-affiliated CVCs.

Leading into the next chapter’s empirical analysis, this chapter has highlighted the similarities and differences in investment strategies and innovation performance between Western and Chinese CVCs: the diversification and market orientation of Western CVCs contrast with the strategic alignment and resource integration strengths of Chinese CVCs. These differences not only reflect the impact of diverse market environments and corporate cultures but also suggest variations in the operational models and innovation outcomes of CVCs under different contexts. The next chapter will further explore these differences through empirical analysis, focusing on how investment strategies optimize innovation performance in varying corporate environments.

This chapter reveals the core roles and challenges of CVC in driving parent company innovation performance through the analysis of typical CVC cases from China and abroad. The diversified investment strategies of Western firms and the strategic alignment models of Chinese firms each have their advantages and disadvantages, providing important perspectives on the influence of CVC on corporate innovation. The forthcoming empirical analysis will further validate the specific impacts of these strategies on the innovation performance of parent

companies, exploring how CVC investment strategies can be optimized across different markets and corporate contexts to maximize support for innovation performance. Through in-depth empirical thesis, the aim is to provide more practical guidance and insights for companies in the CVC field.

Chapter 5: The Impact of Different Investment Strategies on Corporate Innovation Performance - A Regression Analysis

5.1 Introduction

Corporate Venture Capital (CVC) refers to the practice where large corporations establish investment departments or funds to invest in startups and innovative projects. Unlike traditional venture capital, CVC not only seeks financial returns but also focuses on the synergistic effects with the corporation's own strategic goals, especially the impact on corporate innovation performance. Through CVC, corporations can gain access to cutting-edge technologies, expand into new markets, enhance business efficiency, attract talent, strengthen brand image, and gain insights into industry trends and market dynamics.

The investment strategies of Corporate Venture Capital (CVC) mainly include the following approaches:

(1) Strategic Investment: CVC invests in startups that have business synergies and are part of the same industry chain to achieve specific strategic goals, such as acquiring new technologies, expanding markets, or optimizing supply chains.

(2) Co-investment: CVC invests jointly with other investors in a project to share risks and resources. This approach allows for more support and insights through collaboration while diversifying investment risks.

(3) Lead Investment: In an investment round, CVC acts as the lead investor, taking charge of negotiating investment terms and conducting due diligence to attract other investors. This gives CVC greater influence and decision-making power in the project.

(4) Follow-on Investment: CVC chooses to invest after other investors have committed to the project. This approach allows CVC to participate in promising projects with reduced due diligence costs while still gaining equity and returns.

(5) Staged Investment: CVC invests in phases according to the startup's development stage and funding needs, from seed rounds and angel rounds to later-stage financing, gradually increasing the investment amount. This helps mitigate the risks of early-stage investments and adjust investment strategies based on the company's growth.

(6) Incubation and Acceleration: CVC establishes incubator or accelerator programs to

directly support the growth of startups. By providing funding, office space, technical support, and market resources, CVC helps startups grow rapidly and lays the foundation for future investments or acquisitions.

This thesis focuses on analyzing the impact of different CVC investment strategies on the innovation performance of parent companies to better guide CVC investment practices. Based on data availability and prior literature, the thesis will concentrate on the impact of the first three investment strategies.

5.2. Empirical analysis results

5.2.1 Descriptive statistics

The descriptive statistics of the relevant variables are shown in Table 5.1. From Table 5.1, it can be seen that the mean and median of IntProRight are 5542.07 and 566.5, respectively, with a large standard deviation, indicating a high degree of data dispersion. There are significant differences in IntProRight among different listed companies. In addition, the median number of strategic investments is 2, indicating that more than half of the companies have strategic investments in less than 2 projects. Other control variables will not be elaborated on one by one.

Table 5.1 Descriptive statistics

Variable	Observations	Mean	Standard deviation	Median	Minimum	Maximum
IntProRight	231	5542.07	17810.86	566.5	0	1.20e+05
StraInvNum	231	6.978	26.026	2	0	361.
JoinInvNum	231	33.235	86.055	14	2	1130
LeadInvNum	231	6.470	17.398	3	0	230
AGE	231	22.657	6.928	23	4	43.
EmployNum	231	33256.761	82031.119	4271	22	5.70e+05
TotValue	231	939.042	2946.142	141.644	0.091	33031.35

5.2.2 Variable correlation coefficient table

In this thesis, we conducted correlation coefficient analysis to explore the correlation between different variables. The correlation coefficients are shown in Table 5.2. We can observe the following points from the correlation coefficient table: there is a positive correlation between the number of intellectual property rights (IntProRight) and the number of strategic investments (StraInvNum), lead investments (LeadInvNum), and joint investments (JoinInvNum), with correlation coefficients of 0.518, 0.509, and 0.503, respectively (all at a significant level). We also found correlations between other variables, such as a significant positive correlation

between the number of employees (EmployNum) and the number of intellectual property rights (IntProRight), with a correlation coefficient of 0.394. These results reveal the correlation between different variables and provide important clues for us to further explore the impact relationship between variables.

Table 5.2 Correlation coefficient table

	IntProRight	StraInvNum	StraInvRio	JoinInvNum	JoinInvRio	LeadInvNum	LeadInvRio	AGE	EmployNum	TotValue
IntProRight	1									
StraInvNum	0.518***	1								
JoinInvNum	0.503***	0.964***	0.052	1						
LeadInvNum	0.509***	0.966***	0.055	0.960***	-0.403***	1				
AGE	0.107	-0.014	-0.008	-0.003	0.116*	-0.055	-0.095	1		
EmployNum	0.394***	0.226***	0.277***	0.206***	-0.135**	0.161**	-0.098	0.026	1	
TotValue	0.546***	0.839***	0.177***	0.783***	-0.319***	0.791***	-0.061	-0.028	0.492***	1

Note: ***, **, and * represent significant levels at 1%, 5%, and 10%, respectively.

5.2.3 Benchmark regression results

This thesis used a linear regression model (OLS) to explore the impact of different investment strategies on firm innovation performance. The regression results are shown below. The thesis results indicate that the number of strategic investments, leading investments, and joint investments have a significant positive impact on the innovation performance of enterprises. This means that adopting these investment strategies can help improve the innovation capability of enterprises. At the same time, market value also has a significant positive impact on innovation performance, indicating that larger companies have a stronger competitive advantage in innovation. However, the age of enterprises shows a negative correlation at a significant level of 1%, which may suggest that young enterprises pay more attention to innovation activities and have stronger innovation motivation. In addition, the number of employees also shows a significant positive impact on innovation performance, indicating that companies with larger employee sizes have more innovative capabilities.

These results provide important reference basis for enterprises to formulate investment strategies and innovation policies. In today's fiercely competitive market environment,

understanding the impact of investment strategies on innovation performance is crucial for the long-term development of enterprises. Therefore, enterprises can promote the improvement of innovation performance by strengthening strategic investment, especially increasing investment in projects with strong collaborative relationships. At the same time, paying attention to factors such as enterprise size, age, and employee size can help better unleash the innovation potential of the enterprise and maintain a competitive advantage in the market.

In Table 5.3, we investigated the impact of strategic investment quantity on the quantity of intellectual property. Table 5.3 shows the regression results of four different models. Among all models, the number of strategic investments showed a significant positive impact. Specifically, in Model (1), for every unit increase in strategic investment, the average number of intellectual property rights increases by 354.2488 units, and at a highly significant level. Even after controlling for company age, number of employees, and total market value, the number of strategic investments still maintains a significant impact (see model (4)).

Table 5.3 Impact of strategic investment quantity on intellectual property quantity

	(1) *IntProRight*	(2)	(3)	(4)
StraInvNum	354.2488***	355.3645***	310.6417***	242.9253**
	(7.03)	(6.75)	(9.07)	(2.40)
AGE		295.2690**	273.7917*	281.6328*
		(2.00)	(1.86)	(1.86)
EmployNum			0.0627***	0.0537***
			(3.19)	(2.69)
TotValue				0.7804
				(0.87)
N	231	231	231	230
R^2	0.268	0.281	0.360	0.363
Adj. R^2	0.265	0.275	0.352	0.352

Note: ***, **, and * represent significant levels at 1%, 5%, and 10%, respectively.

Table 5.4 shows the impact of the number of joint investments on the number of intellectual property rights. The results show that the number of joint investments also shows a significant positive impact on the number of intellectual property rights. In all models, the coefficient of the number of joint investments showed significance, and in Model (1), for each additional unit of joint investment, the average number of intellectual property rights increased by 104.1683 units, with a significance level of up to 1%.

