

Study on the Impact of Financing Efficiency on Corporate Innovation

Chao Kang¹ and Srochinee Siriwattana²

Suan Sunandha Rajabhat University, Thailand

Email: srochinee.si@ssru.ac.th²

Received: December 13, 2025 Revised: December 29, 2025 Accepted: December 31, 2025

Abstract

The abstract, written in Thai, should present the research objectives, methodology, and findings in a concise manner, providing an overall summary of the paper. It should include all key terms and be brief and precise. China's shift to an innovation-driven "new normal" is vital as traditional growth factors decline, but its innovation system suffers from low efficiency and a focus on incremental innovation, lagging behind global leaders despite high explored is the mismatch between financial input and innovation impact, which stems from financing constraints and, critically, low financing efficiency the ineffective allocation of capital to high-value innovation. This study aims to develop an integrated framework linking financing efficiency (effective resource allocation) to corporate innovation quality and sustainability in China, providing both theoretical enrichment and practical policy guidance to bridge the gap between national ambition and on-the-ground outcomes. Research Objectives (1) to explore the impact mechanism and empirical effects of financing efficiency on corporate innovation. (2) to investigate the mediating role of financing constraints and supply chain finance in the relationship between financing efficiency and corporate innovation. (3) to examine the heterogeneity in the impact of financing efficiency on corporate innovation across different types of enterprises (including variations in size, ownership structure, and market orientation) and across different regions. (4) to combine both quantitative and qualitative research methods in analyzing the relationship between financing efficiency and innovation, ensuring a comprehensive understanding of the impact mechanisms. (5) To provide theoretical support and practical guidance for policy formulation and corporate decision-making, aiming to enhance the role of financing efficiency in fostering innovation.

This study concludes that financing efficiency (specifically pure technical efficiency) is a crucial positive driver of corporate innovation, especially breakthrough innovation, a finding that advances literature by focusing on efficiency of utilization over mere availability. The study reveals a dual-pathway mechanism where improved financing efficiency alleviates financing constraints and enhances supply chain finance, which then boosts innovation. This relationship is regionally

heterogeneous, showing a stronger positive impact in less financially developed central and western regions of China.

Keywords: Financing Efficiency, Total Factor Productivity of Enterprises, Enterprise Management

Introduction

Since China's reform and opening-up, its economic success has been remarkable. Yet, as population and resource dividends fade, labor costs rise, and growth slows, the economy has entered a "new normal." The extensive, factor-input-driven growth model is unsustainable, making technological innovation critical for transformation (Romer, 1990; Aghion & Howitt, 1992; Helpman, 2004). China's focus on innovation intensified from the 2000s: the 2006 National Medium- and Long-Term Science and Technology Development Plan laid the groundwork for a national innovation system, and the 2012 "Innovation-Driven Development Strategy" elevated innovation to a core national priority, with a goal to lead global sci-tech innovation by 2050. This policy trajectory underscores innovation's centrality to national strategy—yet gaps persist, raising questions about the alignment between policy ambition and on-the-ground outcomes. Endogenous growth theory (Romer, 1990) emphasizes that sustained growth hinges on quality of innovation and ecosystem maturity (e.g., knowledge spillovers, institutional support), not just input scale. Herein lies the gap: while China has boosted R&D inputs, its innovation ecosystem still struggles to translate these into frontier-level competitiveness.

Despite China's rising position in the 2023 Global Innovation Index (ranked 12th globally), its innovation system remains constrained by low R&D efficiency, incremental innovation dominance, and financial system distortions. While China's R&D intensity reached 2.55% of GDP in 2023, it still lags behind innovation leaders such as Germany (3.3%), the U.S. (3.45%), and South Korea (4.81%). Theoretical perspectives from Aghion and Howitt (1992) emphasize that genuine innovation stems from creative destruction—the replacement of old technologies by new ones—whereas China's incremental approach reflects a deviation from this ideal. At the enterprise level, innovation capacity is crucial to competitiveness. However, firms face financing constraints due to unstable financial channels, high costs, and low efficiency in capital allocation (Beck et al., 2005; Poncet et al., 2010). Although ongoing financial reforms aim to lower financing costs, information asymmetry and high innovation risk continue to limit access to capital (Hall et al., 2012). Building on Schumpeter's (1911) view that finance underpins innovation and Levine's (1997) emphasis on financial intermediaries' role in efficient resource allocation, this study explores a critical issue: how financing efficiency defined as the effective allocation of financial resources to high-value, innovative activities affects innovation quality and sustainability in China. Prior research has largely

