**ISSN** 2409-2665
**Journal of Logistics, Informatics and Service Science**
Vol. 12 (2025) No. 11, pp. 85-96
**DOI:10.33168/JLISS.2025.1106**

# The Impact Mechanism of Supply Chain Finance and Digital Inclusive Finance on Technological Innovation of A-share Listed Companies

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**Abstract.** Corporate innovation is a crucial lever for enterprises to achieve sustainable competition, and financial means can provide long-term financing support for corporate innovation. Based on panel data from A-share listed companies in 31 provincial-level administrative regions in China from 2011 to 2023, this paper examines the impact mechanisms of supply chain finance and digital inclusive finance on corporate innovation. The study finds that: first, supply chain finance can effectively promote corporate innovation. Second, digital inclusive finance can effectively promote corporate innovation.Third, the spatial heterogeneity test found that the impact effects of supply chain finance and digital inclusive finance on corporate innovation vary across different regions. Fourth, R&D investment plays a significant partial mediating role in the process of digital inclusive finance promoting corporate innovation. Fifth, R&D investment has a significant single-threshold effect in the process of supply chain finance promoting corporate innovation. This study has positive implications for improving financial means in the new era to better support the real economy and can also provide important references for government departments.

**Keywords:** Supply Chain Finance, Digital Inclusive Finance, Corporate Innovation, R&D Investment

# 1. Introduction

Businesses significantly contribute to economic development. Enterprise innovation is intrinsically linked to competitive advantages and market positioning, serving as a crucial driver of industrial advancement and socio-economic growth (Shi, Y., & Wei, F., 2024). Nevertheless, in actuality, organisations frequently encounter numerous obstacles in technological progress. Initially, substantial investment and unpredictable returns hinder the proactive engagement of firms. Research, development, and implementation of technological advances frequently necessitate substantial initial investment, accompanied by prolonged recovery periods and elevated risk, particularly when the technology is immature or the market remains inadequately acknowledged (Asimiyu, Z., 2024). The second pertains to the unpredictability of technology and the industry. The swift advancement and enhancement of technology necessitate that organisations persist in investing in technological innovation; yet, the accelerated market fluctuations will heighten innovation risks and operational expenses for these enterprises. Consequently, for firms to successfully address the aforementioned issues, they require financial support (Du, Z., & Wang, Q., 2024). The 2023 Central Economic Work Conference advocated for financial institutions to expedite the advancement and implementation of green and low-carbon frontier technologies, emphasising the urgent need to leverage the critical functions of finance to significantly overcome the barriers to technological innovation.

Therefore, it is of great practical significance to explore how to promote corporate innovation through financial means. This study takes supply chain finance and digital inclusive finance as examples to explore the key impact of financial support on corporate innovation. Unlike traditional finance, supply chain finance provides comprehensive financial services and solutions to enterprises by integrating and optimizing information flow, capital flow and logistics in the supply chain (Patra, S. P. et al., 2024). Furthermore, the integration of digital informatics systems in manufacturing supply chains has been proven to enhance competitive advantage by optimizing logistics efficiency and environmental service quality (Simanjuntak et al., 2025). These characteristics are beneficial to improving corporate financing capabilities, optimizing corporate capital liquidity, and improving the overall efficiency of the supply chain, thereby promoting corporate innovation and high-quality development (Bai, H. et al., 2024). Digital inclusive finance is the product of the combination of traditional finance and digital technology, which relies on advanced technologies such as big data, cloud computing, and blockchain (George, A. S., 2024). Specifically, as a critical underlying infrastructure for digital finance, blockchain technology significantly enhances the efficiency and security of financial services through decentralization and transparency (Sharma & Karki, 2025). It further enriches inclusive financial products by lowering financing thresholds, improving financing efficiency, and optimizing resource allocation, and helps the online and offline integration of inclusive finance, becoming an important driver for the integrated development of the digital economy and the real economy, and providing new solutions for corporate technological innovation (Jin, L., & Liu, M., 2024; Chen, C. et al., 2024). Empirical studies indicate that regional economic growth, infrastructure construction, and education levels are key determinants driving the development of digital inclusive finance, thereby promoting the balanced allocation of urban-rural financial services (Lu et al., 2025).