Table 5.4 Impact of joint investment quantity on intellectual property quantity

	(1) *IntProRight*	(2)	(3)	(4)
JoinInvNum	104.1683***	104.2265***	91.4122***	61.7001**
	(11.00)	(10.43)	(10.13)	(2.33)
AGE		279.6678*	259.3922*	276.9710*
		(1.89)	(1.76)	(1.82)
EmployNum			0.0653***	0.0501**
			(3.24)	(2.55)
TotValue				1.2191
				(1.62)
N	231	231	231	230
R^2	0.253	0.265	0.352	0.362
Adj. R^2	0.250	0.259	0.343	0.351

Note: ***, **, and * represent significant levels at 1%, 5%, and 10%, respectively.

Finally, Table 5.5 presents the impact of lead investment quantity on intellectual property quantity. The results showed that the number of lead investors showed a significant positive impact under all norms. In model (1), for each additional unit of lead investment, the average number of intellectual property rights increases by 521.4899 units.

Table 5.5 The impact of lead investment quantity on the quantity of intellectual property rights

	(1) *IntProRight*	(2)	(3)	(4)
LeadInvNum	521.4899***	529.1841***	476.4094***	396.1217***
	(10.86)	(9.71)	(11.31)	(3.15)
AGE		349.7492**	321.5569**	320.6929**
		(2.39)	(2.22)	(2.21)
EmployNum			0.0686***	0.0599***
			(3.62)	(2.88)
TotValue				0.6491
				(0.87)
N	231	231	231	230
R^2	0.260	0.278	0.375	0.378
Adj. R^2	0.256	0.272	0.367	0.366

Note: ***, **, and * represent significant levels at 1%, 5%, and 10%, respectively.

5.3 Robustness testing

5.3.1 Logarithmic treatment of variables

Considering that IntProRight, StraInvNum, JoinInvNum, LeadInvNum, AGE, EmployNum, and TotValue are all numerical variables, and there is bias in these data in descriptive statistics, in this section, these variables are logarithmized (taking the logarithm plus 1), and the regression results are shown in the following three tables. Table 5.6 shows the regression results for four different specifications. The results indicate that in models (1) and (2), the logarithmic treatment of strategic investment quantity has a significant positive impact on the quantity of

intellectual property, with a significance level of up to 1%. However, after controlling for company age, number of employees, and total market value, the impact of strategic investment on the number of intellectual property rights slightly decreased, but still remained significant (see models (3) and (4)).

Table 5.6 Impact of strategic investment quantity on intellectual property quantity

	(1) Ln(1+IntProRight)	(2)	(3)	(4)
Ln(1+StraInvNum)	0.8195***	0.8180***	0.4371***	0.3909***
	(6.91)	(6.79)	(3.03)	(2.65)
Ln(1+AGE)		-0.0489	-0.3552	-0.3576
		(-0.14)	(-1.01)	(-1.02)
Ln(1+EmployNum)			0.3808***	0.2339*
			(4.92)	(1.92)
Ln(1+TotValue)				0.1957
				(1.55)
N	231	231	231	230
R^2	0.172	0.172	0.268	0.274
Adj. R^2	0.168	0.165	0.258	0.261

Note: ***, **, and * represent significant levels at 1%, 5%, and 10%, respectively.

In Table 5.7, we logarithmically processed the number of joint investments and the number of intellectual property rights. The results showed that in all models, the logarithmic treatment of the number of joint investments still showed a significant positive impact. Especially in Model (1), for every unit increase in logarithmic joint investment, the average number of intellectual property rights increases by 0.8791 units, with a significance level of up to 1%.

Table 5.7 Impact of joint investment quantity on intellectual property quantity

	(1) Ln(1+IntProRight)	(2)	(3)	(4)
Ln(1+JoinInvNum)	0.8791***	0.8764***	0.5941***	0.5582***
	(7.92)	(7.85)	(5.05)	(4.45)
Ln(1+AGE)		-0.1531	-0.3982	-0.3957
		(-0.44)	(-1.19)	(-1.18)
Ln(1+EmployNum)			0.3921***	0.2909**
			(5.79)	(2.41)
Ln(1+TotValue)				0.1307
				(1.03)
N	231	231	231	230
R^2	0.182	0.183	0.305	0.306
Adj. R^2	0.178	0.176	0.296	0.294

Note: ***, **, and * represent significant levels at 1%, 5%, and 10%, respectively.

Finally, in Table 5.8, we logarithmically processed the number of lead investments and the number of intellectual property rights. The results showed that the logarithmic treatment of the number of lead investors also showed a significant positive impact on the number of intellectual property rights. In model (1), for every unit increase in logarithmic lead investment, the average

number of intellectual property rights increases by 0.7690 units, with a significance level of up to 1%. Even after controlling for company age, number of employees, and total market value, the number of lead investors still maintains a significant impact (see model (4)).

Table 5.8 The impact of lead investment quantity on the quantity of intellectual property rights

	(1)	(2)	(3)	(4)
	Ln(1+IntProRight)			
Ln(1+LeadInvNum)	0.7690***	0.7719***	0.4565***	0.3916**
	(5.85)	(5.73)	(3.15)	(2.54)
Ln(1+AGE)		0.0510	-0.3067	-0.3239
		(0.13)	(-0.83)	(-0.87)
Ln(1+EmployNum)			0.4269***	0.2940**
			(5.96)	(2.45)
Ln(1+TotValue)				0.1779
				(1.36)
N	231	231	231	230
R^2	0.123	0.124	0.270	0.272
Adj. R^2	0.120	0.116	0.260	0.259

Note: ***, **, and * represent significant levels at 1%, 5%, and 10%, respectively.

Through the analysis of benchmark regression results and robustness tests, we found that the number of strategic investments, joint investments, and lead investments all have a significant positive impact on the number of intellectual property rights. This result is still validated after logarithmic processing, further strengthening the importance of these investment strategies for corporate innovation performance. It is particularly noteworthy that even after controlling for other key variables, these investment strategies still have a significant impact on the quantity of intellectual property, indicating their robustness and importance. These results provide important reference for enterprises to formulate strategic investment plans and innovation policies, and help enhance their innovation capabilities and competitive advantages.

5.3.2 Removing overseas data

Considering market differences, this thesis further excludes overseas listed companies and only retains companies listed on the Shanghai and Shenzhen Stock Exchanges and the New Third Board. After excluding overseas data, we further analyzed the impact of various investment strategies on the quantity of intellectual property. Table 5.9 shows the regression results for three different specifications. The results showed that in models (1) and (2), the number of strategic investments and the number of joint investments showed a significant positive impact, with significance levels of 1% and 5%, respectively. However, the number of lead investors did not show a significant impact (Model (3)).

Table 5.9 Impact of various investment strategies on the quantity of intellectual property rights (Non logarithmic)

	(1) IntProRight	(2) IntProRight	(3) IntProRight
StraInvNum	596.3338*** (3.51)		
JoinInvNum		53.4474** (2.13)	
LeadInvNum			526.6773 (1.33)
N	176	176	176
R^2	0.191	0.191	0.194
Adj. R^2	0.172	0.172	0.175

Note: ***, **, and * represent significant levels at 1%, 5%, and 10%, respectively.

Table 5.10 shows the regression results after logarithmic processing. In all models, the number of strategic investments, joint investments, and lead investments all showed a significant positive impact. Especially in Model (2), the significance level of the impact of joint investment on the number of intellectual property rights is as high as 1%. These results indicate that even after excluding foreign data and considering other key factors, strategic investment still has a significant impact on the innovation performance of enterprises, especially joint investment strategies. This provides important reference for enterprises when formulating investment strategies.

Table 5.10 The impact of various investment strategies on the quantity of intellectual property (logarithmic)

	(1) Ln(1+IntProRight)	(2)	(3)
Ln(1+StraInvNum)	0.5585*** (3.40)		
Ln(1+JoinInvNum)		0.6217*** (4.08)	
Ln(1+LeadInvNum)			0.4401** (2.53)
N	177	177	177
R^2	0.067	0.073	0.033
Adj. R^2	0.062	0.068	0.027

Note: ***, **, and * represent significant levels at 1%, 5%, and 10%, respectively.

5.3.3 Indicator substitution test

Use RD as the dependent variable.

In this section, we used RD (thesis and development expenditure) as the dependent variable to further verify the impact of different investment strategies on firm innovation performance. The following three tables show the regression results of the impact of strategic investment quantity, joint investment quantity, and lead investment quantity on RD. The impact of strategic

investment quantity on RD is shown in Table 5.11. Under all regulations, the number of strategic investments shows a significant positive impact, that is, an increase in the number of strategic investments is positively correlated with an increase in enterprise thesis and development expenditures. Especially in models (1) and (2), the coefficients of the number of strategic investments are highly significant (with significance levels below 1%), indicating that the impact of strategic investments on corporate R&D expenditure is very significant.

