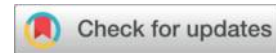


Empirical Analysis of the Impact of Digital Economy on the

Development of Financial Technology



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Abstract

Fintech is an important direction for the future development of the financial industry. It will continue to drive financial innovation, enhance the efficiency and quality of financial services, and make a greater contribution to the development of the economy and society. This paper aims to explore the relationship between digital economy and fintech development through empirical analysis. Based on panel data from 30 provinces across the China, the paper uses a combination of fixed effects models and heterogeneity tests to deeply investigate the impact of digital economy on the development of fintech in China. The results show that China's digital economy promotes the development of fintech, with significant impacts in both eastern and western regions.

The results are of great significance for understanding the interaction mechanisms between the two and for promoting the sustainable development of fintech in the digital economy environment.

Keywords: Digital economy; Financial technology; Innovative development

Introduction and Literature Review

The Current Status of Digital Economy Development

The digital economy encompasses several aspects such as digital business transactions, digital platforms, and digital services. Its core lies in using digital technologies to improve economic efficiency and create new economic value. Globally, the digital economy has become an important engine of economic growth. The contribution of the digital economy to global GDP continues to increase, and more and more countries view the digital economy as a key force for economic recovery and development. The "China Digital Economy Development White Paper (2023)" points out that in 2023, the scale of China's digital economy reached 53.9 trillion yuan, an increase of 3.7 trillion yuan compared to the previous year; the digital economy accounted for 42.8% of GDP, up 1.3 percentage points from the previous year; the contribution of digital economy growth to GDP growth was 66.45%.

The digital economy is a new form of economy based on the internet and digital technologies.

Zhang Yifan (2024) believes that the digital economy, based on the application of digital technologies, considers data as a core resource, and realizes economic activities through the interaction of information flow, value flow, and capital flow. It regards data resources as key production factors, modern information networks as important carriers, and digital technological innovation as the core driving force. Li Yixuan and Zhang Bin (2024) pointed out that government policies, market demand, technological innovation, and talent supply are key supporting factors for the development of China's digital economy. Zhang Yisheng and Gao Xiaoke (2018) explored the impact of digital economy on the regional economic development imbalance in China. Through empirical analysis with threshold effects, they found that the rapid development of digital economy can, to some extent, help narrow the economic gap between the east and west, thereby promoting the balanced development of regional economies.

The Current Status of Financial Technology Development

Globally, the scale of the fintech market continues to expand and has become an important driver of economic growth. More and more countries and regions recognize the potential of fintech and actively promote the development of related industries. Innovations in the fintech industry include mobile payments, online lending, smart investment advisory, and the application of blockchain technology in finance. In 2023, global fintech financing reached 4,547 deals with a total financing amount of 113.7 billion USD. Although this number decreased compared to 2022, it is still 10% higher than pre-pandemic levels in 2019, demonstrating the robust vitality and development potential of the fintech market. Seed-stage financing stood out with more than 4 billion USD (China Fintech Competitiveness Report, 2024). In 2023, payment technology, insurtech, and blockchain became the three leading sectors in the global fintech market, with financing amounts of 20.7 billion USD, 8.1 billion USD, and 7.5 billion USD, respectively. In the context of a decrease in total global fintech market financing, insurtech and ESG (Environmental, Social, and Governance) and green finance saw strong growth with an increase in financing amounts.

Development of Financial Technology

Fintech, leveraging advanced technologies such as big data, artificial intelligence, and blockchain, comprehensively organizes and analyzes various financial services, thus forming a technological industry ecosystem (Han Han, 2018). This has expanded the coverage of financial services and lowered the entry barriers to the credit market (Li Chuntao et al., 2020). Cheng Guangbin et al. (2024) conducted an in-depth study on the impact, mechanisms, and spatial effects of fintech on economic inclusive green growth. They found that fintech significantly promotes inclusive green growth, especially in driving economic growth and social fairness. Furthermore, fintech contributes to inclusive green growth in the eastern region, core cities, and cities with a higher level of financial development. Cui Hao et al. (2024) found that fintech assists enterprises in digital transformation through three paths: optimizing information, enhancing risk-taking capacity, and boosting digital innovation vitality. Additionally, He Chong and Ling Ji (2024) believe that fintech significantly promotes digital transformation in enterprises, with a temporal spillover effect.