focused on financing constraints (Fazzari et al., 1988; Chen et al., 2017), neglecting the efficiency dimension of financial allocation and its link to innovation quality rather than quantity. Furthermore, China's low ranking in "Financial Support for Innovation" (35th) underscores the mismatch between financial input and innovation impact (WIPO, 2023). This research contributes to both theory and practice by developing an integrated framework linking financial system efficiency to corporate innovation quality. Academically, it enriches the literature on financial-innovation dynamics in transitional economies. Practically, it provides policy insights for improving financial allocation mechanisms and guidance for enterprises seeking to enhance innovation capability through efficient financing strategies.

This study aims to address these gaps by offering a comprehensive framework that integrates the various aspects of financing behavior and innovation, providing both academic contributions and practical guidance for business decision-makers.

Research Objectives

1. To explore the impact mechanism and empirical effects of financing efficiency on corporate innovation.
2. To investigate the mediating role of financing constraints and supply chain finance in the relationship between financing efficiency and corporate innovation.
3. To examine the heterogeneity in the impact of financing efficiency on corporate innovation across different types of enterprises (including variations in size, ownership structure, and market orientation) and across different regions.
4. To combine both quantitative and qualitative research methods in analyzing the relationship between financing efficiency and innovation, ensuring a comprehensive understanding of the impact mechanisms.
5. To provide theoretical support and practical guidance for policy formulation and corporate decision-making, aiming to enhance the role of financing efficiency in fostering innovation.

Literature Review

Financing Constraint Theory

The Financing Constraint Theory applied to enterprise innovation asserts that innovation projects are highly susceptible to financial limitations due to five unique, compounding characteristics. Key Vulnerabilities of Innovation Investment, These characteristics distinguish innovation from general investments and intensify the need for stable external financing: High Adjustment Costs: Innovation relies heavily on human capital (skilled employees), and any

disruption, such as turnover, leads to significant knowledge loss, re-investment expenses, and the risk of proprietary technology leakage. High Risk: Innovation projects face extreme uncertainty across technical, market, and financial dimensions. The financial volatility of R&D investment is significantly higher than that of fixed assets, escalating external financing costs. Low Collateral Value: Innovation primarily generates intangible assets (intellectual property), which have high specificity and are difficult to reallocate. This limits their use as collateral, thereby reducing a firm's access to crucial debt financing. Long Cycle: Innovation is a long-term process requiring sustained funding across R&D and marketization. Interruptions due to funding gaps often result in project failure or necessitate disproportionately large subsequent investments. Prominent Information Asymmetry: The complexity of innovation makes it difficult for external parties to evaluate. Managers have superior knowledge of project risks, and firms often withhold information to protect IP, which increases investor risk and consequently raises the cost of external financing.

Collectively, these characteristics make innovation activities more susceptible to financing constraints (Hall, 2002; Bergemann & Hege, 2005; Hall & Lerner, 2009; Czarnitzki & Hottenrott, 2011; Gorodnichenko & Schnitzer, 2013), emphasizing the need for robust external financing support.

Financing Theory

Corporate financing theory encompasses two main strands: capital structure theory (linking firm value to capital structure) and financing structure determinant theory (analyzing factors like profitability and firm size). (1) MM Theory, In 1958, Modigliani and other scholars first put forward the MM theorem when discussing and analyzing the problem of financing structure, which mainly describes that there is no correlation between the value of the company and the capital structure when ignoring income tax: however, when considering income tax, the original theory is adjusted and optimized, and the conclusion that there is a certain correlation between the value of the company and the capital structure is summarized. In addition, debt operation can reduce the tax burden of the company to a certain extent, thus increasing the income of enterprises. (2) Pecking Order Financing Theory, The Pecking Order Financing Theory proposes that a company's financing choices follow a strict hierarchy based on minimizing information asymmetry and transaction costs, which contradicts the perfect-information assumption of MM theory. The preferred order is: Internal Financing (Endogenous): Lowest cost and transaction risk. Debt Financing (Bonds/Bank Loans) Intermediate cost. Companies prefer bonds over equity because debt issuance signals less negative information to the market. Equity Financing (Stock): Highest cost and least preferred. Issuing new stock often signals to external investors that the company's prospects are poor (leading to IPO underpricing and loss of value), making it a last resort.