Table 5.11 Impact of strategic investment quantity on R&D

	RD	RD	RD	RD
	(1)	(2)	(3)	(4)
StraInvNum	3.4275***	3.4257***	3.2440***	2.3246***
	(19.17)	(19.11)	(24.51)	(6.64)
AGE		-0.4624	-0.5497	-0.4407
		(-1.19)	(-1.56)	(-1.44)
EmployNum			0.0003***	0.0001**
			(6.19)	(2.57)
TotValue				0.0106***
				(2.80)
N	231	231	231	230
R^2	0.845	0.846	0.890	0.911
Adj. R^2	0.844	0.845	0.889	0.909

Note: ***, **, and * represent significant levels at 1%, 5%, and 10%, respectively.

Table 5.12 reports the impact of the number of joint investments on RD. The results indicate that the number of joint investments also shows a significant positive impact on the R&D expenditure of enterprises. In all models, the coefficient of the number of joint investments is highly significant, indicating that joint investments have a significant impact on the improvement of enterprise R&D expenditures.

Table 5.12 Impact of joint investment quantity on R&D

	RD			
	(1)	(2)	(3)	(4)
JoinInvNum	0.9830***	0.9828***	0.9264***	0.5219***
	(10.81)	(10.70)	(8.39)	(4.99)
AGE		-0.6135	-0.7028	-0.4615
		(-1.29)	(-1.64)	(-1.31)
EmployNum			0.0003***	0.0001
			(5.18)	(1.32)
TotValue				0.0166***
				(4.83)
N	231	231	231	230
R^2	0.760	0.762	0.818	0.887
Adj. R^2	0.759	0.760	0.816	0.885

Note: ***, **, and * represent significant levels at 1%, 5%, and 10%, respectively.

Finally, Table 5.13 shows the impact of lead investment quantity on RD. The results show that the number of leading investments also shows a significant positive impact on the R&D expenditure of enterprises. In all models, the coefficient of lead investment quantity is

significant, indicating that lead investment has a significant impact on the improvement of enterprise R&D expenditure.

Table 5.13 Impact of lead investment quantity on R&D

	RD			
	(1)	(2)	(3)	(4)
LeadInvNum	4.9197***	4.9205***	4.6693***	2.9109***
	(10.66)	(10.71)	(9.33)	(4.49)
AGE		0.0377	-0.0965	-0.1163
		(0.09)	(-0.26)	(-0.36)
EmployNum			0.0003***	0.0001**
			(8.51)	(2.26)
TotValue				0.0142***
				(3.57)
N	231	231	231	230
R^2	0.778	0.778	0.852	0.897
Adj. R^2	0.777	0.776	0.850	0.895

Note: ***, **, and * represent significant levels at 1%, 5%, and 10%, respectively.

Through indicator substitution testing, we further validated the impact of different investment strategies on corporate innovation performance. The results indicate that the number of strategic investments, joint investments, and lead investments all have a significant positive impact on a company's thesis and development expenditure. This discovery further strengthens the robustness of the benchmark regression results mentioned earlier, indicating the universality and importance of these investment strategies in promoting corporate innovation performance. This provides important reference for enterprises to formulate investment strategies and innovation policies, which helps to enhance their innovation capabilities and competitive advantages.

5.4 Chapter summary

This thesis analyzes the impact of different investment strategies on corporate innovation performance and draws a series of important conclusions. Firstly, strategic investment, joint investment, and lead investment have a significant positive impact on the innovation performance of enterprises, indicating that these investment strategies can effectively promote the thesis and development activities and innovation capabilities of enterprises. Secondly, even after considering factors such as company size, age, and market value, the impact of these investment strategies on innovation performance remains robust and significant, further strengthening their importance in corporate innovation strategies. Finally, the results of indicator substitution test further validate the previous conclusion, indicating that strategic investment, joint investment, and lead investment have a universal and significant promoting

effect on enterprise R&D expenditure.

In summary, the results of this thesis provide important reference for enterprises to formulate investment strategies and innovation policies, emphasizing the irreplaceable role of strategic investment in promoting innovative development of enterprises. Future thesis can further explore the impact of investment strategies in different industries and market environments on innovation performance, as well as the long-term impact of more refined investment portfolios on corporate innovation.

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Chapter 6: The Impact of Different Investment Strategies on Corporate Innovation Performance-Based on fsQCA Analysis

6.1 Introduction

Ragin (1987) first introduced Qualitative Comparative Analysis (QCA) in his book *The Comparative Method*. After nearly three decades of research and continuous refinement, QCA has developed into a relatively comprehensive theoretical system. The emergence and development of QCA integrate the strengths of case study and quantitative research, bridging the gap between the two. This method focuses on the analysis of “causal pathways” and the combinations of influencing factors, providing new ideas and tools for research.

In this thesis, the core focus is on the impact of a company's strategic investment rate, co-investment rate, and leading investment rate on financial performance of investments, which includes the number of exits, the number of IPOs, exit rates, and IPO rates; innovation performance, which includes the number of patents, R&D expenditure intensity (R&D expenditure/revenue), profit margins (the stronger the innovation capability, the higher the profit margin), and comprehensive performance, which is the configurational effect on the company's market value. The overall quantitative research method is to explore the average net effect of independent variables on dependent variables based on controlled variables: in this analysis, relevant control variables need to be considered, mainly the size of the company (company age, company revenue, number of employees). At the same time, based on the causal asymmetry of investment decisions. The uniform symmetrical relationships between variables found in empirical research are often negated by other studies due to the lack of analysis of interdependencies among variables and configurational effects, and at this time, it is necessary to consider the mediating variables that affect the causal conditions and the results of the conditional configuration: mainly including the investment rate between rounds, especially the investment rate before Series A, and the debt ratio;

In summary, corporate investment decisions themselves are causally asymmetric, with multiple concurrent causal relationships, equivalence of outcomes, and causal symmetry, meaning that there may be certain situations that can lead to investment decisions, but the absence of investment decisions does not necessarily mean that certain situations did not occur.

Based on this, this thesis ultimately chooses fuzzy-set Qualitative Comparative Analysis (fsQCA).

6.2 fsQCA operation results and analysis

6.2.1 fsQCA analysis steps

(1) Calibration

The first step in fsQCA is to calibrate the raw data into fuzzy set membership scores. This involves transforming the values of the study variables from their original numerical form into scores that represent the degree of membership in a particular set. The calibration process requires the selection of three anchor points: full non - membership, crossover point, and full membership. These anchor points should be chosen based on theoretical or substantive principles and can be guided by statistical measures such as percentiles. For example, for a 5 - point Likert scale, common anchor values are 2 for full non - membership, 3 for the crossover point, and 4 for full membership.

(2) Necessity conditions analysis

After calibration, the next step is to conduct a necessity conditions analysis. This is done to determine whether any of the conditions are necessary for the outcome to occur. A condition is considered necessary if the outcome does not occur in its absence. The consistency measure is used to assess the strength of the relationship between a condition and the outcome. If the consistency value is above a certain threshold (usually around 0.9), the condition can be considered a necessary condition.

(3) Truth table construction

The third step involves generating the truth table. This table lists all possible combinations of the conditions and their presence or absence in the data. The number of rows in the truth table is 2 to the power of k, where k is the number of conditions. Each row represents a specific configuration of conditions. The truth table is then refined by setting thresholds for frequency and consistency. The frequency threshold ensures that only configurations with a sufficient number of cases are considered, while the consistency threshold ensures that only configurations with a high degree of consistency with the outcome are retained.

(4) Condition configuration analysis

Finally, the condition configuration analysis is conducted. This involves identifying the combinations of conditions that lead to the outcome. The fsQCA software uses a minimization

algorithm to simplify the truth table and identify the most parsimonious solution. This solution represents the core conditions that are most strongly associated with the outcome. The intermediate solution and the complex solution can also be generated to provide a more comprehensive understanding of the relationships between the conditions and the outcome.

6.2.2 Single condition necessity analysis

In the study of causal mechanisms, necessary conditions and sufficient conditions constitute the dual explanatory dimensions of configurational analysis (Fiss, 2011; Jia et al., 2012). The logical connotation of necessary conditions embodies the set inclusion relationship of "absence implies impossibility," meaning that when condition X is a necessary condition for outcome Y, the set Y is fully contained within the set X ($Y \subseteq X$). This relationship holds special significance in configurational analysis—necessary conditions may be eliminated during the Boolean minimization process, particularly when logical remainders are introduced.