The Current State of the Integration of Digital Economy and Financial Technology

With the rapid development of information technology, the digital economy has become a new engine for global economic growth. Fintech, as an important application of the digital economy in the financial field, is changing the financial industry ecosystem at an unprecedented pace. Deeply studying the relationship between digital economy and fintech industry innovation development is crucial for promoting the transformation and upgrading of the financial industry and sustainable economic development.

The integration and development of digital economy and fintech presents multiple characteristics. Mobile payment has become a typical representative of the fusion of digital economy and fintech. Consumers can complete payments through mobile devices, greatly improving the convenience and efficiency of payments. For example, in China, mobile payment methods like Alipay and WeChat Pay have been widely applied in daily consumption, business transactions, and other scenarios, covering almost all online and offline fields. Furthermore, with the continuous progress of technology, mobile payments have been upgraded in terms of payment security, speed, and user experience, such as the use of biometric payment technologies like face and fingerprint recognition, further enhancing payment security and convenience.

Fintech development also promotes the convenience of cross-border payments. Through technologies such as blockchain, cross-border transaction costs have been reduced, transaction time shortened, and transaction processes have become more transparent and traceable. For example, some fintech companies use blockchain technology to build cross-border payment platforms, achieving fast settlement and clearing of funds, providing more efficient services for enterprises and individuals involved in cross-border trade and remittances.

In the digital economy era, a large amount of data is generated. Financial institutions and fintech companies utilize big data analysis technologies to deeply mine and analyze customer behavior, preferences, and consumption habits, thereby constructing accurate customer profiles. Based on these profiles, financial institutions can better understand customer needs and provide personalized financial products and services, such as customized wealth management products and exclusive credit schemes, improving customer satisfaction and loyalty. Big data and artificial intelligence play important roles in risk assessment and management. Financial institutions, by collecting and analyzing vast amounts of customer, market, and transaction data, can more comprehensively assess the risk status of clients, improving the accuracy and timeliness of risk evaluations. Meanwhile, using machine learning and other technologies, financial institutions can continuously optimize risk models, predict and prevent risks in advance, and reduce default rates and losses.

The construction of Digital China is a key engine in promoting Chinese-style modernization in the digital age and a strong support for creating new national competitive advantages. The development of Digital China can rapidly improve the scale and quality of data resources and effectively unleash the value of data elements. Fintech, driven by technology, is an important force in building a financially strong country. The synergy between Digital China and fintech can provide higher quality financial services and broader space for financial innovation for the development of the real economy. The path to financial technology innovation under the context

of Digital China can be built in four aspects: credit systems, technological innovation, risk control, and regulatory management, fully achieving the historic transformation from a financial power to a financial strong country (Liu Bin, 2024). Lu Kun (2023) et al. believe that both fintech and digital economy can significantly promote regional green innovation. Based on the threshold effect of fintech, when fintech development is at a low level, digital economy does not support and promote regional green innovation; however, when fintech reaches a certain level, the impact of digital economy on green innovation changes from insignificant to positive.

Theoretical Analysis and Research Hypotheses

Research Hypotheses

The development of the digital economy has brought advanced information technology infrastructure, abundant data resources, and innovative business models, which provide strong support for fintech innovation. For example, the wide application of big data technology in the digital economy can provide financial institutions with more comprehensive customer information, thus driving innovations in fintech in areas such as risk assessment and precision marketing.

Hypothesis 1: The level of digital economy development is positively correlated with the development of fintech.

As the digital economy develops, technologies such as artificial intelligence, blockchain, and cloud computing continue to advance. These technologies applied to the financial sector can optimize business processes, improve transaction speed, and reduce operational costs, thus enhancing the service efficiency of fintech. For instance, smart customer service systems can quickly respond to customer inquiries, improving service efficiency.

Hypothesis 2: Technological progress in the digital economy environment will significantly promote the improvement of fintech service efficiency.

The expanding market scale of the digital economy means that more enterprises and individuals are involved in digital economic activities, providing fintech with a broader market space and more business opportunities. Fintech companies can develop new financial products and services targeting the new demands in the digital economy, such as supply chain finance services tailored for e-commerce platforms.