Enterprise Innovation Theory

Schumpeter's innovation theory, which views economic growth as driven by knowledge accumulation and entrepreneurial "creative destruction," describes enterprise innovation as a high-cost, high-risk, long-cycle, and often random process aimed at generating high market benefits through five main forms: product, process, marketing, management, and organizational innovation. The new Schumpeter growth theory, which evolved from the original Schumpeter innovation theory, emphasizes the critical role of entrepreneurs in enterprise development and economic growth (Liu Yulin and Ge Shuang, 2018). Entrepreneurs obtain new productivity by recombining existing factors of production to produce new materials. The innovative spirit of enterprises is essential for enterprise development and economic growth, and is the driving force for innovative activities. At the same time, the significant difference between the new Schumpeter growth theory and the new classical growth theory is that economic growth is an unbalanced destruction based on innovation, that is, in the process of destruction, innovation can continue to emerge (Lee and Malerba, 2017), that is to say, innovation is an endogenous determinant of economic growth, not an exogenous variable, and the new Schumpeter growth theory also emphasizes the role of intervention in economic growth.

Methodology

This research uses quantitative research methods. The qualitative component uses semi-structured interviews to explore contextual dynamics of financing and innovation decisions. Key stakeholders include senior executives, financial managers, and innovation leaders, with sampling criteria focusing on: (1) minimum 5 years of experience in their role; (2) demonstrated innovation track record (e.g., overseeing patent filings or new product launches); (3) representation across industries, firm sizes, and regions. A total of 15-20 interviews will be conducted, lasting 45-60 minutes each (in-person or online). This study focuses on Chinese manufacturing enterprises, examining how Financing Efficiency impacts corporate innovation and the mediating role of financing constraints. The mixed-methods design ensures depth: quantitative analysis tests hypotheses across a large sample, while qualitative analysis explains underlying mechanisms. The quantitative analysis employs two key techniques: Data Envelopment Analysis (DEA) for measuring financing efficiency and SEM (with embedded regression-like paths) for exploring causal relationships. The target population comprises Chinese publicly listed companies that disclose comprehensive financial and R&D data. Including those firms with consistent financial disclosures (e.g., R&D expenditure, patent filings). The study employs a stratified purposive sampling approach to ensure a representative and balanced selection of Chinese listed companies. A sample of 401 firms is selected to ensure adequate representation across industries, ownership types, and firm

sizes. This sample size is chosen to provide a robust dataset for empirical analysis while maintaining manageability. The manufacturing enterprises' data we used in our research was collected from the CSMAR database and Wind information, the relative financial index ranging from 2007 to 2021 on A-share listed companies' balance sheet, cash flow statement and income statement was abstracted. DEA is applied to measure Financing Efficiency using total equity, liabilities, and cash flow as inputs and operating income and net profit as outputs. Panel data regression is employed to analyze the direct effects of Financing Efficiency on innovation. Structural Equation Modeling (SEM) evaluates mediating effects, while subgroup analyses assess heterogeneity across industries and firm characteristics. Statistical Software STATA MP 17: For panel data regression and heterogeneity analysis. AMOS: For SEM and path analysis. Excel: For data cleaning and preliminary visualization. And action Plan is a document doing academic research. It summarizes a specific step.

