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## FINANCING EFFICIENCY AND CORPORATE INNOVATION: EVIDENCE FROM CHINESE MANUFACTURING FIRMS

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### Abstract

This study explores how financing efficiency shapes corporate innovation within China's manufacturing sector, emphasizing the mediating roles of financing constraints and supply chain finance. The research employs Data Envelopment Analysis (DEA) to evaluate financing efficiency and applies panel regression models to test the proposed relationships. The results demonstrate that greater financing efficiency significantly enhances firms' innovation performance. Mechanism analysis indicates that this relationship operates through the relaxation of financing constraints and increased participation in supply chain finance. Regional heterogeneity tests reveal that the positive effect is stronger in Central and Western China than in the Eastern region. Furthermore, corporate governance, operational efficiency, information disclosure, social capital, market competition, and government subsidies are identified as major determinants of financing efficiency, whereas excessive government regulation has a modest negative influence. By integrating both direct and indirect pathways, this study enriches the theoretical understanding of how financial mechanisms drive innovation and provides practical insights for policymakers and business leaders seeking to improve innovation through more efficient financing systems.

**Keywords:** Financing Efficiency, Corporate Innovation, Financing Constraints

### Introduction

China's rapid economic growth since the reform and opening-up has been driven largely by resource and labor advantages. However, with diminishing population dividends, rising labor costs, and slowing growth, the economy has entered a "new normal," requiring a shift toward innovation-led development. In response, the government has prioritized technological innovation as a core national strategy, aiming to become a global leader in science and technology by 2050. Despite progress, significant gaps remain compared with developed economies, especially in R&D investment and technological capabilities.

At the enterprise level, innovation capacity is critical to competitiveness. Firms face financing challenges due to underdeveloped financial markets, unstable funding channels, and high financing costs. Innovation, particularly in high-risk technological sectors, requires substantial and sustained investment, but high failure rates and information asymmetry often increase financing costs. Although reforms have sought to reduce these burdens, financing constraints remain a major barrier to corporate innovation.

Existing research highlights several gaps. First, innovation measurement indicators lack standardization, limiting cross-study comparability. Second, empirical work directly linking financing behavior to innovation is scarce, particularly in China's unique institutional context. Third, few studies integrate direct and indirect effects of financing efficiency on innovation, including mediating factors such as financing constraints, resource allocation, and supply chain finance.



### 3. Data Collection

3.1 Data Sources: Secondary data from authoritative databases (e.g., CSMAR, WIND).

3.2 Sample: Chinese A-share listed manufacturing enterprises.

3.3 Period: Multi-year panel data to allow longitudinal analysis.

### 4. Data Analysis

4.1 DEA model to compute financing efficiency scores.

4.2 Regression analysis to test direct and indirect effects.

4.3 Mediation analysis using methods such as the Baron & Kenny approach and bootstrapping.

4.4 Robustness checks and subgroup analysis to assess heterogeneity and validate findings.

## Research Results

### 1. Quantitative Results

This quantitative study examined the relationships between financing efficiency (FE), corporate innovation (CI), and factors such as financing constraints (FC), supply chain finance (SCF), corporate governance (CG), business operation efficiency (BOE), and external influences in China's Yangtze River Delta, Pearl River Delta, and Bohai Rim regions, using 401 valid surveys and structural equation modeling (SmartPLS 4.0). Key findings:

- Corporate governance had the strongest direct impact on FE (0.232,  $p < 0.001$ ), followed by social capital (0.141,  $p = 0.004$ ) and policy regulation (0.114,  $p = 0.029$ ). FE directly promoted CI (0.203,  $p < 0.001$ ) and affected FC (0.149,  $p = 0.003$ ) and SCF (0.194,  $p < 0.001$ ). FC and SCF also directly influenced CI.

- Indirect effects showed FE's influence on CI through FC (0.023,  $p = 0.042$ ) and SCF (0.021,  $p = 0.045$ ). Corporate governance had the strongest indirect effect on CI (0.057,  $p = 0.001$ ).

- The model showed moderate explanatory power:  $R^2 = 0.430$  for FE, 0.422 for FC, 0.410 for CI, and 0.338 for SCF. Effect size analysis emphasized key paths, particularly CG  $\rightarrow$  FE (0.057) and FE  $\rightarrow$  CI (0.044).

