Journal of Risk Analysis and Crisis Response, 2025, 15(4), 769-786
https://jracr.com/
ISSN Print: 2210-8491
ISSN Online: 2210-8505

Article

A Study on the Promoting Role of Fintech in the Total Factor Productivity of Enterprises in Strategic Emerging Industries

Jin-mo Li [1,2] and Mu Zhang [1,2,*]

[1] School of Applied Economics, Guizhou University of Finance and Economics, Guiyang (550025), Guizhou, China
[2] Guizhou Institution for Technology Innovation & Entrepreneurship Investment, Guizhou University of Finance and Economics, Guiyang (550025), Guizhou, China
* Correspondence: rim_007@163.com

Received: August 7, 2025; Received in revised form: December 17, 2025; Accepted: December 28, 2025; Available online: December 31, 2025

Abstract: The Third Plenary Session of the 20th Central Committee of the Communist Party of China proposed the development of "new productive forces," whose core essence lies in "significantly enhancing total factor productivity." As the backbone of boosting TFP, strategic emerging industries shoulder the crucial mission of leading the sustained and healthy development of industries. By virtue of its innovative business models, applications, and service systems, fintech provides comprehensive and efficient financial support for enterprises in strategic emerging industries, thereby contributing to the improvement of their TFP. Based on data from 1,370 strategic emerging enterprises spanning the period 2014–2023, this study systematically analyzes the impact of fintech on corporate TFP and its underlying transmission mechanisms. The findings indicate that fintech significantly promotes the TFP of strategic emerging enterprises, and this conclusion remains robust after conducting endogeneity tests and robustness checks. An in-depth analysis of the mechanism reveals that fintech primarily enhances TFP through two chained intermediary pathways: alleviating financing constraints to further advance enterprise digital transformation, and strengthening digital technology innovation capabilities to drive enterprise digital transformation. Furthermore, national regulation exerts a positive moderating effect on the contribution of fintech to the TFP growth of strategic emerging enterprises. Heterogeneity analysis shows that compared with non-state-owned enterprises and resource- or labor-intensive industries, fintech has a more pronounced TFP-enhancing effect on state-owned enterprises and technology-intensive industries. Finally, based on the empirical results, this study offers insights for fintech to better empower the efficiency of the real economy and promote the high-quality development of strategic emerging industries.

Keywords: Fintech; Total Factor Productivity; Chain-based Intermediary; Strategic Emerging Industries

1. Introduction

The Third Plenary Session of the 20th Central Committee of the Communist Party of China put forward the development of "new productive forces," with its core essence being to "significantly enhance total factor productivity." This highlights the fundamental shift in development momentum from "factor input-driven" to "innovation efficiency-driven." As a key area for innovation-driven

development, improving the TFP of strategic emerging industries is crucial for achieving economic transformation and upgrading [1]. Characterized by technology and capital intensity, high growth potential, and significant risks, the development of strategic emerging industries relies heavily on continuous technological innovation and substantial capital investment. However, traditional financial systems struggle to effectively meet the financing needs of such enterprises due to issues such as information asymmetry, insufficient collateral, and backward risk assessment. Fintech, emerging from the deep integration of digital technology and financial services, has effectively alleviated the financial predicaments faced by strategic emerging enterprises. Can fintech then promote the improvement of TFP in these enterprises? What are the transmission mechanisms through which this effect operates, and what factors influence it? At this critical juncture in advancing new-quality productive forces, an in-depth analysis of the inherent logic between fintech and the TFP of strategic emerging industries holds important theoretical and practical significance.

Existing research has focused on the core issue of TFP growth, conducting comprehensive and in-depth analyses of its driving mechanisms from multiple perspectives. In the dimension of technological innovation, R&D investment (Liu Yuanchu et al., 2024) [2] and open innovation ecosystems (Song Qinghua et al., 2024) [3] not only directly accelerate the pace of technological progress but also indirectly enhance corporate TFP by promoting knowledge spillover effects. In the field of financial resource allocation, digital finance and digital tax administration (Chen Xiaoxiong et al., 2025) [4] alleviate financing constraints and correct capital misallocation, thereby further optimizing factor allocation efficiency (Liang Jian, 2025) [5]. Regarding the policy environment, fintech policies and green regulations improve TFP by encouraging green innovation and guiding capital flow to high-value-added sectors (Liu Jian et al., 2023) [6]. Currently, only a limited number of scholars have focused their research on the relationship between fintech and strategic emerging industries. Zhai Huayun (2014) [7] examined the relationship between fintech development levels, R&D investment, and corporate growth using annual samples of A-share listed companies in strategic emerging industries on the Shanghai and Shenzhen Stock Exchanges. Liu Yuanchu et al. (2024) [2] further constructed a regional fintech development index and empirically demonstrated that fintech significantly enhances the TFP of listed companies in strategic emerging industries. However, this study failed to explore specific causal pathways and overlooked the moderating effects of other factors, presenting certain limitations.

This paper's potential contributions are as follows: 1) It examines the mechanism through which fintech enhances TFP in strategic emerging enterprises using a chained mediation model, constructing micro-level transmission pathways via two chains: financing constraints-digital transformation and digital technology innovation-digital transformation; 2) It investigates the moderating role of national regulation in the relationship between fintech and corporate TFP, enriching the research framework on fintech's impact on strategic emerging enterprises;3. The study conducts heterogeneity analysis from the perspectives of firm ownership structure and industry, offering new insights for future research. The remaining sections are structured as follows: Section 2 presents theoretical analysis and research hypotheses; Section 3 outlines the research design; Section 4 reports empirical results and analysis; Section 5 discusses findings; and Section 6 concludes the study.

2. Theoretical Analysis and Research Hypotheses

2.1. The Impact of Fintech on the Total Factor Productivity of Strategic Emerging Enterprises

Current research generally recognizes that the development of fintech contributes to the improvement of corporate TFP. Specifically: Wang Yan (2023) [8] verified that fintech plays a role in promoting the TFP growth of manufacturing enterprises; Song Min et al. (2021) [9] measured fintech development by the number of fintech companies and found a positive correlation between regional fintech firm density and corporate TFP; from a new structural economics perspective, Ba Shusong et al. (2020) [10] used regional R&D investment to measure the level of fintech development and discovered a threshold effect in the impact of fintech on enterprise TFP—meaning fintech can effectively stimulate economic growth only when its development exceeds a certain threshold. Compared with traditional industries, enterprises in strategic emerging industries exhibit more active technological innovation activities. The development of fintech can precisely help enterprises overcome financing difficulties during the innovation process, providing stable and continuous financial support for enterprises' long-cycle innovation projects [11]. The smooth progress of innovation activities will contribute to the improvement of enterprises' total factor productivity. Accordingly, this paper proposes the following hypothesis:

H1: Fintech can significantly enhance the TFP of enterprises in strategic emerging industries.