The existing literature offers extensive research findings; nonetheless, there is a paucity of studies concerning the level of Chinese A-share listed businesses. This research endeavours to analyse the influence of supply chain finance and the advancement of digital inclusive finance on corporate innovation, utilising data from A-share listed businesses across several provinces in China. The primary contribution of this research is the examination of the impact mechanism. This study examines the direct influence of supply chain finance and digital inclusive finance on business innovation, while also utilising R&D expenditure as both a mediating and threshold variable to investigate the mediating and threshold effects between the two. This study aims to offer theoretical support and practical insights for advancing China's supply chain finance and digital inclusive finance, thereby fostering business innovation.

This paper is divided into four sections. The second section comprises a literature review and research

hypotheses. The third section encompasses data sources, variable measurement, and model configuration. The fourth section delineates the empirical findings. The fifth section emphasises the findings and policy suggestions.

# 2. Literature Review and Research Hypotheses

## 2.1.Supply Chain Finance and Enterprise Innovation

Supply chain finance enhances the financial performance of organisations and diminishes financing costs in several ways, hence establishing a robust financial basis for enterprise innovation (Zaman, S. I. et al., 2024). Yang Yalin and Wu Qiang (2025) discovered that the advancement of supply chain finance offers enhanced resources and support for the innovative endeavours of retail companies via financial assistance. Yu Zhaoji and Zhao Yingzi (2024) discovered that, from the standpoint of green development, supply chain financing may significantly enhance the advancement of companies' green technology innovation. Research also finds that supply chain integration acts as a full mediator between digital strategy and sustainable innovation performance, highlighting the critical role of collaborative mechanisms in translating innovation outcomes (Li et al., 2025). Guo Jing and Zhang Guanbin (2024) discovered through mechanism analysis that supply chain finance can substantially enhance the innovative capacity of manufacturing businesses by alleviating financial restrictions and facilitating their digital transformation. Luo Ye (2024) emphasises the developmental potential of small and medium-sized enterprises, asserting that supply chain finance significantly facilitates their innovation by mitigating financing challenges. Pu Xiaotong et al. (2024) examined the correlation between supply chain finance and agricultural firms from an agrarian viewpoint. The findings indicate that supply chain finance can alleviate funding limitations for firms and enhance their risk-bearing capability, consequently markedly augmenting the innovative capabilities of small and medium-sized agricultural enterprises. Furthermore, supply chain collaboration has been proven to significantly enhance green innovation performance, with policy effectiveness being more pronounced in state-owned enterprises than in private firms (Ou et al., 2025). This study posits the initial research hypothesis H1: Supply chain finance can substantially enhance the innovation of China's A-share listed enterprises.

## 2.2.Digital Financial Inclusion and Corporate Innovation

The conventional financial model presently fails to address the varied requirements of the real economy. Digital inclusive finance has created new avenues for company financing and has significantly facilitated the profound integration of the digital economy with the real economy (Su Lei et al., 2025). Yao Yan (2024) discovered that the inclusivity and efficiency of digital inclusive finance facilitate greater financial support for small and medium-sized firms, consequently advancing their green research and development innovation. Zeng Weibo et al. (2024) assert that digital inclusive financing can substantially enhance corporate technological innovation, with a more pronounced impact on technology-based firms. Furthermore, digital technology capability has been proven to significantly enhance enterprise innovation performance by improving firms' network adaptability and coordination (Lu et al., 2025). Liang Mengxi (2024) posits that, from the standpoint of green development, digital inclusive finance has positively influenced corporate green innovation by lowering financing costs, augmenting capital accessibility, and increasing the accessibility and ease of financial services. Xu Shumiao (2024) determined that digital inclusive finance has mitigated information asymmetry between agricultural enterprises and financial institutions, enhanced the financial market position of agricultural enterprises, and facilitated their digital transformation by supplying necessary funds for innovation. Meanwhile, digital financial inclusion can also promote corporate social responsibility fulfillment (such as charitable donations) by improving transparency and efficiency, with digital transformation playing a mediating role (Yin, 2025). This study posits the second research hypothesis H2: Digital inclusive financing can considerably enhance the innovation of China's A-share listed enterprises.