In summary, financing efficiency plays a vital role in corporate innovation, with both direct and indirect effects through FC and SCF, driven by internal (e.g., governance) and external (e.g., policy) factors.

### 2. Qualitative Results

Based on qualitative analysis of interviews with 20 business leaders across China's core economic zones, key findings validate the hypothesized relationships in the conceptual model.

2.1 Financing Efficiency and Corporate Innovation ( $H_1$ ): The frequent co-occurrence of terms like "innovation investment," "capital optimization," and "competitive advantage" supports that financing efficiency positively impacts corporate innovation. Keywords such as "capital allocation" and "R&D funding" indicate that effective financing enhances innovation capacity and market competitiveness.

2.2 Financing Constraints as a Mediator ( $H_4$ ): Terms like "capital shortages" and "funding bottlenecks" validate the mediating role of financing constraints. When financing efficiency alleviates these constraints, it directly facilitates innovation outcomes, supporting  $H_4$ .

2.3 Supply Chain Finance as a Mediator ( $H_8$ ): Keywords related to "supply chain finance," such as "trade credit" and "partner support," show how supply chain finance

mediates the relationship between financing efficiency and corporate innovation. Enhanced supply chain finance supports innovation collaboration and resource pooling, validating H<sub>8</sub>.

2.4 Corporate Governance, Information Disclosure, Policy Regulation, and Social Capital (H<sub>9</sub>–H<sub>12</sub>): The analysis reveals a chain of indirect effects:

- H<sub>9</sub>: Corporate governance enhances financing efficiency, which drives innovation investment.
- H<sub>10</sub>: Information disclosure boosts investor confidence, facilitating R&D funding and innovation.
- H<sub>11</sub>: Policy regulation, through financing support, fosters innovation output.
- H<sub>12</sub>: Social capital, via network resources and partnerships, drives capital access and collaborative innovation.

In conclusion, internal governance, information transparency, policy support, and social capital all play critical roles in enhancing financing efficiency and, in turn, corporate innovation in Chinese enterprises.

## Discussion

This study demonstrates that Financing Efficiency (FE) particularly pure technical efficiency plays a pivotal role in driving Corporate Innovation (CI). Quantitative results show a strong positive effect of FE on CI ( $\beta = 0.203$ ,  $p < 0.001$ ), consistent with Hall & Lerner (2010) but extending prior work by emphasizing not just financing availability, but the efficient utilization of funds. Pure technical efficiency appears especially critical for breakthrough innovation, while scale efficiency benefits incremental innovation, confirming the differentiated nature of financing impacts (Myers & Majluf, 1984).

Mediating Mechanisms were identified in the form of Financing Constraints (FC) and Supply Chain Finance (SCF). Improved FE alleviates FC ( $\beta = 0.149$ ,  $p = 0.003$ ) and promotes SCF ( $\beta = 0.194$ ,  $p < 0.001$ ), both of which independently enhance CI (FC:  $\beta = 0.156$ ; SCF:  $\beta = 0.107$ ). These results align with the pecking order theory and relational financing literature (Petersen & Rajan, 1997), showing that FE reduces information asymmetry, enhances creditworthiness, and enables better leverage of supply chain relationships.

Antecedents of FE include strong Corporate Governance (CG) ( $\beta = 0.232$ ), Social Capital ( $\beta = 0.141$ ), and Information Disclosure ( $\beta = 0.115$ ), along with external factors such as Policy Regulation and Government Subsidies. These findings reinforce governance theory (Jensen & Meckling, 1976) and social capital theory (Coleman, 1988), suggesting that both internal controls and relational networks are essential for sustained financing efficiency.

Regional Heterogeneity analysis shows FE's impact on innovation is stronger in Central and Western China than in the East, supporting Guiso, et al. (2004) on the role of regional financial development. This suggests that policy efforts to enhance FE may yield higher marginal gains in less-developed financial environments.

In summary, the integration of quantitative and qualitative findings confirms that enhancing FE through governance improvements, relational networks, and transparency creates both direct and indirect pathways to innovation. For practitioners, the results highlight the need to pair internal capability-building with targeted policy support to fully realize innovation potential.

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