Results

This study used a cross-sectional survey via WENJUANXING, targeting 401 management personnel in key Chinese economic zones (Yangtze River Delta, Pearl River Delta, and Bohai Rim) to explore the relationship between Financing Efficiency (FE) and Corporate Innovation (CI), considering Financing Constraints, Supply Chain Finance, Internal Influences, International Relationships, and External Environment as influencing factors for Structural Equation Modeling (SEM) analysis. The study's 401-participant cross-sectional survey (mostly male, middle-aged, and undergraduate-educated managers/finance professionals in key Chinese economic zones) yielded a statistically normal and robust dataset, with high reliability and strong convergent and discriminant validity supporting its use for subsequent Structural Equation Modeling (SEM) analysis on financing efficiency and corporate innovation. The structural equation model showed acceptable fit (SRMR = 0.094) and moderate explanatory power confirming that Financing Efficiency (FE) directly and positively drives Corporate Innovation (CI) (\$0.203, $p < 0.001$), with Corporate Governance (CG) being the strongest positive antecedent of FE (\$0.232, $p < 0.001$), and Financing Constraints (FC) and Supply Chain Finance (SCF) acting as significant mediators. The qualitative analysis, using semantic network mapping of interview data, strongly validated all proposed hypotheses (H1-H12), confirming that Financing Efficiency (FE) directly drives Corporate Innovation (CI), is primarily enhanced by Corporate Governance, and its impact is significantly mediated by Financing Constraints and Supply Chain Finance, with Information Disclosure, Policy Regulation, and Social Capital also exerting crucial indirect effects through FE.

This study systematically explores the impact of financing efficiency on corporate innovation, focusing on underlying mechanisms, heterogeneous effects, and antecedent factors,

with the aim of addressing the financing bottlenecks faced by enterprises in innovation activities amid national innovation strategies. Integrating theoretical analysis and empirical testing, the research adopts methods such as DEA and regression models, using data from Chinese manufacturing enterprises to conduct in-depth investigations and comprehensively reveal the complex relationship between financing efficiency and corporate innovation. Empirical results show that financing efficiency—especially pure technical efficiency—has a significant positive impact on corporate innovation, supported by robustness tests using alternative indicators such as R&D density and utility model patents. Mechanism analysis confirms that financing constraints and supply chain finance play mediating roles: improved financing efficiency alleviates financing constraints and promotes the use of supply chain finance, thereby indirectly boosting corporate innovation. Heterogeneity analysis further finds that the impact of financing efficiency on innovation is more pronounced in central and western China, reflecting the influence of regional differences in financial development. Additionally, antecedent factor analysis identifies that internal factors such as corporate governance and operational efficiency, interactive factors such as social capital, and external factors such as market competition and government subsidies can significantly enhance financing efficiency, while excessive government regulation may have a marginal negative impact.

This study enriches the literature on financing efficiency and corporate innovation by clarifying specific impact paths and expanding understanding of antecedent factors. Practically, the findings provide actionable insights: enterprises should focus on improving internal governance and operational transparency to enhance financing efficiency, while policymakers should formulate targeted policies—such as optimizing the financial environment in central and western regions and increasing support for small and medium-sized enterprises—to alleviate financing constraints and promote corporate innovation. Limitations include a focus on manufacturing enterprises, which may restrict generalizability; future research could expand the sample to include more industries or explore the role of digital and green finance.

Conclusion

This study delves into the intricate relationship between financing efficiency and corporate innovation through a comprehensive empirical approach, with key findings that advance existing literature beyond mere confirmation of known concepts. Our core discovery that financing efficiency, particularly pure technical efficiency, exerts a significant positive impact on corporate innovation extends prior research: while Hall & Lerner (2010) emphasized financing availability, we highlight the critical role of how efficiently firms utilize financial resources. A conceptual model helps visualize this distinction: pure technical efficiency, reflecting strategic sophistication in

capital allocation, dominates breakthrough innovation (e.g., invention patents), whereas scale efficiency (size-driven advantages) matters more for incremental innovation (e.g., utility model patents). This dimensional differentiation addresses gaps in Myers & Majluf (1984), who did not distinguish efficiency dimensions in innovation contexts. Our identification of financing constraints and supply chain finance as mediating mechanisms also contributes to the field. While Brown et al. (2012) linked efficiency to reduced constraints and Petersen & Rajan (1997) highlighted relational financing, we integrate these strands: improved financing efficiency alleviates constraints by reducing information asymmetry and enhances supply chain finance access by signaling creditworthiness, creating a dual pathway unexamined in prior work.