Hypothesis 3: The expanding market scale of the digital economy helps fintech expand its business scope.

Research Design

Model Specification

To visually analyze the impact of digital economy on the development of fintech, the following model is constructed:

$$FINT_{it} = \beta_0 + \beta_1 DIG_{it} + \beta_2 Control_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

Where i represents individuals (provinces), t represents years, fintech development level (FINT) is the dependent variable, digital economy (DIG) is the core explanatory variable, and Control represents related control variables: urbanization level (URB), marketization level (MARKET), degree of openness (OPEN), government intervention level (GOV), and innovation level (Innovation). The model also includes individual fixed effects μ and year fixed effects λ , while

β_0 、 β_1 、 β_2 is the parameter to be estimated, and ε is the random disturbance term..

Variable Measurement

1. Dependent Variable: Fintech Development Level

The measurement of fintech development level involves a comprehensive evaluation of the fintech development status. This study refers to the research of Wang Jun et al. (2021), where the primary indicators include digital infrastructure, digital industrialization, industry digitization, and digital innovation capabilities, among others. The entropy method is used to derive a composite score.

Table 1 Digital Economy Indicator System

Primary Indicator	Secondary Indicator	Measurement Metric	Attribute
Digital Infrastructure	Internet Penetration Level	Number of Internet broadband access ports	Positive
		Number of Internet broadband users	Positive
		Number of Internet domain names	Positive
	Mobile Phone Penetration Level	Density of mobile phone base stations	Positive
		Mobile phone penetration rate	Positive
	Information Transmission Coverage	Length of long-distance optical cables per unit area	Positive
Digital Industrialization	Software & IT Services	Software business revenue as % of GDP	Positive
		Employment in IT/software industries	Positive
		IT service revenue as % of GDP	Positive

	Electronics Manufacturing	Telecom business volume as % of GDP	Positive
		Per capita telecom business volume	Positive
	Postal Services	Per capita postal business volume	Positive
		Express delivery volume	Positive
		E-commerce transaction volume of enterprises	Positive
Industrial Digitization	Enterprise Digitalization	Proportion of enterprises engaged in e-commerce	Positive
		Number of computers per 100 employees	Positive
		Number of enterprises with websites per 100 firms	Positive
	Digital Inclusive Finance	Digital inclusive finance index	Positive
Digital Innovation Capability	R&D Intensity	Full-time equivalent of R&D personnel in industrial enterprises	Positive
		R&D expenditure of industrial enterprises	Positive
		Number of R&D projects in industrial enterprises	Positive
	Technological Innovation	Total value of technology contracts	Positive
		Number of patents granted	Positive

2. Core Explanatory Variable: Digital Economy Development Level

Based on the study of Li Chuntao (2020), the level of fintech development in a region is indirectly reflected by the search volume of 40 keywords related to “fintech” in Baidu News. The total search volume in a specific region for different years is taken in logarithmic form and used as a proxy to measure the fintech development level (FINT). Furthermore, the Peking University Digital Inclusive Finance Index is also used as a proxy variable for fintech development in robustness tests.

3. Control Variables

Five control variables, including urbanization level (URB), marketization level (MARKET), degree of openness (OPEN), government intervention (GOV), and innovation level (Innovation), are summarized in Table 2.

Data Sources and Variables Definition

This paper uses panel data from 30 provinces in China over the period 2012-2022. All data comes from the National Statistical Yearbook. For missing data, interpolation is used. The specific definitions of the variables are summarized in Table 2 below.

Table 2 Variable Definitions and Measurement Methods

Variable Type	Variable Name	Measurement Method
Dependent Variable	FinTech Development Level (FINT)	
Independent Variable	Digital Economy (DIG)	Measured using the logarithmic transformation of Baidu News search volume index for 40 FinTech-related keywords (following Li et al., 2020 methodology). Composite index calculated via entropy weight method, encompassing: Digital infrastructure (e.g., broadband penetration) , Digital industrialization (e.g., IT industry output), Industrial digitization (e.g., enterprise digital adoption), Digital innovation capability (e.g., R&D indicators)
Control Variables	Urbanization Level (URB)	Urban population / Total population (%)
	Marketization Level (MARKET)	Provincial marketization index (from NERI Report)
	Openness Level (OPEN)	Total import & export value / GDP (%)
	Government Intervention (GOV)	Total government investment / GDP (%)
	Innovation Level (Innovation)	Number of domestic invention patent applications (log-transformed)

Empirical Tests and Results Analysis

Descriptive Statistics

Given the data availability, this paper constructs panel data for 30 Chinese provinces from 2012 to 2022. The indicator data comes from sources such as the "China Urban Statistical Yearbook." For missing data, interpolation was applied. The descriptive statistics for the variables are shown in Table 3 below.