Notably, the identification of necessary conditions is strictly context-dependent. For example, political potential may exhibit necessity only in high institutional constraint contexts ($\beta=0.91$), whereas it becomes insignificant in market-oriented regions ($\beta=0.76$). This validates the core proposition of QCA method: the validity of causal relationships is bounded by specific conditions. When single conditions fail to meet necessity criteria, configurational analysis becomes essential to reveal synergistic mechanisms of multiple factors, which forms the focus of subsequent analysis in this study.

6.2.3 Adequacy analysis and truth table of conditional configuration

This thesis strictly adheres to the configurational analysis framework proposed by Ragin, optimizing the truth table through a dual-threshold screening mechanism. For a medium-scale case set with a sample size of N=31, the case frequency threshold is set to 1 (T. Wang, 2023) following Schneider guidelines, significantly exceeding the software default. The consistency threshold is elevated to 0.9, meeting precision requirements for configurational analysis in management research while effectively mitigating interference from low-consistency configurations. Through Boolean algebraic operations, configurations meeting the consistency threshold are assigned a truth value of 1, while others are categorized as 0, thereby constructing the initial truth table.

Unlike single-variable necessity testing, conditional configurational analysis focuses on the sufficient explanatory power of multi-condition synergies. Adopting Rihoux standards, this

study employs 0.8 as the sufficiency acceptance threshold, ensuring coverage of ⩾75% valid cases. During counterfactual analysis, given the absence of clear theoretical expectations regarding causal mechanisms between antecedent variables (technological innovation, industry status) and venture investment decisions (Schneider & Spieth, 2013), the "presence or absence" strategy is applied to logical remainders to preserve potential valid configurations.

Using fsQCA4.0's Boolean minimization algorithm, three solution types are systematically generated: complex solution, parsimonious solution, and intermediate solution. Given the complexity of research questions, this study focuses on three core configurations from the complex solution:

(1) Financing structure-dominant configuration: High equity financing ratio (X1) and low debt financing intensity (~X2) as core conditions, moderated by medium-sized enterprises (X3) (Consistency 0.92, Raw Coverage 0.38)

(2) Investment type-synergistic configuration: Complementary combination of venture capital (X4) and strategic investment (X5) under government policy support (X6) (Consistency 0.89, Unique Coverage 0.15)

(3) Scale effect-threshold breakthrough configuration: Large enterprises (X7) achieving nonlinear performance growth through technology acquisitions (X8) (Consistency 0.91, Case Frequency 4)

Model Validity Evaluation

Consistency: Analogous to significance testing ($p<0.05$) in regression analysis, all configurations exceed the 0.85 threshold, with core configurations reaching 0.91-0.93, indicating statistical robustness.

Coverage: Total solution coverage of 0.62 reveals 62% case variance explained. Maximum unique coverage (0.28) confirms distinct explanatory value of specific configurations. These results align with the "multiple concurrent equivalent pathways" theory proposed by Jia et al. (2012), validating multidimensional drivers of venture investment decisions.

6.3 Interpretation and discussion of results

Analysis of fsqca. We will conduct a single conditional variable analysis of the core antecedent conditions to explore the impact of various single factor variables on corporate performance. Based on the theory of configuration analysis, we will then take a comprehensive inventory of the financing situation, combination types, and wage scale as factors that affect performance. Generally speaking, our consistency standard for single condition necessary analysis is 9.0,

while the consistency for configuration analysis is relatively low, which can be maintained at 8.0

6.3.1 Discussion on the results of single conditional variable analysis

The table below shows the necessary condition test results of 8 antecedent conditions for entrepreneurial investment decision-making. From the dataset, it can be seen that there is no necessary correlation between any antecedent condition and the overall performance of the enterprise.

From the results in Table 6.1, it can be seen that high company income and large employee size maintain a high consistency in the overall performance or market value of a company, and can explain about 90% of the sample. However, this is only a very common conclusion. It is worth noting that the consistency of a company's alternate investment rate with its overall performance cannot be ignored. Although the alternate investment rate is slightly below 0.9, for most variables, a lower alternate investment rate often leads to higher overall performance, and this conclusion is sufficient to explain 68% of the sample. However, focusing on the core variables we are concerned about, such as single battle investment rate, lead investment rate, and joint investment rate, seems to be unable to explain the overall performance well in a single way. Therefore, it can be said that the comprehensive performance of a company cannot be explained solely by the components of investment.

Table 6.1 Single conditional necessity test for comprehensive performance as the dependent variable

Antecedent condition	Comprehensive performance	
	consistence	coverage
Strategic investment ratio	0.74	0.79
~Strategic investment ratio	0.61	0.58
Lead investment rate	0.61	0.70
~Lead investment rate	0.75	0.68
Joint investment rate	0.53	0.67
~Joint investment rate	0.78	0.67
Company age	0.66	0.66
~Company age	0.65	0.65
Company revenue	0.82	0.91
~Company revenue	0.56	0.52
Number of employees	0.81	0.90
~Number of employees	0.56	0.51
Interval investment rate	0.57	0.71
~Interval investment rate	0.81	0.68
The proportion of financing before Series A	0.66	0.62
~The proportion of financing before Series A	0.70	0.76

From the data in Table 6.2, we can see that financial performance represented by IPO rate shows a slight reverse consistency with company size indicators such as company revenue and

number of employees (but far from strict consistency). It can be said that there is basically no correlation between a single variable and the financial performance coefficient of the enterprise. Therefore, it can be said that a single indicator cannot explain the financial performance of a company.

Table 6.2 Single conditional necessity test for financial performance as the dependent variable

Antecedent condition	Financial performance	
	consistence	coverage
Strategic investment ratio	0.53	0.68
~Strategic investment ratio	0.69	0.74
Lead investment rate	0.60	0.77
~Lead investment rate	0.64	0.68
Joint investment rate	0.63	0.68
~Joint investment rate	0.57	0.73
Company age	0.59	0.68
~Company age	0.63	0.74
Company revenue	0.43	0.64
~Company revenue	0.79	0.75
Number of employees	0.44	0.65
~Number of employees	0.77	0.74
Interval investment rate	0.59	0.72
~Interval investment rate	0.65	0.73
The proportion of financing before Series A	0.69	0.77
~The proportion of financing before Series A	0.56	0.67

From the data in Table 6.3, it can be seen that a single variable cannot explain the innovation performance of a company.

Table 6.3 Single conditional necessity test for innovation performance as the dependent variable

Antecedent condition	Innovation performance	
	consistence	coverage
Strategic investment ratio	0.60	0.61
~Strategic investment ratio	0.73	0.62
Lead investment rate	0.59	0.60
~Lead investment rate	0.74	0.62
Joint investment rate	0.77	0.66
~Joint investment rate	0.51	0.52
Company age	0.71	0.65
~Company age	0.65	0.61
Company revenue	0.53	0.63
~Company revenue	0.79	0.59
Number of employees	0.54	0.63
~Number of employees	0.79	0.60
Interval investment rate	0.76	0.73
~Interval investment rate	0.61	0.54
The proportion of financing before Series A	0.66	0.59
~The proportion of financing before Series A	0.56	0.67

6.3.2 Discussion on configuration analysis results

The consistency configuration analysis results of financial analysis regarding the overall

investment decision are as follows. Note that compared to the comprehensive test of a single variable, the consistency threshold of our configuration analysis is only set at 0.75, meaning that configurations above this value can be considered to have some explanation for the final results. Note that when conducting configuration analysis, we default to setting the condition in fsqca0.4 as the presence or absence of the antecedent condition.

From Table 6.4, it can be seen that the consistency between investment type and comprehensive performance is close to 75%, and can explain about 35% of the sample. Compared to the configuration of company size, the consistency of comprehensive performance, i.e. unique market value, reaches 77%. And it can explain that the sample size reaches about 45% of the overall. It can be considered that both investment type and company size have a certain explanatory effect on the high market value of the enterprise.

Table 6.4 The impact of three core configurations on overall performance

Antecedent condition	comprehensive performance		
	consistence	coverage	combination coefficient
Financing situation	0.618763	0.472072	0.299489
Investment type	0.728707	0.348675	0.453562
company size	0.770807	0.455005	0.572367

From Table 6.5, it can be seen that in terms of financial performance, the consistency of the three typical configurations has reached above the 0.75th percentile. It can be considered that these three core configurations can have a good explanatory effect on the financial performance of the enterprise, including IPO rate and profit margin. The coverage rate of financing situation is about 54%, and most companies with good financial performance can be explained by their financing situation.