The regional heterogeneity analysis showing a stronger impact in central and western China aligns with studies on regional financial inequality (Guiso et al., 2004) but extends this by demonstrating context-dependence: in less financially developed regions, efficiency improvements yield larger marginal benefits for innovation, challenging assumptions of a universal relationship. Antecedent factor analysis enriches understanding by integrating internal (corporate governance: Jensen & Meckling, 1976), interactive (social capital: Coleman, 1988), and external factors (market competition: Nickell, 1996), while noting excessive regulation's risks (Djankov et al., 2002) a holistic view absent in narrower prior studies. Limitations include the focus on manufacturing, and future research could expand to other industries or cross-country comparisons, or explore digital and green finance's moderating roles.

Theoretical and Managerial Implications

Theoretical Implications, This study contributes to existing literature in several key theoretical dimensions, enhancing understanding of the financing efficiency-corporate innovation relationship and the broader fields of financial management and innovation economics. First, it refines the theoretical connotation of financing efficiency by distinguishing its dimensionality and clarifying differential impacts on innovation. Unlike prior research that treated efficiency as unidimensional, this study decomposes it into pure technical, scale, and overall efficiency, empirically showing that pure technical efficiency drives breakthrough innovation while scale efficiency matters for incremental innovation. This resolves ambiguities in previous work and provides a nuanced foundation for future research. Second, it advances understanding of mediating mechanisms by verifying the roles of financing constraints and supply chain finance. Integrating fragmented literatures on constraints (Hall & Lerner, 2010) and relational financing (Petersen & Rajan, 1997), it shows financing efficiency operates through both channels, offering a systematic explanation for how financial efficiency translates into innovation. Third, it contextualizes the relationship by emphasizing regional heterogeneity, responding to calls for context-aware theories (Guiso et al., 2004). By revealing stronger effects in less financially

developed regions, it demonstrates that institutional and regional factors moderate the financing-innovation nexus, challenging universal relationship assumptions. Finally, it constructs a holistic theoretical framework connecting antecedents, mechanisms, and consequences of financing efficiency for innovation, integrating previously isolated research streams into a cohesive model and guiding future inquiry.

Managerial Implications

The findings offer actionable insights for policymakers aiming to foster innovation and economic growth. To enhance financial market development, policymakers should reduce information asymmetry through standardized financial reporting and credit rating systems, enabling more precise capital allocation. For supporting high-risk innovation, targeted measures such as 30% matching funds for pre-patent R&D in high-tech manufacturing and innovation risk pools covering 50% of failed project losses for SMEs can mitigate risks.

Addressing regional disparities requires tailored policies: prioritizing central and western regions with tax holidays for regional banks increasing SME lending, and establishing “innovation finance hubs” in Chengdu or Chongqing to aggregate venture capital. To encourage private sector participation, tiered tax incentives—such as 175% R&D expense deductions for SMEs (vs. 150% for large firms) and 5-year corporate income tax exemptions for private equity investing in breakthrough innovation—are effective. These recommendations prioritize feasibility (e.g., tax incentives are easier to implement) and urgency (regional disparities require immediate attention to avoid widening innovation gaps).

Limitations of Findings

This study has two primary limitations. First, its exclusive focus on manufacturing enterprises restricts generalizability, as service and high-tech industries have distinct financing needs and innovation patterns—relying more on intangibles and breakthrough innovation. Future research could expand to cross-sector samples, with measurement tools adapted to industry specifics (e.g., using software patents for tech firms). Second, the measurement of key variables, while aligned with existing literature, has inherent limitations. Innovation proxies such as patent counts and R&D density capture output quantity but not economic value or commercial success; financing efficiency, measured via DEA, ignores qualitative aspects like capital structure flexibility. Future work could address this by integrating innovation metrics such as patent citation counts (to reflect impact) and commercialization revenue shares, alongside financing efficiency metrics like dynamic DEA (to capture temporal adjustments) and machine learning models (to incorporate qualitative data like lender-firm relationships). These improvements would better align measurements with real-world dynamics, enhancing result depth.