2.2. The Channels through Which Fintech Influences the TFP of Strategic Emerging Enterprises

2.2.1. Chain Mediation Effect: Financing Constraints-Digital Transformation

Existing research has analyzed the mediating effect of fintech on enhancing corporate TFP from a credit rationing perspective. However, the mechanism through which fintech boosts TFP in strategic emerging enterprises does not depend on a single factor but rather results from the interplay of multiple factors. Therefore, this paper further examines the pathways through which fintech enhances corporate TFP by exploring chained mediating effects such as alleviating financing constraints, digital technology innovation, and digital transformation.

Financing costs represent a critical determinant of enterprise TFP. Within traditional financial systems, corporate financing expenses are influenced by macroeconomic conditions and other factors. Science and technology enterprises, characterized by higher risk profiles, face particularly acute capital shortages. The development of fintech addresses the limitations of traditional financial institutions in meeting the financing needs of SMEs and high-growth enterprises, providing greater capital support that enables increased investment in R&D activities and thereby enhances TFP. However, the mechanisms and pathways through which alleviating financing constraints promotes TFP growth are diverse. Against the backdrop of rapid digital economic development, easing financing constraints provides critical resource support for corporate digital transformation, significantly boosting TFP in strategic emerging industries. On one hand, ample capital enables enterprises to acquire hardware facilities such as big data platforms and intelligent production equipment while introducing core technologies like artificial intelligence algorithms, thereby establishing the technological foundation for digital transformation. This facilitates improvements in total factor productivity. On the other hand, financial backing covers the full spectrum of costs associated with business process reengineering, digital team development, and employee digital skills training. It prevents transformation projects from being interrupted due to short-term cash flow pressures, further optimizing resource allocation efficiency and ultimately boosting total factor

productivity. Therefore, from the perspective of financial support, the development of fintech alleviates enterprises' financing constraints. This alleviation, in turn, drives corporate digital transformation, ultimately boosting the TFP of enterprises in strategic emerging industries. This establishes a transmission pathway: "Fintech → Alleviating Financing Constraints → Promoting Corporate Digital Transformation → Enhancing Corporate TFP." Accordingly, this paper proposes the following hypothesis:

H2a: Fintech can promote corporate digital transformation by alleviating financing constraints, thereby enhancing total factor productivity.

2.2.2. Digital Technology Innovation—Chain-Based Mediating Effects in Digital Transformation

Advancing digital transformation is not merely about introducing technology; it involves the deep integration of digital technologies with business scenarios. Based on the Resource-Based View, a company's competitive advantage stems from its internal heterogeneous resources—those that are scarce, difficult to imitate, and irreplaceable—rather than relying solely on external market conditions **错误!未找到引用源。**. The core prerequisite lies in the company's capacity for digital technology innovation tailored to its developmental needs. Due to its scarcity and difficulty to replicate, this capability becomes a critical advantage for achieving digital transformation. Digital technological innovation directly drives the iterative renewal and upgrading of corporate production technologies. By introducing cutting-edge technologies such as artificial intelligence and big data analytics, enterprises can accelerate technological transformation processes, significantly boosting growth in the critical dimension of technological progress within total factor productivity **错误!未找到引用源。**. This enables companies to gain technological advantages in intense market competition. Simultaneously, according to dynamic capability theory, in dynamically changing market environments, a company's competitive advantage depends not only on existing resources but also on its ability to integrate, construct, and reconfigure both internal and external resources. The enhanced digital technological innovation capabilities enabled by fintech represent a concrete manifestation of dynamic capabilities. By continuously iterating technologies and restructuring business processes, enterprises drive digital transformation to advance across the entire value chain. This approach adapts to dynamic demands during the transformation process, enabling flexible responses to various challenges in digital development and further boosting total factor productivity. Therefore, from a technological perspective, the development of fintech enhances enterprises' digital technological innovation capabilities. The improvement in these capabilities, in turn, drives enterprise digital transformation, ultimately boosting the TFP of enterprises in strategic emerging industries. This establishes a transmission pathway: "Fintech → Enhances digital technological innovation capabilities → Promotes enterprise digital transformation → Increases enterprise TFP." Accordingly, this paper proposes the following hypothesis:

H2b: Fintech can promote enterprise digital transformation by enhancing digital technology innovation capabilities, thereby improving total factor productivity.

2.3. Mechanism of Fintech's Impact on TFP in Strategic Emerging Enterprises

2.3.1. Regulatory Role of National Oversight

The convergence of finance and technology inherently carries risk attributes, potentially amplifying existing risks in both sectors and even triggering systemic risks 错误!未找到引用源。. Against the backdrop of network information technology, the proliferation of diverse participants and intricate connectivity patterns has also led to the emergence of more concealed financial risks. National regulatory authorities have effectively mitigated numerous risks inherent in fintech's service to strategic emerging industries by meticulously constructing clear compliance frameworks and risk prevention and control rule systems. This approach reduces legal and operational uncertainties for enterprises adopting fintech, enabling them to overcome hesitations and increase long-term investment in technological R&D. Simultaneously, it effectively corrects market failures such as disorderly capital expansion, directing fintech resources precisely to critical sectors of the real economy. Consequently, it facilitates significant improvements in enterprises' total factor productivity. Accordingly, this paper proposes the following hypothesis:

H3a: National regulation positively regulates the improvement of TFP in strategic emerging enterprises through fintech.

2.3.2. Differentiated Impact of Fintech on TFP in Strategic Emerging Enterprises

The role of fintech in enhancing TFP for enterprises in strategic emerging industries is influenced by multiple factors. Existing literature indicates that this impact exhibits heterogeneity across different enterprise property rights 错误!未找到引用源。, industry characteristics 错误!未找到引用源。, and regions 错误!未找到引用源。. Therefore, this paper further analyzes the heterogeneous effects of fintech development on TFP across enterprises with different property rights and industry characteristics.

1) Ownership Structure. State-owned enterprises occupy a central position in China's economic development and play a pivotal role in achieving high-quality growth objectives. Consequently, SOEs possess external incentives to enhance their TFP further, thereby serving as exemplary leaders in advancing high-quality economic development. Additionally, small and medium-sized private enterprises often face scale discrimination and ownership discrimination in financing, while large state-owned enterprises enjoy unique advantages in the credit market, enabling them to obtain effective financial support 错误!未找到引用源。. Moreover, state-owned enterprises possess greater risk tolerance for long-cycle, high-return innovations like fintech, allowing them to more efficiently drive technological breakthroughs and optimize resource allocation through digital innovation, thereby strengthening their contribution to TFP. Accordingly, this paper proposes the following hypothesis:

H3b: The impact of fintech on enhancing TFP for strategic emerging enterprises varies across ownership structures.