## 2.3.Mediating Effect of R&D Investment Between Financial Instruments and Corporate Innovation

Currently, certain scholars within the academic community are examining the internal impact

mechanisms of supply chain finance and digital inclusive finance on company innovation. Yu Zhaoji and Zhao Yingzi (2024) discovered that the advancement of supply chain financing may significantly stimulate corporate investment activities, particularly in research and development, and that the enhancement of corporate investment activities can further facilitate corporate green technology innovation. Xu Tianshu and Sun Tiantian (2023) assert that supply chain finance can enhance the total level of business R&D spending, hence positively influencing technological innovation. Li Zonglin (2024) discovered that digital inclusive finance has substantially enhanced the green technology innovation of small and medium-sized enterprises, and it can further augment corporate green technology innovation capabilities by increasing R&D investment. Liang Lingling et al. (2023) assert that digital inclusive finance enhances the treatment and mobility efficiency of R&D staff by fostering increased investment in R&D, thereby creating advantageous conditions for corporate green technology innovation. This study posits hypothesis H3a: R&D spending significantly mediates the relationship between supply chain financing and company innovation. H3b: Research and development spending significantly mediates the relationship between digital financial inclusion and business innovation.

### 2.4.Threshold Effect of R&D Investment Between Financial Instruments and Corporate Innovation

The academic community has yet to directly investigate the threshold effect of R&D expenditure on the relationship between financial resources and company innovation. Li Yunyun (2024) discovered that elevated levels of corporate liquidity loan financing amplify the impact of green finance on corporate green innovation. Notably, green finance exerts an inverted U-shaped nonlinear impact on digital economy development, initially promoting growth but showing diminishing marginal benefits as expansion intensifies (Li et al., 2025). Zhao Hui and Wang Ting (2023) utilised fiscal expenditure as a proxy for government intervention and discovered that government involvement exerted a strong single threshold effect in the context of financial development fostering regional innovation. Liu Xiaokang (2023) employed government subsidies as a threshold variable to examine the threshold effect between digital finance and corporate innovation. Government subsidies may also be seen as a source of R&D funding. This study posits the research hypothesis H4a: R&D investment exerts a threshold effect on the relationship between supply chain financing and company innovation. The investment in R&D exhibits a threshold effect on the relationship between digital inclusive finance and business innovation.

## 3. Data and Methods

### 3.1.Data Sources

China comprises 34 provincial-level administrative areas; however, due to significant data deficiencies in Taiwan Province, Hong Kong Special Administrative Region, and Macao Special Administrative Region, these three units were removed from the sample. This study employs panel data from 31 provincial-level administrative units in China from 2011 to 2023, sourced from the "China Statistical Yearbook," "China Financial Yearbook," the "Statistical Yearbook" of each province, and the Wind database. Interpolation is employed to address minimal missing data. To mitigate the effects of heteroscedasticity, all pertinent metrics are logarithmically transformed.

### 3.2.Variables

Dependent variable: Technological Innovation (TI) in enterprises. This study assesses the degree of technical innovation within enterprises, evaluated by innovation output, quantified by the natural logarithm of the annual number of invention patent applications.

Independent variable: (1) Supply Chain Finance (SCF). This article cites pertinent research findings and quantifies supply chain financing using the ratio of the aggregate of short-term loans and notes payable to total assets. A greater ratio corresponds to enhanced efficiency in supply chain financing. Digital Inclusive Finance (DIF). This article employs the "Digital Inclusive Finance Index" developed by the Digital Finance

Research Centre of Peking University and the Ant Group Research Institute to assess the advancement of digital inclusive finance. This index is derived from existing literature and conventional inclusive finance metrics suggested by international organisations, integrating the contemporary context and distinctive features of digital financial services with the accessibility and dependability of data to establish a digital inclusive finance indicator system.