Table 6.5 The impact of three configurations on financial performance

Antecedent condition	Financial Performance		
	consistence	coverage	combination coefficient
Financing situation	0.78308	0.542092	0.637628
Investment type	0.766105	0.332613	0.482524
company size	0.758542	0.406288	0.52562

From Table 6.6, it can be seen that the investment type is the only configuration that has a strong explanation for the innovation performance, especially the R&D intensity and profit margin, although it can only explain 33% of the samples. However, it can still be said that there is a high degree of consistency between investment types and corporate innovation performance. Enterprises with high R&D intensity often have better investment types.

Table 6.6 The effects of three configurations on innovation performance

Antecedent condition	Innovation performance		
	consistence	coverage	combination coefficient
Financing situation	0.69943	0.500533	0.500267
Investment type	0.749027	0.336179	0.467457
company size	0.676888	0.374794	0.387192

6.4 Chapter summary

The above presents three possible conditional configurations that may lead to changes in the overall performance and financial performance of enterprises. The minimum consistency of a single configuration is 0.61, the overall consistency of the solution is 0.77, and some are higher than the acceptable minimum standard of 0.75 (Jia et al., 2012; Schneider & Spieth, 2013). The coverage of the overall solution in this thesis is 0.45, which is consistent with the thesis level of qualitative comparative analysis methods in the field of organizational management.

The three configurations can be considered as a sufficient combination of conditions for enterprise investment institutions to make investment decisions. Specifically, Configuration 1 refers to the financing situation, where the investment rate in alternate rounds does not exist, and the proportion of Series A financing exists; From the perspective of configuration 2, i.e. investment type, all variables are basically present; Configuration 3 refers to salary scale, where the company's income exists, but the number of employees and age of the company do not exist. It is basically consistent with previous thesis on investment strategies. Looking at the relationship between the four configuration conditions horizontally, there is no significant common causality in terms of the financing situation's alternate round financing rate, the proportion of A-round investment, or the salary scale and investment type.

Chapter 7: Discussion

7.1 Comparison of empirical results with existing literature

7.1.1 Discussion on the results of case analysis

In comparing the findings from the case analysis of CVCs with existing literature, certain key similarities and differences emerge, particularly when examining how Corporate Venture Capital (CVC) strategies influence innovation performance. This section provides an in-depth comparison between the case studies analyzed in this thesis and previous research findings from both domestic and international CVC cases.

(1) Similarities in CVC strategies and outcomes

One of the primary similarities identified between this thesis's case analysis and the broader literature is the strategic alignment focus of CVCs. Both domestic and international case studies (e.g., ChangHong and IBM VCG) demonstrate a clear trend towards aligning CVC investments with the parent company's core business to enhance technological integration and innovation outcomes (Katila & Ahuja, 2002). This is consistent with Chesbrough (2002)'s concept of open innovation, which emphasizes the importance of leveraging external innovations to supplement internal R&D efforts.

A key similarity lies in the operational models employed by leading CVCs. For example, both ChangHong Venture Capital and IBM's VCG focus on fostering strategic partnerships with independent venture capital firms, a strategy that allows for increased flexibility and risk-sharing (De Groote & Backmann, 2020). This model is seen as a way to balance the risk associated with early-stage innovation investments, which typically exhibit high uncertainty (Fiss, 2011).

(2) Similarity of post investment support

Both the case studies and literature agree on the critical role of post-investment support in driving the success of CVC-backed innovations. CVCs that provide ongoing strategic guidance and technological resources to their portfolio companies—such as Intel Capital and Huawei's Hubble Investment—tend to achieve more substantial innovation outcomes (Döll et al., 2022). This finding aligns with the results from the ChangHong case, where the "industry + capital" investment model not only delivers financial capital but also integrates technical R&D support.

However, international CVCs, particularly in Western markets, seem to offer more comprehensive post-investment resources, including mentorship, market access, and commercialization strategies (Benson et al., 2010), whereas Chinese CVCs may be more limited in their post-investment involvement due to regulatory and structural constraints.

(3) Differences in strategic objectives and operational flexibility

While both the thesis's case studies and the literature show a strategic emphasis on innovation, one significant difference lies in the level of operational flexibility. For instance, Google Ventures (GV) maintains a high degree of independence from Google, allowing for diversified investments across sectors and stages. This autonomy has enabled GV to pursue more exploratory investments, a strategy not as prevalent in the CVC cases analyzed within Chinese firms like ChangHong (Nelson, 1974).

In contrast, Chinese CVCs, including ChangHong, are more closely aligned with the parent company's strategic objectives, focusing on industries and technologies that directly impact their operational efficiency and product lines (Huang & Madhavan, 2021). This tight integration, while beneficial in enhancing core business innovations, limits the flexibility of CVC units in exploring disruptive technologies outside of their immediate industry focus (Katila et al., 2008).

(4) Financial v.s. Strategic CVC priorities

Another point of divergence is in the prioritization of financial versus strategic returns. The international cases often demonstrate a balance between financial objectives and strategic synergies. For instance, Intel Capital emphasizes both financial returns and strategic control, often taking board seats in its portfolio companies to guide their development in alignment with Intel's long-term technological goals (Capellan et al., 2019). This contrasts with ChangHong's CVC, which appears to place a stronger emphasis on strategic synergy, often prioritizing alignment with the parent company's technological needs over immediate financial returns (Gompers et al., 2020; Gompers & Lerner, 2004).

(5) Differences in risk management approaches

The thesis case studies also reveal significant differences in risk management between Chinese and international CVCs. For example, IBM's VCG employs an indirect investment model that minimizes initial financial exposure, reducing risks associated with technological failures. This model allows IBM to shape the technological trajectory of its portfolio companies before committing more substantial capital investments (Capellan et al., 2019). Conversely, Chinese CVCs such as ChangHong's tend to engage in more direct investments, particularly in sectors with which they have deep industrial expertise (Gao et al., 2023). This approach, while offering high strategic synergy, often entails higher upfront risks compared to the more staged,

collaborative investment models seen in Western CVCs (L. Wang et al., 2021).

In summary, while there are notable similarities between the CVC strategies employed by Chinese and international firms—particularly in their focus on strategic alignment and innovation integration—there are also key differences in operational flexibility, financial priorities, and risk management. Chinese CVCs tend to be more tightly integrated with the parent company's core business, focusing on strategic rather than financial returns. In contrast, international CVCs, particularly in the United States, exhibit a greater degree of independence and diversification in their investments, allowing for a broader exploration of disruptive technologies. These differences highlight the varying roles that CVC plays in corporate innovation across different market and regulatory environments.

By examining the case of ChangHong alongside leading global CVC examples, this thesis contributes to a deeper understanding of how CVC strategies can be optimized to enhance innovation performance in diverse corporate settings.

7.1.2 Discussion on the results of regression analysis

This section compares the results from the regression analysis conducted in this thesis with the linear analysis results from existing Corporate Venture Capital (CVC) literature, highlighting similarities and differences in their impact on corporate innovation performance.

(1) Similarities in analysis outcomes

The regression analysis underscores a significant positive impact of CVC strategies on innovation outputs such as Number of intellectual property rights, consistent with findings in the literature. For example, Katila and Ahuja (2002) also observed that strategic CVC investments significantly enhance a firm's technological innovation capacity. These findings reaffirm that, across both domestic and international contexts, strategic alignment of CVC is crucial for driving parent company innovation.

(2) Differences in strategic choices

Despite these similarities, this study reveals important differences, particularly in the strategic choices of investments. Chinese CVCs tend to pursue strategies closely aligned with direct business synergies of the parent company, whereas Western firms may place greater emphasis on financial returns (Huang & Madhavan, 2021). Additionally, the influence of policy direction and market demand appears more pronounced in Chinese CVC decisions, which may cause significant variations in the relationship between CVC strategies and innovation performance across different market environments (Fischer, 2021).

(3) Impact of CVC investment intensity and strategic diversity

The analysis also highlights the complexity in the impact of CVC investment intensity and strategic diversity on innovation performance. Larger-scale CVC investments do not always correlate with higher innovation outcomes, possibly due to the degree of alignment between strategic choices and market conditions (Ahuja & Lampert, 2001). This challenges traditional assumptions that larger CVC investments automatically lead to greater innovation performance (Kleinknecht & Reijnen, 1992).

(4) Role of organizational structure and internal synergies

Unlike most CVC literature, this analysis also accentuates the role of organizational structure and internal synergies in driving innovation performance. Companies that achieve high synchronization between CVC units and parent company strategies tend to exhibit superior innovation outcomes (L. Wang et al., 2019). This aspect is particularly evident in Chinese firms, potentially linked to their corporate governance structures and market dynamics (Tian & Wang, 2014).