2) Industry Factor Intensity. Factor intensity is a key dimension influencing fintech's ability to enhance enterprises' TFP, fundamentally reflecting variations in the alignment between fintech's digital empowerment characteristics and the developmental needs of different industries. Technology-intensive industries rely on continuous R&D innovation as their core competitiveness. Their characteristics—high R&D investment and complex factor allocation—align strongly with fintech's technological empowerment and resource optimization functions, making fintech's contribution to their TFP more pronounced. Conversely, resource- and labor-intensive industries primarily depend on resource inputs and labor cost control, exhibiting lower demand compatibility

with fintech, which consequently has a relatively limited enabling effect. Accordingly, this paper proposes the following hypothesis:

H3c: The enhancement of TFP in strategic emerging enterprises by fintech varies across industries with differing factor intensity.

3. Research Design

3.1. Model Specification

This paper draws upon the research of Nanda and Rhodes-Kropf (2013) **错误!未找到引用源。** to construct the following regression model examining the impact of fintech on the total factor productivity of enterprises in strategic emerging industries:

$$TFP\_OP_{i,t} = \alpha_0 + \alpha_1 F\,\mathrm{int}\,ech_{i,t} + \beta \mathrm{Control}_{i,t} + \gamma_j + \chi_t + \varepsilon_{i,t} \quad (1)$$

Where i, j, t represent firm, industry, and year, respectively; TFP_OP denotes the firm's total factor productivity; Fintech measures the provincial-level development of financial technology; Control includes control variables; γ_j and χ_t represent industry and year fixed effects, respectively; and $\varepsilon_{i,t}$ is the random disturbance term.

$$M_{i,t} = \delta_0 + \delta_1 F\,\mathrm{int}\,ech_{i,t} + \beta \mathrm{Control}_{i,t} + \gamma_j + \chi_t + \varepsilon_{i,t} \quad (2)$$

$$TFP\_OP_{i,t} = \rho_0 + \rho_1 F\,\mathrm{int}\,ech_{i,t} + \rho_2 M_{i,t} + \beta \mathrm{Control}_{i,t} + \gamma_j + \chi_t + \varepsilon_{i,t} \quad (3)$$

$$Digit_{i,t} = \delta_0 + \delta_1 F\,\mathrm{int}\,ech_{i,t} + \beta \mathrm{Control}_{i,t} + \gamma_j + \chi_t + \varepsilon_{i,t} \quad (4)$$

$$TFP\_OP_{i,t} = \rho_0 + \rho_1 F\,\mathrm{int}\,ech_{i,t} + \rho_2 Digit_{i,t} + \beta \mathrm{Control}_{i,t} + \gamma_j + \chi_t + \varepsilon_{i,t} \quad (5)$$

Building upon regression model (1), equation (2) represents the regression model of the explanatory variable Fintech on the mediator variable M, while equation (3) represents the regression model of the explanatory variable Fintech and the mediator variable M on the dependent variable TFP_OP. Equation (4) represents the regression model of the explanatory variable Fintech on the mediating variable Digit, while Equation (5) represents the regression model of the explanatory variable Fintech and the mediating variable Digit on the dependent variable TFP_OP. Here, M denotes the mediating variable value for firm i in year t, specifically comprising the financing constraint level SA and the digital technology innovation capability Inn. Digit represents the firm's digital transformation index, with the definitions of other variables consistent with those in Equation (1).

Furthermore, drawing upon the research of Fang et al. **错误!未找到引用源。**, a chain mediation model is constructed based on Equations (1), (2), and (4) to test two chain mediation pathways: "Fintech → Alleviating Financing Constraints → Promoting Enterprise Digital Transformation → Enhancing Total Factor Productivity" and "Fintech → Improving Digital Technology Innovation Capability → Promoting Enterprise Digital Transformation → Enhancing Total Factor Productivity," as illustrated in Equations (6) and (7).

$$Digit_{i,t} = \phi_0 + \phi_1 F\,\mathrm{int}\,ech_{i,t} + \phi_2 M_{i,t} + \beta \mathrm{Control}_{i,t} + \gamma_j + \chi_t + \varepsilon_{i,t} \quad (6)$$

$$TFP\_OP_{i,t} = \phi_0 + \phi_1 F\,\mathrm{int}\,ech_{i,t} + \phi_2 M_{i,t} + \phi_3 Digit_{i,t} + \beta \mathrm{Control}_{i,t} + \gamma_j + \chi_t + \varepsilon_{i,t} \quad (7)$$

To examine moderation mechanisms, this study adopts the moderation testing method proposed by Jiang Ting (2022) 错误!未找到引用源。 to assess the moderating role of national regulation between fintech and firm TFP. An interaction term between fintech level and national regulation is introduced. The moderation effect model is constructed as follows:

$$TFP\_OP_{i,t} = \eta_0 + \eta_1 F\,\mathrm{int}ech_{i,t} + \eta_2 Supervise_{i,t} + _{i,t} + \eta_3 F\,\mathrm{int}ech_{i,t} * Supervise_{i,t} + \beta \mathrm{Control}_{i,t} + \gamma_j + \chi_t + \varepsilon_{i,t} \quad (8)$$

3.2. Variable Specification

3.2.1. Dependent Variable

Total Factor Productivity (TFP). This study employs the OP method (Olley and Pakes, 1996) 错误!未找到引用源。 to measure the TFP of listed companies in strategic emerging industries.

3.2.2. Independent Variables

Fintech Level. Drawing on Guo Feng (2020) 错误!未找到引用源。 and others, this study employs the Peking University Digital Inclusive Finance Index as the metric for fintech level. This index comprises three dimensions—coverage breadth, usage depth, and digital support services—to comprehensively reflect fintech development across Chinese provinces. Logarithmic transformation was subsequently applied.

3.2.3. Control Variables

To control for other factors influencing the study, this paper draws on research by Zhang Chen (2025) 错误!未找到引用源。 and others. The firm-level control variables selected include: leverage ratio (Lev), return on equity (Roe), cash flow ratio (Cashflow), largest shareholder ownership ratio (Top), board size (Board), firm age (Firmage), revenue growth rate (Growth), and fixed asset ratio (Fixed). Additionally, time-fixed effects and industry-fixed effects are controlled for.

3.2.4. Other Variables

1) Mediating Variables. To measure the financing constraints faced by enterprises, this study adopts the SA Index approach from Hadlock and Pierc (2010) 错误!未找到引用源。 . The absolute value of the SA Index is used, where higher values indicate greater financing constraints. For firms' digital technology innovation capabilities, this study draws on Tao Feng (2023) 错误!未找到引用源。 . By matching listed firms' patent main classification codes with the "Statistical Classification of the Digital Economy and Its Core Industries," we compiled the number of digital economy patent applications. This data was then incremented by one and log-transformed to measure digital technology innovation. For the digital transformation index, this paper draws on the research of scholars such as Wu Fei (2023) 错误!未找到引用源。 . It employs machine learning methods to aggregate the frequency of digital-related keywords and take the logarithm to measure digital transformation.

