Does Fintech Promote Green Economic Growth in Chinese Cities?

Wenhua Xu*, Yuanqi Feng

School of Economics and Management, East China Jiaotong University,

Nanchang 330013, China

*Corresponding author's e-mail: 2496@ecjtu.edu.cn

Abstract. Green economic development is the foundation of high-quality growth, and fintech is an important driving force supporting such development. As the technological revolution deepens, the potential for fintech applications in the green economy continues to expand. Based on provincial panel data from 30 provinces in China between 2012 and 2021, this paper empirically examines the impact of fintech on green economic growth in Chinese cities. The findings reveal that fintech significantly promotes green growth in cities. Furthermore, industrial upgrading plays a mediating role between fintech and urban green economic growth. The impact of fintech on green economic growth exhibits heterogeneity: it is stronger in central and western regions than in eastern regions, slightly higher in areas with scarce natural resources than in resource-rich areas, and more pronounced in regions with low digital economic levels compared to those with higher levels. In conclusion, this paper suggests that the government should increase support for fintech, improve data collection and disclosure standards, and encourage financial institutions to enhance their independent research and innovation capabilities, in order to provide reference value for promoting urban green economic growth.

Keywords: Fintech; Urban Green Economic Growth; High-Quality Development.

1 Introduction

The 20th National Congress of the Communist Party of China stressed that green and low-carbon development is critical for high-quality growth, while the Fintech Development Plan (2022-2025) emphasizes enhancing digital, intelligent, and green financial services to support carbon neutrality goals. As China shifts toward sustainable economic development, fintech, through mechanisms like green credit and ESG investment, plays a vital role in transforming industries and promoting green growth. This study explores fintech's impact on green economic growth in Chinese cities and its underlying mechanisms.

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Existing research shows fintech's positive impact on the economy. Daud et al. (2022) identified that fintech reduces information asymmetry and transaction costs, advancing the financial sector[1]. Guo et al. (2024) found that fintech promotes industrial transformation and resource allocation[2], while Yang and Zhou (2024) demonstrated fintech's role in improving capital allocation and driving industrial upgrading[3].

In terms of green economic growth, Belmonte-Ureña et al. (2021) emphasized the importance of balancing growth with environmental protection[4]. Galeotti et al. (2024) stressed the role of green energy[5], while Bretschger and Grieg (2024) demonstrated the effectiveness of carbon taxes[6].

However, gaps remain in understanding fintech's specific role in urban green economic growth, particularly through industrial upgrading. This study addresses this gap by using provincial panel data from 2012 to 2021. A fixed-effects model is employed to examine fintech's impact. The study also explores the mediating role of industrial upgrading and conducts heterogeneity analysis across geography, resource endowment, and digital economy levels.

This paper contributes by (1) exploring fintech's direct and indirect effects on urban green growth, (2) highlighting the mediating role of industrial upgrading, and (3) providing a detailed heterogeneity analysis to enrich understanding of regional differences in fintech's impact.

2 Theoretical Analysis and Research Hypotheses

2.1 Direct Impact of Fintech on Urban Green Economic Growth

Fintech drives urban green economic growth by reducing information asymmetry and transaction costs through advanced technologies like big data, AI, and cloud computing. It expands financial access for SMEs, alleviating financing constraints and supporting green development. Fintech also enhances data accuracy, enabling targeted policies for real-time, efficient green growth. By optimizing resource allocation, improving responses to regulations, and reducing costs, fintech strengthens urban green economic growth.

Hypothesis H1: Fintech directly promotes urban green economic growth in China.

2.2 Indirect Impact of Fintech on Urban Green Economic Growth

Fintech's direct impact on urban green growth is limited by resource misallocation and information asymmetry, making industrial upgrading a likely mediator. Fintech directs resources to green industries, improving efficiency and enabling industrial upgrading, which drives more sustainable and resource-efficient structures. This transition supports greener industrial practices, reducing the environmental footprint of economic development.

Hypothesis 2: Fintech indirectly promotes urban green economic growth through industrial upgrading.