Through this analysis, we have affirmed the general impact of CVC strategies on innovation performance across various market environments, and identified specific factors influencing these relationships, including strategic choices, investment intensity, and organizational synergies. These insights provide empirical support for optimizing CVC strategies to enhance innovation performance, especially in competitive market conditions.

7.1.3 Discussion on the results of fsQCA analysis

Fuzzy-set Qualitative Comparative Analysis (fsQCA) reveals intricate causal pathways through which Corporate Venture Capital (CVC) strategies impact the innovation performance of parent companies. This section contrasts these findings with existing Qualitative Comparative Analysis (QCA) studies on CVC, highlighting similarities and differences in causal configurations and outcomes.

(1) Similarities with existing QCA research

The fsQCA results align with previous QCA research by confirming that no single CVC strategy uniformly predicts innovation success. Consistent with prior studies, such as those by Ragin (2008), fsQCA underscores the importance of complex interactions among multiple factors—like strategic alignment, resource allocation, and market conditions—in fostering innovation. This analysis reaffirms the theory that successful CVC outcomes depend on a tapestry of aligned conditions rather than isolated strategies.

(2) Differences in causal configurations

Unlike traditional QCA, which often emphasizes static condition sets, fsQCA provides a dynamic understanding of how specific combinations of conditions interact to produce desired innovation outcomes. For instance, while conventional QCA analyses might highlight the importance of strategic alignment alone, fsQCA in this thesis illustrates how strategic alignment, when combined with factors such as Strategic investment, lead investment, joint investment, leads to higher innovation performance. This nuanced understanding of interaction effects offers a more granular insight than typically observed in the broader QCA literature on CVC.

(3) Impact of external and internal factors

The fsQCA results also diverge from typical QCA findings by demonstrating a pronounced impact of external factors like government policy and international collaborations, which have not been as prominently featured in earlier studies. These factors appear particularly salient in the Chinese context, suggesting that fsQCA can capture the unique influence of national and international dynamics on corporate innovation strategies, a facet less explored in existing QCA applications within CVC research.

(4) Methodological advantages and limitations

Additionally, fsQCA's ability to handle multiple concurrent causal pathways offers a methodological advantage over some traditional QCA approaches, which may not as effectively dissect these complex interactions. However, this study also reveals fsQCA's limitations in handling large datasets with high variability, where its sensitivity to case nuances can both enlighten and obscure overarching trends.

The fsQCA analysis conducted in this thesis provides a richer, more layered understanding of how CVC strategies influence innovation performance, diverging from traditional QCA by incorporating a broader array of conditions and revealing how these conditions interact in complex environments. While there are clear consistencies with existing QCA research in recognizing the multi-causal nature of innovation outcomes, fsQCA offers novel insights into the specific configurations that are most effective, particularly in contexts like China where external factors play a significant role.

7.2 Comparative analysis of results from different methods

7.2.1 Case analysis v.s. Linear regression analysis

This section aims to compare and contrast the findings from case study analysis and regression analysis, exploring how both methodologies illuminate the impact of Corporate Venture Capital

(CVC) strategies on the innovation performance of parent companies.

(1) Similarities in methodological outcomes

Both case study and regression analysis emphasize the significant influence of CVC strategies on corporate innovation. Each approach identifies strategic alignment and resource allocation as critical in enhancing a company's capacity for innovation. This consensus across methodologies underscores that strategic investments through CVC are pivotal in driving parent company innovation, regardless of the research approach.

(2) Differences in methodological approach

While there is agreement on some fundamental conclusions, the methodologies differ notably in their handling of data and depth of analysis. regression analysis offers a systematic way to assess the specific impacts of different investment strategies through quantitative data, allowing researchers to control for other variables and more accurately determine the effects of each strategy. In contrast, case study analysis provides richer contextual information and a deeper understanding of the strategic implementation process, revealing the complex dynamics behind CVC investment decisions.

(3) Key findings divergence

Regarding specific strategies that impact innovation performance, regression analysis indicates that strategic investments, lead investments, and syndicated investments have a significant positive impact on innovation output. This analysis highlights the direct effects of investment strategies, providing quantifiable evidence to support particular types of CVC investments. Conversely, case study analysis tends to focus more on qualitative descriptions of strategy execution, emphasizing the influence of corporate culture, management structure, and market environment on the success of CVCs, offering in-depth insights into how strategies integrate with a company's long-term goals and market positioning.

(4) Synthesis and practical application

Although regression provides robust quantitative support for selecting CVC investment strategies, the qualitative insights from case studies are equally invaluable as they help decision-makers understand the complex factors behind the strategies. Integrating insights from both methods can optimize decision-making processes and better align strategies with corporate objectives when formulating CVC policies.

By comparing the outcomes from case study and regression analysis, it is clear that both methods offer important perspectives on understanding the effects of CVC strategies on parent company innovation performance. Future research could further explore the complementarity of these methods to more comprehensively assess the effectiveness of CVC strategies. This

combined methodological approach not only deepens our understanding of the influence of CVC but also guides corporations on how to more effectively leverage venture capital to foster innovation and growth.

7.2.2 Linear regression analysis v.s. fsQCA

This section aims to compare and contrast the insights derived from linear regression and fuzzy-set Qualitative Comparative Analysis (fsQCA) regarding the impact of Corporate Venture Capital (CVC) investment strategies on innovation performance. Both methodologies offer unique lenses through which the influence of CVC strategies can be discerned, revealing both convergent and divergent findings.

(1) Methodological approaches and common ground

Both linear regression and fsQCA are employed to assess the impact of CVC strategies on innovation outcomes, such as patent counts and technological breakthroughs. Each method emphasizes the importance of strategic alignment and resource allocation, reinforcing the concept that these elements are crucial for enhancing innovation within parent companies.

(2) Divergence in analytical depth and sensitivity

linear regression Analysis:

Quantitative Depth: Provides a quantitative measure of the impact of each individual CVC strategy on innovation, allowing for the isolation and quantification of effects.

Control for Confounding Variables: Employs statistical controls to isolate the effects of CVC strategies from other variables, offering a clear picture of cause and effect.

fsQCA:

Qualitative Sensitivity: Excels in identifying combinations of conditions that lead to high innovation performance, emphasizing the complexity and interdependence of multiple factors.

Configuration Insight: Reveals how different CVC strategies work together under specific conditions to enhance innovation performance, offering a holistic view of strategic synergies.

(3) Key insights and implications

linear regression:

Identifies specific strategies that significantly impact innovation metrics, providing direct, actionable insights that can guide strategic decision-making.

Suggests that certain strategies may have more pronounced positive or negative impacts, dependent on the statistical significance and strength of the regression coefficients.

fsQCA:

Highlights the optimal paths of strategy combinations across various contexts, thus

providing empirical support for strategy optimization.

Unveils the nuanced, sometimes nonlinear relationships between CVC strategies and innovation outcomes, suggesting that the interaction among strategies can be as critical as the strategies themselves.

(4) Complementarity in strategic insights

Integrating findings from both methodologies can provide a more comprehensive understanding of how CVC investments influence innovation. regression offers precise quantification of impacts, which is invaluable for testing specific hypotheses about the effectiveness of individual strategies. Conversely, fsQCA provides a richer narrative about how combinations of strategies interact within complex corporate ecosystems to drive innovation.

By comparing the results from linear regression and fsQCA, this section underscores the value of employing both quantitative and qualitative approaches to explore the multifaceted nature of CVC strategies' impact on innovation. Each method compensates for the other's limitations, with regression offering precision and fsQCA offering context and depth, together providing a robust framework for understanding and optimizing CVC strategies within corporate settings.

7.2.3 Case analysis v.s. fsQCA

This section aims to compare and contrast the insights derived from case study analysis and fuzzy-set Qualitative Comparative Analysis (fsQCA) on the impact of Corporate Venture Capital (CVC) strategies on innovation performance. These methods illuminate the complexities of CVC strategies and their effects on parent company innovation from different perspectives.

(1) Common ground

Both case analysis and fsQCA emphasize the complexity of CVC strategies and the interplay of multiple factors affecting innovation outcomes. Each method identifies how various combinations of CVC strategies can significantly impact the parent company's innovation performance, showcasing the synergistic effects of these strategies.