2) Moderating Variables. Following Tang Song et al. (2020) 错误!未找到引用源。 , this study employs the ratio of provincial financial regulatory expenditure to financial industry value-added as a national regulatory indicator. A higher ratio indicates stricter regional financial oversight. Table 1 provides variable definitions and descriptions.

3.3. Sample and Data Sources

This study examines listed companies in China's strategic emerging industries from 2014 to 2023. Following the methodology of Sun Lijun (2024) 错误!未找到引用源。 , the research constructs a database of emerging comprehensive index enterprises using companies listed in the China Strategic Emerging Industries Composite Index. To ensure data accuracy, validity, and operability, the following preprocessing steps were applied to the raw data: 1) Exclusion of financial and ST-listed company samples;2) Deleted samples with severe core data missingness; 3) Filled partial data gaps using interpolation; 4) Truncated all continuous variables at the 1% and 99% tail to mitigate outlier effects. This yielded a final valid sample of 13,700 observations. Financial data for listed companies were sourced from the CMSAR and RESSET databases.

Table 1. Variable Definitions.

Type	Name	Symbol	Definition/Explanation
Dependent Variable	Total Factor Productivity	TFP_OP	Drawing on the research of Olley and Pakes et al.
Explanatory Variables	Level of Financial Technology	Fintech	Peking University Digital Inclusive Finance Index
Control Variables	Asset-Liability Ratio	Lev	Total Liabilities at Year-End / Total Assets at Year-End
	Return on Equity	Roe	Net profit / Average shareholders' equity
	Cash Flow Ratio	Cash Flow	Net Cash Flow from Operating Activities / Total Assets
	Largest Shareholder's Shareholding Ratio	Top	Number of Shares Held by Largest Shareholder / Total Number of Shares
	Board Size	Board	Ln (Number of Board Members)
	Years in Business	Firmage	Ln (Current Year - Year of Establishment + 1)
	Revenue Growth Rate	Growth	(Current Period Revenue - Previous Period Revenue) / Previous Period Revenue
	Fixed Assets Ratio	Fixed	Net Fixed Assets / Total Assets
Intermediate Variable	Financing Constraints	SA	Drawing on research by Hadlock, Pierc, et al.
	Digital Technology Innovation Capability	Inn	Ln (Number of Digital Technology Patents + 1)
	Digital Transformation Index	Digit	Drawing on research by Wu Fei et al.
Moderating Variable	National Regulation	Supervise	Provincial Financial Regulatory Expenditure/Financial Industry Value Added

4. Empirical Results and Analysis

4.1. Descriptive Statistics

Table 2 presents descriptive statistics for key variables. Results indicate that TFP_OP has a mean of 6.621 and standard deviation of 0.731, while Fintech has a mean of 5.935 and standard deviation of 0.187. Furthermore, the standard deviations of some control variables in this study reflect significant differences among the selected sample firms, demonstrating effective control for the research objectives.

Table 2. Descriptive Statistics.

Variables	Count	Mean	Sd.	Min	Max
TFP_OP	13700	6.621	0.731	5.161	8.663

Fintech	13,700	5.935	0.187	5.441	6.149
Lev	13700	0.345	0.213	-0.283	0.821
Roe	13700	0.092	0.147	-0.459	0.658
Cash Flow	13700	0.053	0.097	-0.280	0.455
Firmage	13700	2.879	0.354	1.792	3.526
Top	13700	31.351	16.990	0.000	76.200
Board	13700	2.098	0.203	1.609	2.708
Growth	13700	0.147	0.563	-2.278	2.631
Fixed	13700	0.160	0.135	-0.177	0.598
SA	13700	3.841	0.239	3.261	4.447
Inn	13700	2.421	1.729	0.000	6.683
Digit	13700	2.103	1.571	0.000	5.551

4.2. Benchmark Regression

Column (1) in Table 3 presents the impact of fintech on the total factor productivity of strategic emerging industries enterprises without controlling for variables. The results indicate an estimated coefficient of 0.617, which is statistically significant at the 1% confidence level. Column (2) shows the regression results after incorporating control variables, revealing a similarly positive and statistically significant effect at the 1% confidence level. All control variables demonstrate sufficient significance and validity in the regression outcomes. Columns (3) and (4) present regression results after controlling for industry and year fixed effects. The sign and significance level of the coefficient estimate remain consistent with the preceding results, validating that fintech promotes the improvement of TFP for strategic emerging industries enterprises and confirming Hypothesis 1.

Table 3. Baseline Regression Results.

	(1)	**(2)**	**(3)**	**(4)**
	TFP_OP	**TFP_OP**	**TFP_OP**	**TFP_OP**
Fintech	0.617***	0.500***	0.463***	0.676***
	(0.033)	(0.033)	(0.141)	(0.125)
Lev		1.344***		1.246***
		(0.028)		(0.027)
Roe		1.126***		1.123***
		(0.044)		(0.041)
Cashflow		0.373***		0.307***
		(0.062)		(0.058)
Firmage		0.164***		0.082***
		(0.017)		(0.017)
Top		-0.000		0.000
		(0.000)		(0.000)
Board		0.443***		0.405***
		(0.027)		(0.026)
Growth		-0.000***		-0.000***
		(0.000)		(0.000)
Fixed		-0.662***		-0.906***
		(0.038)		(0.039)
_cons	2.960***	1.779***	3.874***	1.108
	(0.196)	(0.199)	(0.834)	(0.749)
ind	NO	NO	YES	YES
year	NO	NO	YES	YES
N	13700.000	13700.000	13700.000	13700.000
r2_a	0.025	0.230	0.163	0.338

Standard errors in parentheses, * p<0.1, ** p<0.05, *** p<0.01, same below.

4.3. Endogeneity Issues and Robustness Checks

4.3.1. Endogeneity Issues

As a macro-level variable, the level of financial technology is less influenced by the total factor productivity of individual enterprises, thereby mitigating the endogeneity problem caused by reverse causality. However, variable omission or measurement error may still lead to endogeneity bias. Therefore, this study adopts the method proposed by Xie Xuanli (2018) 错误!未找到引用源。, selecting the internet penetration rate of the city (i.e., the number of households with broadband internet access) as an instrumental variable and employing the 2SLS method to address endogeneity concerns. The choice of urban internet penetration rate as an instrumental variable stems from the fact that regional internet household access numbers are closely linked to the development level of the regional internet economy and exhibit a certain correlation with fintech development. However, since regional internet household access numbers are primarily household-based, they cannot influence the TFP of different enterprises, thereby satisfying statistical exogeneity. The regression results are presented in Table 4, where Column (1) shows the first-stage regression results and Column (2) presents the second-stage regression results. The first-stage regression results indicate that the coefficient estimate for Internet is significantly positive at the 1% level, satisfying the correlation assumption between the instrumental variable and the Fintech index. Furthermore, the F-statistic exceeds 10, indicating that the weak instrumental variable test is passed. The second-stage regression results show that the coefficient for Fintech is significantly positive at the 1% level, consistent with the benchmark regression results, confirming the validity of the study's conclusions.