Control variables: There are many factors that affect enterprise innovation. Therefore, based on existing research results, it is necessary to set control variables for this study. (1) Net return on total assets (ROA). This study uses the ratio of corporate net profit to total assets as a measurement indicator. (2) Debt-to-asset ratio (DEBT). This study uses the ratio of total liabilities to total assets at the end of the enterprise as a measurement indicator. (3) Factor intensity (FACTOR). Factor intensity refers to the proportion of various production factors input based on the lowest production cost in the production process of the enterprise. (4) Number of employees (EMP). The skills, knowledge and experience of employees can continuously enhance the ability of the enterprise to absorb and develop innovation. (5) Enterprise age (AGE). The logarithm of the difference between the research period and the establishment period of the enterprise is used as a proxy indicator for enterprise age.

Mediating variable: R&D investment (RDI). This study uses the capital investment of the enterprise in R&D as a proxy indicator.

## 3.3.Model Specification

### 3.3.1. The Panel Regression Model

The study would use the panel regression model to prove the direct impact of supply chain finance and digital inclusive finance on corporate innovation. Its general formula is as follows, where β0 represents the intercept term of the Y axis, β1 to β6 represent the coefficients of the independent variable, and ε represents the error term.

$$TI_1 = \beta_0 + \beta_1 SCF + \beta_2 ROA + \beta_3 DEBT + \beta_4 FACTOR + \beta_5 EMP + \beta_6 AGE + \varepsilon$$

$$TI_2 = \beta_0 + \beta_1 DIF + \beta_2 ROA + \beta_3 DEBT + \beta_4 FACTOR + \beta_5 EMP + \beta_6 AGE + \varepsilon$$

### 3.3.3. Mediating Effect Model

The formula for the mediating effect model is as follows.In the aforementioned formula: a denotes the direct effect of the independent variable on the mediating variable; b signifies the direct effect of the mediating variable on the dependent variable; c and c' indicate the direct effect of the independent variable on the dependent variable; e1, e2, and e3 represent error terms.

$$TI = cSCF + e_1$$
$$RDI = aSCF + e_2$$
$$TI = c'SCF + bRDI + e_3$$

$$TI = cDIF + e_1$$
$$RDI = aDIF + e_2$$
$$TI = c'DIF + bRDI + e_3$$

### 3.3.4 Threshold Effect Model

The threshold effect refers to the situation that when an economic parameter reaches a specific value or a

specific range, it would cause another economic parameter to undergo a sudden change or qualitative change. The basic formula of the threshold effect is as follows:

$$TI_t = \alpha + SCF\beta_1 + \varepsilon_t \ (SCF_t \le \gamma)$$
$$TI_t = \alpha + SCF\beta_2 + \varepsilon_t \ (SCF_t > \gamma)$$

$$TI_t = \alpha + DIF\beta_1 + \varepsilon_t \ (DIF_t \le \gamma)$$
$$TI_t = \alpha + DIF\beta_2 + \varepsilon_t \ (DIF_t > \gamma)$$

In the above formula, β1 and β2 represent different threshold intervals, the influence coefficient of SCF or DIF on TI; SCFt and DIFt represent the threshold variable; γ represents the threshold value.

# 4. Results and Discussion

This section mainly presents the results of a series of empirical analyses, including benchmark regression, robustness tests, mediation effects and threshold effects.

## 4.1.Benchmark Regression

Table 1 shows the direct regression results of supply chain finance and digital inclusive finance on enterprise innovation.

Table 1: Results of Benchmark Regression

| Variables | SCF | DIF | ROA | DEBT | FACTOR | EMP | AGE | Constant | N | R2 | F |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Direct Regression Results | 0.301***(0.096) | | 0.005 (0.006) | 0.000 (0.001) | -0.295** (0.140) | 0.313* (0.163) | 2.955*** (0.282) | -2.092 (2.841) | 403 | 0.7925 | 236.84 |
| | | 0.122** (0.053) | 0.006 (0.006) | 0.001 (0.001) | -0.243* (0.139) | 0.417*** (0.159) | 2.233*** (0.277) | -2.067 (2.870) | 403 | 0.7926 | 233.12 |

Source: Based on Empirical Analysis by Stata.17.0.