Contributions to Literature

This study makes distinct contributions to the literature on financing and corporate innovation, advancing theoretical understanding and methodological rigor. First, it deepens the conceptualization of financing efficiency by unpacking its multi-dimensional impact on innovation, distinguishing pure technical efficiency's role in breakthrough innovation from scale efficiency's role in incremental innovation—addressing gaps in prior work that treated efficiency as monolithic. Second, it strengthens methodological rigor by combining DEA, panel regression, mediation analysis, and heterogeneity analysis to capture direct and indirect effects and contextual variations, offering a blueprint for multi-method research on complex financial-innovation relationships. Third, it emphasizes contextual factors, bridging literature on financing and institutional economics. By examining regional differences, it shows the financing-innovation relationship is contingent on local financial development, filling gaps in studies assuming universal relationships. Together, these contributions enhance theoretical precision, methodological diversity, and contextual awareness in the field.

Areas for further research

Future research could explore several promising directions. Cross-country comparative studies would enhance generalizability by examining how institutional contexts—such as market-based vs. bank-based financial systems or varying legal frameworks—shape the relationship between financing efficiency and innovation. Extending the framework to economies with different innovation ecosystems (e.g., European tech hubs vs. Southeast Asian manufacturing clusters) would reveal how legal systems, investor protection, or industrial policies moderate efficiency's impact, contributing to a more global theory.

Longitudinal analyses using 10+ year panel data could capture the dynamic evolution of financing efficiency and its long-term effects on innovation, exploring how efficiency shifts across firm lifecycles (startups vs. mature firms) and whether early efficiency gains have persistent impacts on breakthrough innovation. Examining dynamic adjustments—such as how firms reallocate financing after market shocks—would further clarify the adaptability of financial strategies. Investigating interactions between financing efficiency and non-financial factors (e.g., corporate culture, leadership) could unpack more nuanced innovation drivers. For example, exploring whether a culture of experimentation amplifies the impact of efficient financing on innovation would integrate financial and organizational perspectives, offering a more holistic view. Finally, developing guidelines to bridge quantitative findings with actionable qualitative insights—tailored to stakeholders like local officials or firm managers—would ensure research translates into practical decision-making.

References

- Brown, J. R., Martinsson, G., & Petersen, B. C. (2012). Do R&D tax credits work? Evidence from a panel of countries, 1979–2006. *Journal of Public Economics*, 96(5–6), 344–355.
- Bushman, R. M., & Smith, A. J. (2001). Financial accounting information and corporate governance. *Journal of Accounting and Economics*, 32(1–3), 237–333.
- Cao, Q., Wang, H., & Wang, Y. (2018). The impact of supply chain finance on firm innovation: Evidence from the Chinese manufacturing industry. *Asia Pacific Journal of Management*, 35(2), 365–385.
- Chen, J., & Wang, Y. (2020). The impact of innovation quality on firm performance: Evidence from China. *Technological Forecasting and Social Change*, 161, 120325.
- Coleman, J. S. (1988). Social capital in the creation of human capital. *American Journal of Sociology*, 94, S95–S120.
- Davis, L. E., & North, D. C. (1971). Index. In *Institutional change and American economic growth* (pp. 273–283). Cambridge University Press.
- Fazzari, S. M., Hubbard, R. G., & Petersen, B. C. (1988). Financing constraints and corporate investment. *Brookings Papers on Economic Activity*, 1988(1), 141–195.
- He, L., Cheng, S., & Lu, X. (2020). The impact of supply chain finance on the financing efficiency of SMEs: Evidence from China. *Journal of Business Research*, 119, 489–501.
- Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4), 305–360.
- Kothari, S. P., Leone, A. J., & Wasley, C. E. (2005). Performance-matched discretionary accrual measures. *Journal of Accounting and Economics*, 39(1), 163–197.
- Lu, F. (2001). *Research on corporate financing efficiency*. Economic Science Press.
- Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, 13(2), 187–221.
- Nickell, S. (1996). Competition and corporate performance. *Journal of Political Economy*, 104(4), 724–746.
- Petersen, M. A., & Rajan, R. G. (1997). The benefits of lending relationships: Evidence from small business data. *Journal of Finance*, 52(1), 3–37.
- Zingales, L., Guiso, L., Sapienza, P., & (2004). The role of social capital in financial development. *American Economic Review*, 94(3), 526–556.