Table 4. Endogeneity Test.

	(1) Fintech	(2) TFP_OP
Internet	0.006***	
	(9.68)	
Fintech		17.843***
		(7.70)
Controls	YES	YES
ind	YES	YES
year	YES	YES
N	11265	11265
F	93.678	133.430

4.3.2. Robustness Test

1) Replacing the Dependent Variable. This paper further employs the LP method to measure the total factor productivity (TFP) of listed companies in strategic emerging industries, using TFP_LP as the dependent variable for regression analysis. Column (1) in Table 5 presents the empirical results, indicating that after measuring TFP using the LP method, the regression coefficient remains significantly positive, confirming the robustness of the original regression results.

2) Changing the estimation method. Considering that different estimation methods may affect empirical results, to mitigate sample selection bias, this study re-regresses using the Bootstrap method, following the approach of Ma Limei and Huang Chongle (2022) 错误!未找到引用

源。 .Bootstrap is a nonparametric statistical method that generates multiple samples through resampling to estimate the distribution of model parameters. Column (2) in Table 5 presents the empirical results, showing that the regression coefficient remains significantly positive, confirming the robustness of the original regression results.

3) Adjusting the time period. In 2016, the state first systematically deployed fintech as a core measure supporting technological innovation. To prevent policy interference from affecting regression results, the study period was adjusted to 2016–2023, with robustness tests conducted. Column (3) in Table 5 presents the empirical results, where the regression coefficient remains significantly positive at the 1% confidence level, confirming the robustness of the original regression results.

Table 5. Robustness Test.

	(1) Replacing the Dependent Variable	(2) Changing Estimation Method	(3) Adjust time interval
	TFP_LP	TFP_OP	TFP_OP
Fintech	0.700***	0.170***	1.339***
	(0.159)	(0.020)	(0.136)
Controls	YES	YES	YES
ind	YES	YES	YES
year	YES	YES	YES
N	13700.000	13700.000	10960.000
r2_a	0.490		0.402

4.4. Mechanism Testing

Table 6. Chain Mediation Effect 1.

	(1) SA	(2) TFP_OP	(3) Digit	(4) TFP_OP	(5) Digit	(6) TFP_OP
Fintech	-0.053**	0.838***	0.304**	0.865***	0.311***	0.825***
	(0.022)	(0.123)	(0.245)	(0.124)	(0.245)	(0.122)
SA		-0.807***			-0.007*	-0.807***
		(0.053)			(0.105)	(0.052)
Digit				0.042***		0.042***
				(0.005)		(0.005)
_cons	2.027***	1.111	0.220	-0.522	0.193	1.103
	(0.131)	(0.747)	(1.473)	(0.744)	(1.488)	(0.745)
Controls	YES	YES	YES	YES	YES	YES
ind	YES	YES	YES	YES	YES	YES
year	YES	YES	YES	YES	YES	YES
N	11547.000	11547.000	11550.000	11550.000	11547.000	11547.000
r2_a	0.847	0.481	0.543	0.474	0.543	0.485

1) Chain Mediation Effect of Financing Constraints on Digital Transformation. Models (1), (2), (4), (6), and (7) were employed to test the chain mediation effect, with regression results presented in columns (1), (5), and (6) of Table 6. Column (1) uses financing constraints as the dependent variable. The estimated coefficient for fintech on financing constraints is significantly negative, indicating that fintech development effectively alleviates financing constraints. Column (5) uses digital transformation as the dependent variable. The estimated coefficients for fintech and financing

constraints are significantly positive and negative, respectively, indicating that fintech development promotes corporate digital transformation, and alleviated financing constraints also facilitate such transformation. Column (6) uses total factor productivity (TFP) as the dependent variable. The estimated coefficients for financing constraints and digital transformation are significantly negative and positive at the 1% level, respectively. While the estimated coefficient for fintech remains positive at the 1% level. This indicates the existence of a transmission pathway: "fintech → alleviating financing constraints → promoting enterprise digital transformation → enhancing enterprise TFP," meaning fintech can promote enterprise digital transformation by alleviating financing constraints, thereby enhancing enterprise TFP, validating Hypothesis 2a.

2) Chain Mediation Effect of Digital Technology Innovation on Digital Transformation. Models (1), (2), (4), (6), and (7) were employed to examine the chain mediation effect, with regression results presented in columns (1), (5), and (6) of Table 7. Column (1) uses digital technology innovation as the dependent variable. The estimated coefficient for fintech on digital technology innovation is significantly positive, indicating that fintech development enhances firms' digital technology innovation capabilities. Column (5) uses digital transformation as the dependent variable. Both fintech and digital technology innovation exhibit significantly positive estimated coefficients, suggesting that fintech development and improved digital technology innovation capabilities facilitate corporate digital transformation. Column (6) uses total factor productivity as the dependent variable. The estimated coefficients for digital technology innovation and digital transformation are significantly positive at the 1% and 10% levels, respectively, while the estimated coefficient for fintech remains positive at the 1% level. This indicates the existence of a transmission pathway: "Fintech → Enhances digital technology innovation capabilities → Promotes enterprise digital transformation → Improves enterprise total factor productivity." That is, fintech can promote enterprise digital transformation by enhancing digital technology innovation capabilities, thereby improving enterprise total factor productivity, validating Hypothesis 2b.

Table 7. Chain Mediation Effect 2.