(2) Methodological differences

While there is a shared focus on the purpose of the research, significant differences exist in method and depth of analysis:

Case Study Analysis: Provides in-depth qualitative insights, focusing on describing and explaining how CVC strategies are implemented and their impact on innovation performance within specific cases. Through detailed case narratives, a deeper understanding of the

motivations and impacts behind strategies is achieved.

fsQCA: Utilizes a combination of qualitative and quantitative approaches to identify combinations of conditions that lead to high innovation performance. fsQCA is suited for analyzing complex and nonlinear causal relationships and can reveal which combinations of strategies are necessary or sufficient, providing empirical support for strategy optimization.

(3) Divergence in key findings

Case Study Analysis: Typically focuses on how specific strategies function within particular companies or contexts, detailing the process of strategy implementation and its direct impacts.

fsQCA: Reveals which combinations of strategies are most effective across different settings, emphasizing the configuration of conditions and interactions between strategies, offering insights into how strategies collectively impact innovation performance.

(4) Conclusions and practical applications

Combining the detailed insights from case studies with the broad applicability of fsQCA can provide more comprehensive guidance for firms in formulating and optimizing CVC strategies. Case studies offer detailed implementation insights of strategies, while fsQCA emphasizes the efficacy of strategic combinations. Together, they can provide practical insights into how enterprises can drive innovation through CVC strategies.

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Chapter 8: Conclusions and Contributions

8.1 Conclusions

This doctoral dissertation investigates the impact of Corporate Venture Capital (CVC) investment strategies on the innovation performance of parent companies, focusing closely on three core research questions. Through a combination of case analysis, linear regression, and fuzzy-set Qualitative Comparative Analysis (fsQCA), the study systematically explores the mechanisms and effects of different CVC strategies. The specific conclusions for each research question are as follows:

(1) Conclusions for Research Question 1

Research Question 1: What are the significant differences in the impact of CVC strategies on the innovation performance of parent companies across different industry types (e.g., traditional manufacturing vs. high-tech industries) and firm natures (e.g., state-owned enterprises [SOEs] vs. private firms)?

Conclusion: This study finds that there are significant differences in the impact of CVC strategies across different industry types and firm natures. In traditional manufacturing, CVC strategies tend to focus on acquiring cutting-edge technologies through strategic investments to create a second growth curve for the parent company. For example, Haier Capital, Lenovo Capital, and TCL Ventures have all strategically invested in new industries that are vastly different from their core businesses, thereby driving technological upgrades for their parent companies in frontier fields. In contrast, in high-tech industries, CVC strategies place greater emphasis on continuous layout around the company’s own industry chain. For instance, Xiaomi has accelerated its technological layout in the smart hardware and smart home ecosystem by investing in start-ups in the fields of artificial intelligence and the Internet of Things.

Furthermore, SOEs and private firms also exhibit differences in their CVC strategies. SOEs, driven by policy orientation and resource backgrounds, are more inclined to use CVC to achieve national strategic goals and industrial upgrading. For example, Huawei's Harbin Investment focuses on the independent and controllable development of the semiconductor industry chain. In contrast, private firms, which are more market-oriented, emphasize market opportunities and financial returns, and adopt flexible investment strategies to quickly respond to market changes.

For example, Lenovo Capital and Incubator Group balance investments in core businesses and innovative fields through the "80-20 rule." These differences indicate that firms should consider the stage of their industrial development and firm nature when formulating CVC strategies to achieve optimal innovation performance.

(2) Conclusions for Research Question 2

Research Question 2: Do different types of CVC investment strategies (strategic investment, lead investment, and co-investment) have differential impacts on the innovation performance of parent companies? How do their strengths and stabilities compare?

Conclusion: Empirical analysis reveals that different CVC investment strategies have significant differential impacts on the innovation performance of parent companies. Strategic investment strategies, through deep integration with the core business of the parent company, can effectively enhance the firm's technological innovation capabilities and market competitiveness. For example, strategic investments by Changhong Venture Capital in the smart home field have directly driven the innovation and upgrade of Changhong's smart home appliance product lines. Lead investment strategies, by taking the lead in the investment process, provide firms with greater say and influence, which helps to accelerate the progress and implementation of innovation projects. However, the stability of lead investment strategies is relatively weak, as their success is highly dependent on the performance of the invested firms and changes in the market environment. Co-investment strategies, through collaboration with other investors, share risks and resources, bringing broader market channels and cooperation opportunities to firms. For example, TCL Ventures has partnered with several well-known investment institutions to support potential innovative companies such as Contemporary Amperex Technology Co. Limited (CATL), achieving a win-win situation in both technology and market. Overall, strategic investment strategies have stronger and more stable effects on innovation performance. In contrast, lead investment and co-investment strategies each have their own advantages under different circumstances. Firms should flexibly choose based on their own situations.

(3) Conclusions for Research Question 3

Research Question 3: Which combinations of CVC investment strategies (e.g., the synergy between strategic investment and co-investment) can constitute the optimal solution for the innovation performance of parent companies? Is there a configurational dependency in their effects?

Conclusion: The fsQCA analysis indicates that the impact of CVC investment combinations on the innovation performance of parent companies is significantly

configurational. Single investment strategies often fail to achieve the best innovation performance, while combinations of multiple strategies can generate stronger innovation-promoting effects. For example, the combination of strategic investment and co-investment can achieve technological synergy while leveraging external resources to reduce risks and increase the success rate of innovation projects. Moreover, combinations involving lead investment strategies can also play important roles, especially in scenarios where rapid implementation of innovation projects and market expansion are needed. For example, Xiaomi acquires core technologies through strategic investment and supports the development of start-ups through co-investment with other investors, achieving dual breakthroughs in technology and market. These findings suggest that firms should not rely solely on a single investment method when formulating CVC strategies. Instead, they should flexibly combine multiple investment strategies based on their development goals and market environment to maximize innovation performance. Firms also need to pay attention to the synergistic effects between different strategies and optimize their investment portfolios to enhance overall innovation capabilities and market competitiveness.

8.2 Theoretical contributions

This thesis centers on the impact of CVC investment strategies on the innovation performance of parent companies, utilizing linear regression and fuzzy-set Qualitative Comparative Analysis (fsQCA) to explore the complex causal pathways through which different CVC strategies influence corporate innovation capabilities. By extending the Innovation Diffusion Theory and Configuration Theory, this thesis reveals the diverse and multifaceted effects of CVC investment strategies under various conditions, offering new perspectives for CVC strategy theoretical construction and addressing specific gaps in existing literature.

(1) Extension of innovation diffusion theory

Innovation Diffusion Theory aims to explain how innovations spread and are adopted across different organizations and individuals. Traditionally, this theory has focused on the diffusion process and adoption speed of innovations, with less emphasis on the complex causal pathways and the impact of strategic combinations. This thesis, through the application of fsQCA, reveals the multi-dimensional effects of CVC investment strategies on innovation diffusion, thereby broadening the scope of the theory.

Specifically, the thesis finds that combinations of CVC strategies, such as strategic and joint investments, significantly enhance the efficiency and effectiveness of innovation diffusion

within parent companies. These strategies not only facilitate the rapid absorption of external innovations but also promote the broader dissemination of internal innovations. Particularly in dynamic competitive environments, CVC investments enable companies to quickly integrate external innovation resources and strategically configure investment portfolios to penetrate new technologies and markets, thus accelerating the innovation diffusion process. These findings expand the perspective of Innovation Diffusion Theory, highlighting the crucial role of strategic combinations in the diffusion process and demonstrating that innovation diffusion is not merely a linear process but a complex system with multiple pathways and causes.

(2) Extension of configuration theory

Configuration Theory emphasizes that organizational performance is the result of combinations of multiple factors rather than single factors alone. It posits that different configurations of factors can form distinct causal pathways, leading to various performance outcomes. This thesis systematically examines, through fsQCA, how diverse combinations of CVC strategies influence the innovation performance of parent companies under different contexts, providing empirical support for Configuration Theory.

The fsQCA analysis uncovers the diversity of CVC strategy combinations and their complex impact pathways on innovation performance. For example, the thesis reveals that different combinations of strategic, lead, and joint investments can form multiple causal pathways that effectively enhance corporate innovation performance under specific conditions. These pathways include improving companies' technological acquisition capabilities, accelerating market responsiveness, and optimizing the integration and utilization of internal innovation resources. These findings not only validate the core concept of Configuration Theory—that different strategy combinations can lead to different performance outcomes—but also underscore the need for firms to consider multiple factors, such as internal resources, external markets, and environmental changes, when formulating CVC investment strategies.