3 Research Design

This paper uses panel data from 30 Chinese provinces (excluding Tibet, Hong Kong, Macau, and Taiwan) from 2012 to 2021. The data are sourced from the China Urban Statistical Yearbook and provincial/city yearbooks. Missing data are handled using mean substitution.

3.1 Variable Selection

Dependent Variable: Green Total Factor Productivity (GTFP). The 19th National Congress of the CPC emphasized improving total factor productivity (TFP) as vital for high-quality growth. Green TFP, which balances economic growth with environmental sustainability by considering energy consumption and pollution, is now a key measure of urban green growth in China. This paper uses GTFP to assess urban green economic growth, following methodologies from Yu Yishan and Wu Meng. Key inputs include labor, capital, and energy, while outputs cover GDP and pollutants like wastewater and emissions. The super-efficiency SBM model and GML index are used for calculation.

Explanatory Variable: Fintech Development Level. Fintech, as defined by the Financial Stability Board, integrates finance and technology using tools like cloud computing, big data, and blockchain to drive market innovation. Due to limited data, fintech development is often measured using indices like the Peking University Digital Financial Inclusion Index, Baidu Fintech Index, or the number of fintech companies in a region. Following Song Min's (2021) approach, this study uses data from the "Tianyancha" platform to identify fintech companies, excluding those with abnormal statuses. The number of fintech companies serves as an indicator of fintech development, with a higher count representing greater development.

Mediating Variable: Industrial Structure Upgrading. Following Xu Min and Jiang Yong (2015), industrial structure upgrading is measured using the industrial structure hierarchy coefficient, calculated by the following formula: $\mathrm{Str} = \sum_{i=1}^{3}(Y_i|Y)i\,, i = 1,2,3$. Y represents the output, and i represents the industry. A larger value indicates a higher level of industrial structure upgrading.

Control Variables. To reduce estimation bias from omitted variables, this study includes the following controls: (1) Human Capital (HC), measured by the share of employees with higher education; (2) Environmental Regulation (ER), based on the ratio of pollution control investment to industrial added value; (3) Government Intervention (GI), measured by public budget expenditure to GDP; (4) Level of Openness (LO), measured by trade as a percentage of GDP; (5) R&D Intensity (RD), based on R&D expenditure to GDP; (6) Economic Development (ED), by regional per capita GDP to national GDP; (7) Population Density (PD), by resident population proportion.

3.2 Model Construction

To test the direct impact of fintech on urban green economic growth in China, the baseline model is constructed as follows:

$$GTFP_{it} = \alpha_0 + \alpha_1 FinTech_{it} + \alpha_2 X_{it} + \mu_t + \phi_i + \varepsilon_{it} \quad (1)$$

Where GTFP is the green economic growth level, Fintech represents fintech development, X includes control variables, μ and ϕ capture time and individual effects, and ε is the error term.

To further test whether fintech development indirectly promotes urban green economic growth through industrial structure upgrading, the following mediation effect model is constructed:

$$Str_{it} = \beta_0 + \beta_2 FinTech_{it} + \beta_2 X_{it} + \mu_t + \phi_i + \varepsilon_{ij} \quad (2)$$

$$GTFP_{it} = \lambda_0 + \lambda_1 FinTech_{it} + \lambda_2 Str_{it} + \lambda_3 X_{it} + \mu_t + \phi_i + \varepsilon_{ij} \quad (3)$$

In the above equation, apart from the industrial structure upgrading level for province i and year t, the meanings of other variables remain consistent with Equation (4-2).

4 Empirical Analysis

4.1 Baseline Regression Analysis

To ensure stable regression estimates, the VIF method was used to test for multicollinearity, with all VIF values below 10, confirming no multicollinearity issues. As shown in Table 1, fintech consistently enhances green economic efficiency. In column (1), without control variables, fintech's coefficient is 0.2785, indicating that a one-unit increase in fintech development results in a 0.2785-unit rise in urban green economic growth. After adding control variables in column (2), fintech's coefficient is 0.2090, still significant at the 1% level. Endogeneity concerns were addressed by using a one-period lagged fintech variable as an instrumental variable, as shown in column (3), with fintech remaining significant at the 1% level, confirming the robustness of the results.