It shows that both supply chain finance and digital inclusive finance have significant positive effects on enterprise innovation. The results of the impact of other control variables on enterprise innovation show that, regardless of whether the core independent variable is supply chain finance or digital inclusive finance, the net profit margin of total assets and the debt-to-asset ratio have no effect on enterprise innovation, while factor intensity, number of employees and enterprise age have significant direct effects on enterprise innovation.

## 4.2.Robustness Test

This section performs a robustness test to verify the reliability of the regression analysis, primarily involving the substitution of the dependent variable's proxy indication by utilising patent applications as the proxy indicator. Secondly, reducing the data aims to mitigate the influence of outliers. Third, excluding municipal samples is necessary, as these municipalities are all established cities, resulting in elevated levels of financial development and innovation, which may compromise the accuracy and generalisability of the research.

Table 2: Results of Robustness Test

| Variables | SCF | DIF | ROA | DEBT | FACTOR | EMP | AGE | Constant | N | R2 | F |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Replacing the dependent variable | 0.196**（0.090） | | 0.005（0.005） | 0.000（0.001） | -0.136（0.131） | 0.477***（0.153） | 2.375***（0.266） | -3.567（2.673） | 403 | 0.788 | 226.82 |
| | | 0.147***（0.050） | 0.006（0.005） | 0.000（0.001） | -0.009（0.129） | 0.535***（0.148） | 1.747***（0.258） | -3.115（2.668） | 403 | 0.873 | 229.96 |
| Data shrinking | 0.240**（0.095） | | 0.020**（0.009） | 0.011***（0.004） | -0.201（0.138） | 0.278*（0.167） | 2.734***（0.281） | -2.646（2.827） | 403 | 0.798 | 241.06 |
| | | 0.388***（0.071） | 0.038***（0.013） | -0.012**（0.004） | -0.015（0.069） | 1.153***（0.025） | 0.622***（0.210） | -10.938***（0.988） | 403 | 0.910 | 667.06 |
| Reducing sample | 0.305***（0.103） | | 0.005（0.006） | 0.001（0.002） | -0.284*（0.158） | 0.334*（0.177） | 2.914***（0.323） | -2.608（3.111） | 351 | 0.786 | 194.17 |
| | | 0.164***（0.057） | 0.007（0.006） | 0.001（0.002） | -0.216（0.155） | 0.461***（0.171） | 2.021***（0.316） | -2.758（3.109） | 351 | 0.785 | 193.87 |

Source: Based on Empirical Analysis by Stata.17.0.

The robustness test results in Table 2 show that regardless of replacing the dependent variable, shrinking the data or deleting the samples of municipalities, supply chain finance and digital inclusive finance have a significant positive impact on corporate innovation. This shows that the regression analysis of this study is reliable and robust.

## 4.3.Spatial Heterogeneity Test

The aforementioned conclusions affirm that supply chain finance and digital inclusive finance play a crucial role in fostering innovation inside Chinese firms. This study will categorise China into three regions—East China, Central China, and West China—for regression analysis, owing to its extensive territory and the disparate development across regions. Table 3 illustrates that, in East China, both supply chain finance and digital inclusive finance exert a strong beneficial influence on firm innovation. Secondly, in Central and Western China, digital inclusive finance significantly enhances firm innovation; nevertheless, the impact of supply chain financing on enterprise innovation is negligible.