	(1)	(2)	(3)	(4)	(5)	(6)
	Inn	**TFP_OP**	**Digit**	**TFP_OP**	**Digit**	**TFP_OP**
Fintech	0.659**	0.804***	0.304*	0.865***	0.191**	0.802***
	(0.310)	(0.119)	(0.245)	(0.124)	(0.238)	(0.119)
Inn		0.114***			0.183***	0.113***
		(0.004)			(0.007)	(0.004)
Digit				0.042***		0.009*
				(0.005)		(0.005)
_cons	-4.531**	-0.001	0.220	-0.522	1.003	-0.010
	(1.867)	(0.716)	(1.473)	(0.744)	(1.433)	(0.716)
Controls	YES	YES	YES	YES	YES	YES
ind	YES	YES	YES	YES	YES	YES
year	YES	YES	YES	YES	YES	YES
N	11545.000	11545.000	11550.000	11550.000	11545.000	11545.000
r2_a	0.414	0.514	0.543	0.474	0.568	0.514

4.5. Testing for Moderation Effects

To ensure the compliant application of fintech, the state has established a series of standards and regulations—including data security and business access requirements—to curb non-compliant operations by fintech enterprises. This prevents companies from becoming entangled in risks due to accessing non-compliant fintech services, thereby safeguarding the continuity and consistency of their production, operations, and technological innovation. Additionally, through differentiated regulatory policies, the state has effectively reduced the cost of fintech services for strategic emerging industries, enhanced enterprises' access to high-quality fintech solutions, and driven resources toward more efficient conversion into technological progress and efficiency gains. The regression results are shown in Table 8. The interaction coefficient between Fintech and Supervise is 8.871 and is significantly positive at the 1% level. This indicates that under appropriate national regulation, fintech can better enhance enterprises' total factor productivity, validating Hypothesis 3a.

Table 8. Moderating Effect of National Regulation.

	(1)	**(2)**
	TFP_OP	**TFP_OP**
Fintech	0.649***	0.488***
	(5.23)	(3.75)
Supervise		-4.194***
		(-6.01)
c_Fintech_Supervise		8.871**
		(2.11)
_cons	1.293*	2.241***
	(1.74)	(2.88)
Controls	YES	YES
N	13700	13430
R2	0.353	0.357
adj. R2	0.350	0.354

4.6. Heterogeneity Analysis

4.6.1. Heterogeneity Analysis Based on Firm Ownership

This study categorizes strategic emerging enterprises based on their ownership structure into state-owned and non-state-owned entities, conducting separate regressions for each sample. The results are presented in Table 9. Columns (1) and (2) demonstrate that the regression coefficient for fintech's impact on total factor productivity is significant for both state-owned and non-state-owned enterprises. However, the coefficient is larger for state-owned enterprises, indicating a more pronounced promotional effect compared to non-state-owned enterprises. This may stem from state-owned enterprises' robust resource base, enabling greater capacity to adopt fintech. They can deeply integrate fintech with production, R&D, supply chains, and other operations, efficiently converting technological advantages into TFP gains. In contrast, non-state-owned enterprises often face challenges such as easy access but difficult deep integration due to budget constraints, resulting in less pronounced promotional effects. This validates Hypothesis 3b.

4.6.2. Analysis Based on Industry Heterogeneity

Given substantial variations in the factor resource consumption priorities among listed firms, sensitivity to fintech's impact on TFP may differ. Therefore, this study categorizes the sample into two industry groups—technology-intensive and resource/labor-intensive—based on the types of

factor resources required by listed companies in the sample, conducting a heterogeneity analysis. Following the methodology of Liu, Yuanchu (2023) 错误!未找到引用源。 , listed companies in high-end equipment manufacturing, next-generation information technology, new energy vehicles, and biotechnology were classified as the technology-intensive subsample. Similarly, new materials, new energy, energy conservation and environmental protection, digital creative industries, and related services were grouped as resource- and labor-intensive industries. Separate regressions were conducted for each subsample, with results presented in Table 9. The results in columns (3) and (4) indicate that fintech exerts a more pronounced effect on promoting TFP in technology-intensive industries compared to resource- and labor-intensive sectors. This may stem from certain technology-intensive enterprises possessing characteristics of light tangible assets and heavy intangible assets, making it difficult for them to obtain adequate credit support under traditional financial models, thereby limiting their TFP improvement. The development of fintech makes the soft power of these enterprises concrete. By constructing visual profiles of enterprises, fintech effectively mitigates information asymmetry issues and reduces financial institutions' concerns about credit risk, thereby facilitating enterprises' access to financial support. Consequently, within technology-intensive industries, fintech can more effectively promote the improvement of enterprises' TFP, validating Hypothesis 3c.

Table 9. Heterogeneity Analysis.

	(1) State-owned enterprises	(2) Non-state-owned enterprises	(3) Technology-intensive industries	(4) Resource- and Labor-Intensive Industries
	TFP_OP	TFP_OP	TFP_OP	TFP_OP
Fintech	1.149***	0.817***	0.884***	0.436
	(0.228)	(0.146)	(0.138)	(0.271)
_cons	-1.953	0.186	-0.259	2.340
	(1.372)	(0.884)	(0.827)	(1.619)
Controls	YES	YES	YES	YES
ind	Yes	Yes	Yes	Yes
year	Yes	Yes	Yes	Yes
N	3008.000	8232.000	10134.000	2857.000
r2_a	0.520	0.476	0.369	0.454

5. Discussion

This study selects 1,370 A-share listed companies in strategic emerging industries as the research sample. Using a two-way fixed effects model for empirical analysis, it delves into the impact of fintech on corporate total factor productivity (TFP) and its specific transmission channels. Additionally, it examines the moderating effect of national regulation on the relationship between fintech and corporate TFP, and further conducts heterogeneity analysis based on corporate property rights and industry factor intensity. The empirical findings are as follows:

1) Fintech significantly enhances the TFP of strategic emerging enterprises. This conclusion remains valid after a series of endogeneity and robustness tests, confirming Hypothesis 1 and aligning with the findings of Song Min (2021) 错误!未找到引用源。 .Reviewing existing literature, studies on the relationship between fintech and corporate TFP have primarily focused on A-share listed companies 错误!未找到引用源。 or manufacturing enterprises 错误!未找到引用源。. This

research broadens the scope by conducting an in-depth analysis using enterprises in strategic emerging industries as the sample, aiming to provide new empirical evidence for academic research in this field.

2) Fintech primarily enhances TFP through two chained intermediary pathways: alleviating financing constraints to accelerate digital transformation, and boosting digital innovation capabilities to further advance digital transformation. This finding confirms Hypotheses 2a and 2b. However, existing studies predominantly analyze single mechanisms—such as financing constraints [2], innovation resource allocation 错误!未找到引用源。, or risk management 错误!未找到引用源。—while overlooking the potential for multiple concurrent mechanisms. This study systematically dissects the potential mechanisms through which fintech influences enterprise TFP, constructing an integrated analytical framework that enriches the existing body of mechanism research.

3) National regulation exerts a positive moderating effect on fintech's promotion of TFP growth. This indicates that robust regulatory frameworks enable enterprises to leverage fintech more effectively, laying the groundwork for TFP enhancement. This finding confirms Hypothesis 3a and corroborates the conclusions of Fu Zhengqiang (2024) 错误!未找到引用源。 regarding how national regulation drives enterprise development. However, most existing studies on fintech's impact on TFP often neglect moderating factors, resulting in incomplete analyses. This paper addresses this gap by explicitly identifying the role of national regulation, thereby deepening our understanding of such mechanism.