Table 1. Baseline Regression Results

	(1)$GTFP$	(2)$GTFP$	(3) $GTFP$
$L.Fintech$			0.2534***(3.9992)
$Fintech$	0.2785***(7.3477)	0.2090***(3.9288)	
N	300	300	270
R^2	0.151	0.271	0.279

* p < 0.1, ** p < 0.05, *** p < 0.01, t-values in parentheses, with province and year fixed effects controlled. Constant terms and control variables are not reported. The same applies below.

4.2 Robustness Test

Robustness checks were conducted using: (1) Baidu Index as a proxy for fintech, (2) excluding Beijing, Tianjin, Shanghai, and Chongqing, and (3) winsorizing data at the

1% and 99% levels. The results in Table 2 show no significant deviation from the baseline, confirming the stability of fintech's positive impact on urban green economic growth.

Table 2. Robustness Test Results

Variable	Replacement of Core Explanatory Variable	Exclusion of Certain Samples	Winsorization Treatment
Fintech	0.1694***2.7759)	0.2440***3.1497)	0.2206***4.4173)
N	300	260	300
R2	0.2599	0.2351	0.2943

4.3 Heterogeneity Analysis

The heterogeneity analysis results, shown in Table 3, reveal that fintech's impact on green economic growth is stronger in the central-western region (column 2, coefficient 0.3522, significant at 1%) compared to the eastern region (column 1, coefficient 0.1102, not significant). Similarly, fintech promotes growth more in resource-poor provinces (column 4, coefficient 0.3168, significant at 1%) than in resource-rich ones (column 3, coefficient 0.2785, significant at 1%). Lastly, fintech's effect is stronger in low digital economy provinces (column 6, coefficient 0.2496, significant at 1%) than in high digital economy provinces (column 5, coefficient 0.0106, not significant), where fintech has already matured.

Table 3. Heterogeneity Test Results

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Fintech	0.1102 (0.6538)	0.3522*** (7.8619)	0.2785*** (6.4770)	0.3168*** (2.8273)	0.0106 (0.0901)	0.2496*** (3.5790)
N	100	200	160	140	110	190
R2	0.4057	0.3572	0.3095	0.3450	0.4249	0.3487

4.4 Mediation Effect Analysis

This study examines industrial structure upgrading as a mediating variable in the relationship between fintech and green economic growth. Table 4 shows that fintech development positively and significantly impacts green growth (coefficient: 0.2090, $p < 0.01$). It also promotes industrial upgrading (coefficient: 0.1824, $p < 0.01$). When both fintech and industrial upgrading are included, fintech's effect decreases slightly (coefficient: 0.1546, $p < 0.01$), while industrial upgrading remains significant (coefficient: 0.2981, $p < 0.01$), confirming its mediating role. This supports Hypothesis H2, showing that fintech indirectly drives green growth via industrial upgrading.

Table 4. Mediation Effect Analysis Results

	(1) $GTFP$	(2) Str	(3) $GTFP$
Fintech	0.2090***(3.9288)	0.1824***(8.2965)	0.1546***(2.6291)
Str			0.2981**(2.1151)
N	300	300	300
R^2	0.271	0.863	0.280

5 Research Conclusions and Policy Recommendations

This study finds that fintech significantly promotes urban green economic growth in China, both directly and indirectly, through industrial upgrading. Analyzing data from 30 provinces (2012–2021), fintech improves resource allocation, reduces energy consumption, and lowers pollution. The effect is stronger initially but diminishes over time as development matures. Additionally, fintech's impact is more pronounced in the central and western regions than in the eastern region, reflecting regional development differences.

To promote fintech's role in green economic growth, first, the government should increase support and investment in fintech to drive both economic and environmental benefits. Second, data disclosure standards for fintech and the green economy should be improved by building unified platforms, fostering collaboration, and developing standardized metrics for environmental and economic impacts. Lastly, financial institutions should enhance R&D and innovation in green technologies, focusing on product diversification and identifying market opportunities to support sustainable growth.

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