Table 3: The Results of Spatial Heterogeneity Test

| Variables | SCF | DIF | ROA | DEBT | FACTOR | EMP | AGE | Constant | N | R2 |
|---|---|---|---|---|---|---|---|---|---|---|
| East China | 0.385**（0.148） | | 0.009（0.007） | 0.009（0.009） | -0.182（0.215） | 0.060（0.206） | 3.304***（0.405） | -1.031（3.805） | 169 | 0.852 |
| | | 0.256**（0.107） | 0.013*（0.008） | -0.011（0.010） | 0.277（0.176） | 1.152***（0.084） | 1.335***（0.326） | -16.046***（2.419） | 169 | 0.929 |
| Central China | 0.381（0.318） | | 0.016（0.015） | -0.001（0.002） | -0.212（0.409） | 1.112*（0.595） | 2.248***（0.795） | -11.404（10.023） | 78 | 0.888 |
| | | 0.255**（0.107） | 0.014（0.015） | -0.001（0.002） | 0.956***（0.225） | 1.684***（0.123） | -0.110（0.387） | -28.022***（3.459） | 78 | 0.938 |
| West China | 0.202（0.174） | | 0.007（0.013） | 0.004（0.005） | -0.089（0.236） | 0.276（0.338） | 2.496***（0.507） | -3.885（5.380） | 156 | 0.711 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0.206**<br>（0.087） | 0.003<br>（0.013<br>） | 0.004<br>（0.005<br>） | -0.168<br>（0.236<br>） | 0.124<br>（0.337<br>） | 1.832***<br>（0.481<br>） | 0.273<br>（5.414） | 156 | 0.720 |

Source: Based on Empirical Analysis by Stata.17.0.

## 4.4.Mediating Effect Results

This study uses the Bootstrap method to test the mediation effect.

Table 4: Mediating Effect Results

| Mediating Variable | Independent Variables | Effect | Regression Results | [95% conf.interval] |
|---|---|---|---|---|
| RDI | SCF | _bs_1: r (Mediating Effect) | 0.132<br>(0.357) | [-0.567 , 0.831] |
| | | _bs_2: r (Direct Effect) | -0.546<br>(0.472) | [-1.472 , 0.379] |
| | DIF | _bs_1: r (Mediating Effect) | 0.486**<br>(0.221) | [0.053 , 0.920] |
| | | _bs_2: r (Direct Effect) | 0.877***<br>(0.274) | [0.340 , 1.415] |

Source: Based on Empirical Analysis by Stata.17.0.

From the mediation effect results in Table 4, it can be seen that R&D investment does not have a mediating effect in the process of supply chain finance promoting enterprise innovation, but has a significant partial mediating effect in the process of digital inclusive finance promoting enterprise innovation.

## 4.5.Threshold Effect Results

Table 5 presents a preliminary threshold-type assessment. R&D investment has a notable threshold effect in the context of supply chain finance facilitating enterprise innovation, however it lacks a threshold effect in the realm of digital inclusive finance boosting enterprise innovation.

Table 5: Verification for Threshold Type for RDI

| Threshold Effect | Threshold Type | Bootstrap | F-Statistic | P-value | Crit10 | Crit5 | Crit1 |
|---|---|---|---|---|---|---|---|
| *Between SCF and TI* | Single Threshold | 100 | 25.15 | 0.040 | 20.812 | 23.099 | 25.996 |
| | Double Threshold | 100 | 4.17 | 0.900 | 16.194 | 19.654 | 32.611 |
| | Triple Threshold | 100 | 4.23 | 0.650 | 10.900 | 15.297 | 21.796 |
| *Between DIF and TI* | Single Threshold | 100 | 20.30 | 0.140 | 22.436 | 28.673 | 33.832 |
| | Double Threshold | 100 | 6.16 | 0.670 | 14.511 | 16.119 | 25.682 |
| | Triple Threshold | 100 | 5.31 | 0.740 | 15.696 | 21.178 | 28.714 |

Source: Based on Empirical Analysis by Stata.17.0.

Table 6 shows the retesting and separately estimating of single threshold effect for RDI. It shows that when R&D investment is used as the threshold variable, the threshold value is 3.1161.

Table 6: Retesting and Separately Estimating of Single Threshold Effect for RDI Between SCF and TI

| Threshold Type | Bootstrap | F Statistic | P-value | Crit10 | Crit5 | Crit1 | Threshold Value Estimation | [95% conf. Interval] |
|---|---|---|---|---|---|---|---|---|
| Single Threshold | 100 | 25.15 | 0.050 | 20.430 | 24.310 | 30.140 | 3.1161 | [ 3.1140, 3.1165] |

Source: Based on Empirical Analysis by Stata.17.0.