Table 3 Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max	Median
FINT	330	43.39	47.97	0	227	26
DIG	330	0.12	0.1	0.01	0.6	0.09
URB	330	0.61	0.12	0.36	0.9	0.59
MARKET	330	8.25	1.92	3.36	12.86	8.34
OPEN	330	0.27	0.27	0.01	1.35	0.15
GOV	330	0.25	0.1	0.02	0.64	0.23
Innovation	330	9.74	1.36	5.7	12.4	9.88

The descriptive statistics table shows key details such as sample size, mean, standard deviation, minimum, maximum, and median for each variable. It provides an overview of the distribution characteristics, which is useful for further analysis.

Fintech Development: The average value is 43.39, with a significant difference between regions (min: 0, max: 227), indicating considerable disparity in fintech development across different provinces. Digital Economy: The average is 0.12, with the minimum at 0.01 and the maximum at 0.6, indicating that while the overall development of the digital economy is slow, some regions have made notable progress. Urbanization: With a mean of 0.61, urbanization is relatively fast in China, but there are significant regional differences. Marketization: The average marketization index is 8.25, indicating significant regional differences in marketization levels across China.

These descriptive statistics provide the foundational understanding for the potential impacts of digital economy, urbanization, and marketization on fintech development.

Correlation Analysis

After obtaining the relevant data, a correlation analysis was conducted to study the relationships between various variables. The correlation coefficients between fintech development level, digital economy, and other variables are summarized as follows:

Fintech Development Level and Digital Economy: The correlation coefficient is 0.492, significant at the 1% level, indicating a close relationship between digital economy development and fintech development. The improvement in the digital economy significantly promotes the progress of fintech. Fintech Development Level and Urbanization: The correlation coefficient is 0.504, suggesting that an increase in urbanization has a positive impact on fintech development. Fintech Development Level and Marketization: The correlation coefficient is 0.404, indicating that marketization is positively related to fintech development. Fintech Development Level and Degree of Openness: The correlation coefficient is 0.233, showing a modest positive relationship between openness and fintech development. Fintech Development Level and Government Intervention: The correlation coefficient is -0.151, suggesting a slight negative impact of government intervention on fintech development. Fintech Development

Level and Innovation: The correlation coefficient is 0.309, indicating that higher innovation capacity supports fintech development.

In addition to the correlation between fintech development and other variables, the correlation between digital economy and other factors is also significant. For example:

Digital Economy and Marketization: The correlation is 0.553, showing a close relationship between the development of digital economy and the marketization process. Digital Economy and Openness: The correlation is 0.482, indicating that the development of the digital economy also relies on openness.

Table 4 Correlation Analysis

	FINT	DIG	URB	MARKET	OPEN	GOV	Innovation
FINT	1						
DIG	0.492***	1					
URB	0.504***	0.460***	1				
MARKET	0.404***	0.553***	0.673***	1			
OPEN	0.233***	0.482***	0.780***	0.644***	1		
GOV	-0.151***	-0.334***	-0.348***	-0.754***	-0.417***	1	
Innovation	0.309***	0.546***	0.500***	0.855***	0.557***	-0.741***	1

Note: Robust standard errors in parentheses. ***/**/* indicate significance at 10%/5%/1% levels. All models include year and province fixed effects.

Multicollinearity Test

The Variance Inflation Factor (VIF) is used to measure the severity of multicollinearity in the multiple linear regression model. It represents the ratio of the variance of the estimated regression coefficients when the explanatory variables are correlated to the variance of the coefficients when they are uncorrelated. The standard threshold for multicollinearity is 10. If the VIF is below 10, multicollinearity is not a problem; if the VIF is between 10 and 100, multicollinearity is strong; and if the VIF is above 100, there is severe multicollinearity.