4) The promotion of TFP by fintech exhibits significant heterogeneity. Compared to non-state-owned enterprises and resource- or labor-intensive industries, fintech exerts a stronger TFP-enhancing effect on state-owned enterprises and technology-intensive industries. This finding confirms Hypotheses 3b and 3c. Reviewing existing literature on the differential impacts of enterprise ownership structure, our results align with those of scholars such as Yang Peng 错误!未找到引用源。.However, regarding the differential impact of industry characteristics, this study builds upon Liu Yuanchu (2023) 错误!未找到引用源。 by further refining the analysis. By subdividing strategic emerging sub-industries into technology-intensive industries and resource- and labor-intensive industries, it delves into the industrial variations in fintech's effectiveness, providing empirical evidence for the targeted formulation of fintech support policies.

6. Conclusion

6.1. Research Findings

Using data from 1,370 strategic emerging enterprises between 2014 and 2023, this study examines the impact of fintech on firms' total factor productivity (TFP). The findings reveal that fintech development significantly boosts firms' TFP. This conclusion remains robust after conducting endogeneity and stability tests. Mechanism analysis indicates two chained intermediary pathways: fintech promotes digital transformation by alleviating financing constraints, thereby enhancing TFP; and fintech fosters digital transformation by improving digital technological innovation capabilities, also boosting TFP. Furthermore, national regulation plays a positive moderating role, further amplifying fintech's promotion of TFP in strategic emerging enterprises. Additional research reveals that compared to non-state-owned enterprises and resource- or labor-intensive industries, fintech

exerts a stronger TFP-enhancing effect on state-owned enterprises and technology-intensive industries.

6.2. Research Implications

1) Strengthen the integration of science and technology with finance to further improve the fintech investment and financing system. Overall, fintech significantly boosts enterprises' total factor productivity. Therefore, relevant national and local authorities should enhance top-level design, refine fintech regulatory frameworks, and strengthen oversight of related business activities to create favorable policy conditions for fintech development 错误!未找到引用源。 .Governments should increase fiscal funding support for innovative industries, leverage public finances to amplify the impact of technological resources, and optimize methods for fiscal investment in science and technology. Concurrently, efforts must accelerate to cultivate high-level, multidisciplinary fintech talent and establish a multi-tiered fintech service system, ensuring enterprises have diversified funding sources for technological innovation.

2) Financial institutions must optimize fintech service models by addressing the varying factor intensity and demand characteristics of strategic emerging industries. On one hand, they should enhance their own application capabilities in technologies like artificial intelligence and big data, refine credit assessment systems, and develop products tailored to corporate R&D needs—alleviating financing constraints through precise risk control. On the other hand, deepen integration with industrial scenarios by collaborating with technology-intensive enterprises to establish digital innovation laboratories. Leverage fintech to empower enterprises' digital R&D and technology commercialization, while providing resource- and labor-intensive enterprises with digital supply chain management tools to optimize resource allocation efficiency. This dual-path approach—product innovation and scenario empowerment—will maximize fintech's catalytic role.

3) Enterprises in strategic emerging industries should proactively leverage fintech to enhance total factor productivity. Companies must strengthen internal financial compliance and disclosure of innovation outcomes, improve credit system development, and increase compatibility with fintech products. Furthermore, enterprises can utilize fintech tools to bolster digital technology R&D capabilities—such as introducing AI-assisted design and big data R&D analysis platforms—while prioritizing financial support for core technological innovation. Simultaneously, they should accelerate digital transformation in internal production and operational processes, establish data management systems, and amplify fintech's impact on TFP by elevating digitalization levels.

Funding: This research was funded by the Regional Project of National Natural Science Foundation of China, grant number 71861003.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

References

[1] Liu Yibei, and Liu Hongwei. "Asset Specificity, Financing Patterns, and Enterprise Total Factor Productivity: An Empirical Analysis Based on Listed Companies in China's Strategic Emerging Industries." Journal of Xiangtan University (Philosophy and Social Sciences Edition), 2020, 44(01), 98-103. https://doi.org/10.13715/j.cnki.jxupss.2020.01.016

[2] Liu Yuanchu, and Chen Yajun. "How Does Fintech Enhance Enterprise Total Factor Productivity? — A Perspective from Strategic Emerging Industries." Modern Economic Research, 2024, (07), 89-101. https://doi.org/10.13891/j.cnki.mer.2024.07.008

[3] Song Qinghua, and Zhou Xueqin. "Can Fintech Enhance Urban Inclusive Green Total Factor Productivity?" Journal of Zhongnan University of Economics and Law, 2024, (02), 67-80. https://doi.org/10.19639/j.cnki.issn1003-5230.2024.0017

[4] Chen, Xiao-Xiong, et al. "The Spillover Effects of Digital Tax Administration: An Analysis Based on Improved Bank Credit Allocation Efficiency." Chinese Rural Economy, 2025, (02), 153-174. https://doi.org/10.20077/j.cnki.11-1262/f.2025.02.006

[5] Liang, Jian. " Fintech-Driven Rural Industrial Revitalization: Impact Mechanisms and Empirical Tests." Statistics and Decision Making, 2025, 41(06), 138-143. https://doi.org/10.13546/j.cnki.tjyjc.2025.06.024

[6] Liu Jian, Kang Xin, and Liu Xinheng. "The Impact of Local Governments' Green Development Focus on Green Total Factor Productivity." Journal of Systems Management, 2025, 34(03), 766-779.

[7] Zhai Huayun, and Fang Fang. "Regional Science and Technology Finance Development, R&D Investment, and Enterprise Growth: Empirical Evidence from Listed Companies in Strategic Emerging Industries." Science and Technology Progress and Policy, 2014, 31(05), 34-38.

[8] Wang, Yan, and Xu, Yan. "The Mechanism of Spatial Agglomeration in China's Manufacturing Sector on Total Factor Productivity: An Empirical Analysis Based on a Double-Threshold Regression Model." Journal of Finance and Economics, 2012, 38(03), 135-144. https://doi.org/10.16538/j.cnki.jfe.2012.03.009

[9] Song Min, Zhou Peng, and Si Haitao. "Fintech and Enterprise Total Factor Productivity: Perspectives of 'Empowerment' and Credit Allocation." China Industrial Economics, 2021, (04), 138-155. https://doi.org/10.19581/j.cnki.ciejournal.2021.04.006

[10] Ba Shusong, Bai Haifeng, and Hu Wentao. "Financial Technology Innovation, Enterprise Total Factor Productivity, and Economic Growth: A New Structural Economics Perspective." Research on Financial and Economic Issues, 2020, (01), 46-53. https://doi.org/10.19654/j.cnki.cjwtyj.2020.01.006

[11] Yang, Tingting. "Exploring Credit Risk Prevention and Control in Commercial Banks Under Supply-Side Reform." China Market, 2018, 25, 54-55. https://doi.org/10.13939/j.cnki.zgsc.2018.25.054

[12] Zhang Lu, et al. "Resource-Based View: Development Trajectory, Knowledge Framework, and Outlook." Nankai Management Review, 2023, 26(04), 246-258.