Table 7 presents the threshold regression analysis for R&D investment in relation to supply chain finance

and firm innovation. When R&D investment is below 3.1161, supply chain finance positively influences enterprise innovation with an impact coefficient of 0.415. Conversely, when R&D investment is equal to or exceeds 3.1161, the positive influence of supply chain finance on enterprise innovation is enhanced, resulting in an impact coefficient of 0.535.

Table 7: Results of Threshold Effect Regression for RDI Between SCF and TI

| Variables | SCF (RDI＜3.1161) | SCF (RDI≧3.1161) | ROA | DEBT | FACTOR | EMP | AGE | Constant | $R^2$ | F |
|---|---|---|---|---|---|---|---|---|---|---|
| Threshold Regression Results | 0.415** (0.168) | 0.535** (0.206) | 0.005 (0.011) | -0.001 (0.001) | -0.231 (0.204) | 0.423 (0.289) | 2.632*** (0.449) | -3.744 (4.220) | 0.739 | 46.83 |

Source: Based on Empirical Analysis by Stata.17.0.

# 5. Conclusion and Recommendations

This study analyses the impact mechanism of supply chain financing and digital inclusive finance on corporate innovation, utilising panel data from A-share listed businesses across 31 provincial administrative regions in China from 2011 to 2023. The research concluded that supply chain finance significantly enhances company innovation. Secondly, digital inclusive finance can significantly enhance company innovation. The spatial heterogeneity test revealed regional disparities in the effects of supply chain finance and digital inclusive finance on corporate innovation. Fourth, R&D investment exerts a notable partial mediating influence in the facilitation of business innovation by digital inclusive finance. Fifth, R&D investment exerts a substantial singular threshold effect on the facilitation of corporate innovation through supply chain finance. Consequently, in light of the aforementioned findings, this study proposes the subsequent policy recommendations.

Initially, supply chain financial institutions ought to offer tailored financial products and services to directly facilitate company innovation initiatives. This encompasses not just low-interest loans and favourable financing terms but also the creation of tailored financial solutions for technology research, development, and implementation. Furthermore, supply chain financial institutions ought to collaborate with the government to jointly develop and refine financial policies and strategies that foster technological innovation. They should ensure effective implementation of these measures by engaging in the design and execution of tax incentives, government subsidies, and other policies, thereby maximising their contribution to advancing green technology innovation. Secondly, financial institutions must actively advance digital inclusive finance, enhance digital infrastructure, particularly in regions with underdeveloped financial systems, elevate their own levels of digitalisation, and offer robust support for the advancement of digital inclusive finance. Moreover, financial institutions ought to leverage digital technology to broaden service parameters, guarantee extensive access to digital inclusive financial services, reduce the financial service barriers for enterprises, and enhance the impetus for innovation within manufacturing enterprises. Third, enterprises ought to enhance collaboration with banks and other financial institutions, engage in supply chain finance and digital inclusive finance by sharing business scenarios, transactions, and other data, and improve their information disclosure standards and corporate innovation capabilities. The government should promote and assist financial institutions and firms in investing and innovating in technology by implementing measures such as tax exemptions, research and development subsidies, and risk compensation. The government should enhance oversight of the financial market, guarantee the transparency and equity of supply chain financing and digital inclusive financial operations, and avert excessive speculation in the financial market. By implementing stringent regulatory measures, the government can facilitate a more efficient allocation of financial resources to sectors that genuinely foster technological innovation.

This study's uniqueness mostly resides in employing R&D spending as a threshold variable to examine the nonlinear effects of financial resources on business innovation. The constraints of this investigation are

contingent upon data availability. The original data, derived from the official statistical yearbooks of each province, is confined to the years 2011 to 2023, resulting in a rather small sample size. The indicators for pertinent factors are constrained and derived from previous academic research findings. Consequently, the indicators are insufficient to accurately reflect the actual condition of each variable. In the future, researchers may contemplate extending the duration to investigate the correlation between financial resources and company innovation under long-term consequences, or examine additional countries and areas as subjects to further broaden the research findings.

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