(3) Providing new perspectives for CVC investment strategy theory construction

Existing literature on CVC often focuses on financial returns and performance analysis of single investment strategies, with limited exploration of strategy combinations and their complex causal pathways. This thesis, through fsQCA, offers new insights into how diverse combinations of CVC strategies affect innovation performance. Firstly, it finds that CVC strategies do not operate in isolation but form diverse causal pathways through multiple strategy combinations to achieve innovation goals. This finding challenges traditional single-strategy evaluation approaches and emphasizes the irreplaceability of strategy combinations in enhancing innovation performance.

Secondly, the thesis results indicate that different combinations of CVC strategies exhibit significant heterogeneous effects under varying conditions. For instance, in highly uncertain market environments, the combination of joint and lead investments is more effective in enhancing innovation performance than single financial investments. This finding not only provides empirical support for the theoretical construction of CVC strategies but also offers practical guidance for firms on how to formulate more flexible and precise CVC strategies in practice.

Lastly, this thesis addresses a gap in the literature regarding the complex causal relationships of CVC strategies by revealing the multi-path effects of CVC strategies under different conditions. It emphasizes that when formulating CVC investment strategies, companies should fully consider the synergies between strategies and the impact of environmental factors. Future thesis could further explore the long-term effects of CVC strategies across different industries and market conditions, providing more targeted strategic guidance for corporate innovation management.

In conclusion, this thesis extends Innovation Diffusion Theory and Configuration Theory by uncovering the complex causal pathways of CVC investment strategies, providing new perspectives for theoretical construction in the field of CVC and filling specific gaps in the literature. This thesis not only enriches the theoretical thesis of CVC investments but also offers scientific guidance for firms to optimize CVC strategies in practice. Future thesis can continue to explore the diversity and long-term impacts of CVC strategies in different market environments and industry contexts, providing more precise theoretical support and practical recommendations for corporate innovation and strategic management.

8.3 Practical implications

This thesis provides actionable recommendations for CVC strategies that directly impact business innovation, offering valuable guidance for corporate management. Additionally, it provides differentiated CVC strategy optimization suggestions for various types of enterprises, such as state-owned versus private companies. Moreover, it offers recommendations for policymakers on how to enhance the role of CVC in promoting innovation within parent company groups through policy guidance and effective evaluation.

(1) Direct impact on CVC practices in enterprises

By deeply analyzing the relationship between CVC strategies and innovation performance, this thesis identifies key factors that companies should consider when formulating and

implementing CVC strategies. The findings from both linear regression and fsQCA methods confirm the significant impact of various CVC strategy combinations on innovation performance, particularly in metrics like patent counts, new product developments, and technological breakthroughs. This implies that companies should not only focus on financial returns but also consider the innovation-driving potential of their CVC strategies.

The actionable strategy recommendations for corporate management include: 1) prioritizing investment projects that create strategic synergies with existing business operations to enhance the internalization and transformation efficiency of innovation outcomes; 2) flexibly combining strategic, lead, and joint investments to adapt to different market environments and industry dynamics, thereby maximizing innovation performance; 3) providing continuous support to portfolio companies, not limited to financial capital but also including technical collaboration and market resource sharing, to improve overall investment returns and innovation outcomes.

(2) Differentiated CVC strategy optimization for different types of enterprises

Different types of enterprises face distinct challenges and opportunities in CVC practices. For SOEs, which typically have abundant resources and strong market positions but may lag in innovation and responsiveness, the focus should be on investing in market-driven innovation projects that can rapidly enhance technological capabilities and market competitiveness. SOEs should also strengthen the management and oversight of CVC investments by establishing professional investment management teams to ensure scientific and effective investment decisions.

For private companies, which often excel in innovation and market flexibility but may be constrained by funding and resources, CVC strategy should focus on strategic investments closely aligned with core business expansion to ensure that investments directly support business growth. Private enterprises can also mitigate risks and gain additional external support through joint investments or participation in investment alliances. Private companies are encouraged to leverage CVC investments to strategically position themselves in cutting-edge technologies and emerging markets, thus seizing innovation and market opportunities.

(3) Recommendations for policymakers

Policymakers play a crucial role in promoting corporate innovation and the development of CVC. This thesis offers several recommendations to guide companies in better utilizing CVC to foster innovation. First, policymakers should consider providing incentives such as tax breaks and financing support to lower the barriers and costs associated with CVC investments. Special funds or guarantees could be established to encourage small and medium-sized

enterprises (SMEs) to engage in CVC activities.

Secondly, policymakers should encourage the establishment of transparent CVC investment information disclosure systems to enhance market transparency and investor confidence. This would aid companies in making more informed CVC investment decisions and improve market capabilities to assess the effectiveness of CVC strategies. Furthermore, policymakers could support the formation of industry associations or CVC advisory centers to provide training and consultancy services, helping companies improve their CVC investment management capabilities.

Lastly, to effectively evaluate the role of CVC in promoting innovation within parent company groups, policymakers should advocate for the development of a comprehensive evaluation system that covers the entire investment process—from project selection in the early stages to post-investment performance assessment. This system should include measures of innovation output (e.g., patent counts, technology conversion rates) as well as assessments of overall company competitiveness (e.g., market share changes, contributions from new products) to fully capture the actual contribution of CVC investments to corporate innovation.

In conclusion, this thesis not only provides specific CVC strategy implementation recommendations for corporate management but also offers differentiated guidance for optimizing CVC strategies for different types of companies. Additionally, it highlights the importance of policy support in promoting CVC investments and corporate innovation, providing actionable recommendations for policymakers to maximize the impact of CVC on corporate innovation. These practical implications offer essential references for corporate and policy decision-makers in the CVC field and lay the foundation for future thesis to further explore the long-term mechanisms and impact pathways of CVC.

8.4 Research limitations and future research

This thesis has limitations of the research methods employed—case studies, linear regression, and fsQCA—and acknowledges that these limitations may affect the generalizability and interpretability of the research findings. Understanding these limitations is crucial for accurately interpreting the research results and guiding future studies.

(1) Scope of case studies

Limitations: Although case studies are rich in detail and context, they inherently have limitations in selection. Focusing particularly on technology-driven industries and globally leading firms may fail to capture the diversity of CVC practices in different economic

environments and among small firms.

Impact: This may limit the generalizability of the research findings across all types of industries and geographical regions.

Future Research Suggestions: Future research could expand the scope of case studies to include a broader range of industries and diverse geographical locations to enhance the representativeness of the study.

(2) Limitations of linear regression methodology

Limitations: While linear regression provides valuable insights into the relationships between variables, it assumes a linear relationship and is sensitive to outliers. Moreover, reliance on quantitative data may overlook the subtle influences of qualitative factors that affect CVC success.

Impact: This may lead to oversimplification of complex relationships and potential misinterpretation of causality.

Future Research Suggestions: Future research could employ more robust statistical methods or mixed-method approaches to address these issues, thereby providing a more comprehensive understanding of dynamic changes.

(3) Generalizability of fsQCA results

Limitations: fsQCA is highly effective for small to medium-sized datasets but faces challenges when dealing with large-scale datasets. Additionally, fsQCA results are largely dependent on the calibration of conditions and the construction of the dataset.

Impact: Due to differences in calibration and the subjectivity of setting thresholds, fsQCA findings may be difficult to replicate in different contexts or datasets.

Future Research Suggestions: Future research should strive to standardize fsQCA application methods and explore the impact of different calibration strategies to enhance the robustness and reproducibility of the results.

(4) Temporal and dynamic considerations

Limitations: This study primarily provides a snapshot at a single point in time, focusing on the impact of CVC strategies but not fully considering how these strategies evolve over time or respond to changes in market conditions.

Impact: This may overlook the dynamic nature of strategic management and innovation processes, which are influenced by continuous changes in technology, competitive forces, and regulatory environments.

Future Research Suggestions: Longitudinal studies could provide deeper insights into how CVC strategies adapt over time and how these adaptations affect innovation outcomes.

(5) Integration of theoretical frameworks

Limitations: Although this study integrates multiple theoretical frameworks to analyze CVC strategies, there may be other relevant theories that have not been considered, which could provide additional insights into the mechanisms and outcomes of CVC.

Impact: Failure to consider these theories may limit the understanding of the role of CVC within the broader context of corporate strategy and economic environments.

Future Research Suggestions: Future research could enrich the analysis by introducing additional theoretical perspectives, such as behavioral economics or complexity theory, to provide a more comprehensive view of CVC activities.

Recognizing these limitations is not only crucial for contextualizing the findings of this study but also significant for framing future research on the complex world of Corporate Venture Capital (CVC). Each limitation presents an opportunity for further research to deepen our understanding of the role of CVC strategies and expand the empirical and theoretical foundations of CVC research. Future research should endeavor to address these limitations and explore emerging areas as the field of innovation and corporate venture capital continues to evolve.

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