[13] Guo Haochen, Lu Minfeng, and Gao Lun. "How Digital Finance Drives High-Quality Development of Sci-Tech Enterprises: An Empirical Study of Chinese Listed Companies Based on Total Factor Productivity." Xinjiang Social Sciences, 2025, (03), 18-33+169. https://doi.org/10.20003/j.cnki.xjshkx.2025.03.003

[14] Li Chuntao, et al. "Fintech and Corporate Innovation: Evidence from Companies Listed on the New Third Board." China Industrial Economics, 2020, (01), 81-98. https://doi.org/10.19581/j.cnki.ciejournal.2020.01.006

[15] Su Xuyang, Zeng Yanmei, and Wen Chuanhao. "How Does Fintech Enhance Corporate New-Quality Productivity? — —The Moderating Effects of Government Actions and Corporate Behavior." Southern Finance, 2025, (05), 3-19.

[16] Li Xuchao, Luo Deming, and Jin Xiangrong. "Resource Misallocation and the Scale Distribution Characteristics of Chinese Enterprises." Chinese Social Sciences, 2017, (02), 25-43+205-206.

[17] Nanda, R., and M. Rhodes-Kropf. "Investment Cycles and Startup Innovation." Journal of Financial Economics, 2013, 110(2), 403-418.

[18] Fang Jie, et al. "Analysis of Multiple Mediating Effects Based on Structural Equation Modeling." Psychological Science, 2014, 37(03), 735-741. https://doi.org/10.16719/j.cnki.1671-6981.2014.03.001

[19] Jiang, Ting. "Mediation and Moderation Effects in Empirical Studies of Causal Inference." China Industrial Economics, 2022, (05), 100-120. https://doi.org/10.19581/j.cnki.ciejournal.2022.05.005

[20] Olley, S., and A. Pakes. The Dynamics of Productivity in the Telecommunications Equipment Industry. Econometrica, 1996, 64(6), 1263-1297.

[21] Guo, Feng, et al. "Measuring China's Digital Inclusive Finance Development: Index Construction and Spatial Characteristics." Economics Quarterly, 2020, 19(04), 1401-1418. https://doi.org/10.13821/j.cnki.ceq.2020.03.12

[22] Zhang Chen, et al. "The Impact of Synergistic Fintech and Green Finance on the Green Transformation of Small and Medium-sized Enterprises." Monthly Journal of Finance and Accounting, 2025, 46(15), 32-40. https://doi.org/10.19641/j.cnki.42-1290/f.2025.15.005

[23] Hadlock CJ, Pierce JR. New Evidence on Measuring Financial Constraints: Moving Beyond the KZ Index. Review of Financial Studies, 2010, 23(5), 1909-1940.
[24] Tao Feng, et al. "The Impact of Digital Technology Innovation on Corporate Market Value." Journal of Quantitative Economics and Technical Economics, 2023, 40(05), 68-91. https://doi.org/10.13653/j.cnki.jqte.20230310.010.
[25] Wu Fei, et al. "Corporate Digital Transformation and Capital Market Performance: Empirical Evidence from Stock Liquidity." Management World, 2021, 37(07), 130-144+10. https://doi.org/10.19744/j.cnki.11-1235/f.2021.0097
[26] Tang Song, Wu Xuchuan, and Zhu Jia. "Digital Finance and Corporate Technological Innovation: Structural Characteristics, Mechanism Identification, and Effect Differences under Financial Regulation." Management World, 2020, 36(05), 52-66+9. https://doi.org/10.19744/j.cnki.11-1235/f.2020.0069
[27] Sun Lijun, Zhang Man, and Gao Qian. "The Relationship Among Factor Endowments, Technological Innovation Capabilities, and Industrial Development Quality in Strategic Emerging Industries." Research on Science and Technology Management, 2022, 42(09), 1-7.
[28] Xie Xuanli, et al. "Can Digital Finance Promote Entrepreneurship? Evidence from China." Economics Quarterly, 2018, 17(04), 1557-1580. https://doi.org/10.13821/j.cnki.ceq.2018.03.12
[29] Ma, Limei, and Huang, Chongle. "Financial Driven Forces and Renewable Energy Development: A Dynamic Evolutionary Analysis Based on Cross-Country Data." China Industrial Economics, 2022, 42(04), 118-136. https://doi.org/10.19581/j.cnki.ciejournal.2022.04.008
[30] Liu, Yuanchu, and Hua, Guihong. "Can Fintech Promote Sustainable Innovation by Alleviating Financial Mismatch? Empirical Evidence from Listed Companies in Strategic Emerging Industries." China Science and Technology Forum, 2023, (04), 122-132. https://doi.org/10.13580/j.cnki.fstc.2023.04.002
[31] Wu Jie, et al. "Fintech and Firm Total Factor Productivity: A Dual Perspective Based on External and Bank-Based Fintech." Economic Dynamics, 2025, (09), 39-58.
[32] Wang, Shiwen, Zhang, Yin, and Zhu, Yan. "Fintech, Financing Constraints, and Total Factor Productivity: An Empirical Study Based on Listed Manufacturing Companies." Research on Macroeconomics, 2022, (08), 55-64+74. https://doi.org/10.16304/j.cnki.11-3952/f.2022.08.006
[33] Deng Chuyao. "Fintech, Innovation Resource Allocation, and Total Factor Productivity." Research on Technology, Economy and Management, 2022, (09), 26-32.
[34] Wu Jie, et al. "Fintech and Corporate Total Factor Productivity: A Dual Perspective Based on External and Bank Fintech." Economic Dynamics, 2025, (09), 39-58.
[35] Fu, Zhengqiang, Zhang, Hailiang, and Li, Dongmei. "The Impact of Fintech on Corporate Digital Transformation: A Moderating Effect Analysis of Corporate Capabilities and External Oversight." Academic Exploration, 2024, (06), 112-124.
[36] Yang, P.; Hao, X.; Wang, L.; Zhang, S.; Yang, L. Moving toward sustainable development: The influence of digital transformation on corporate ESG performance. Kybernetes, 2024, 53, 669–687.
[37] Wang, L. "Green consumption and total factor productivity of strategic emerging industries: An empirical study based on firm-level dynamic panel data." Science and Industry, 2023, 23(02), 9-13.

(Executive Editor: Fang-fang Ji)