Table 5 VIF Multicollinearity Test

Variable	VIF	1/VIF
MARKET	6.69	0.149569
Innovation	4.41	0.22688
URB	3.37	0.296912
OPEN	2.87	0.348588
GOV	2.84	0.352083

DIG	1.6	0.624648
MeanVIF	3.63	

The VIF results for all variables are less than 10, and the Mean VIF is 3.63, suggesting that multicollinearity is not a serious issue in this model.

Baseline Regression

After selecting the indicators and specifying the model, empirical analysis was conducted using the fixed effects model based on the panel data. The results are presented in Table 6.

The regression results show that digital economy significantly promotes fintech development. In both Model 1 and Model 2, the coefficient of digital economy is 112.180 and 98.946, respectively, and they are significant at the 1% level, indicating that the development of the digital economy significantly boosts fintech development. Urbanization has a negative impact on fintech development, with a coefficient of -445.356, significant at the 1% level. This suggests that higher urbanization rates may suppress fintech development, possibly because the fintech infrastructure in highly urbanized regions is already saturated, and further improvements face challenges. Marketization does not have a significant direct impact on fintech development, with a coefficient of -2.137. The degree of openness negatively affects fintech development, with a coefficient of -48.648, significant at the 5% level. This could be due to the greater external competitive pressure in regions with higher openness, which may reduce the development space for local fintech companies. Government intervention also negatively affects fintech development, with a coefficient of -254.034, significant at the 1% level. Excessive government intervention may limit innovation and market vitality in fintech, thus negatively impacting its growth. Innovation capacity does not have a significant impact on fintech development, with a coefficient of -2.111.

Table 6 Baseline Regression

VARIABLES	FINT	
	(1)	(2)
DIG	112.180*** (5.62)	98.946*** (5.47)
URB		-445.356*** (-4.36)
MARKET		-2.137 (-0.84)
OPEN		-48.648** (-2.11)
GOV		-254.034*** (-6.45)
Innovation		-2.111 (-0.46)

Constant	-4.580 (-1.14)	349.232*** (5.54)
Individual fixed effects	YES	YES
Time fixed effects	YES	YES
Observations	330	330
R-squared	0.766	0.828
Number of id	30	30

Based on the R-squared values, which are above 0.7, it shows that the model has a good fit. For example, Model 2 in Table 6 has an R-squared of 0.828, meaning it explains 82.8% of the variation in fintech development levels.

Heterogeneity Test

To analyze the differences between regions, a heterogeneity test was conducted, dividing China into the eastern, central, and western regions for separate regression analysis. The results show that the impact of digital economy on fintech development differs significantly across regions:

Table 7 Heterogeneity Test

VARIABLES	FINT		
	Eastern Region	Central Region	Western Region
DIG	94.542*** (3.96)	-53.185 (-0.50)	108.212*** (2.66)
URB	-779.990*** (-5.12)	-7.929 (-0.02)	-116.543 (-0.33)
MARKET	-8.056** (-2.24)	7.037 (0.90)	-1.096 (-0.21)
OPEN	-46.944 (-1.50)	-166.951 (-1.36)	30.959 (0.40)
GOV	-170.925** (-2.38)	208.332 (1.41)	-244.499*** (-3.94)
Innovation	6.130 (0.83)	14.586 (1.63)	-13.753 (-1.45)
Constant	565.482*** (5.68)	-199.326 (-0.99)	245.753 (1.30)
Individual fixed effects	YES	YES	YES
Time fixed effects	YES	YES	YES
Observations	143	66	121
R-squared	0.864	0.945	0.786
Number of id	13	6	11

According to Table 7, the digital economy in the eastern region has a significant positive impact on fintech development, with a coefficient of 94.542, which is statistically significant at the 1%

level. The relatively mature digital economy in the eastern region significantly promotes fintech development. This may be attributed to the region's well-established economic and technological foundations, which enable the digital economy to directly drive fintech progress. However, urbanization in the eastern region negatively affects fintech development, with a coefficient of -779.990, significant at the 1% level. This aligns with the baseline regression results, suggesting that excessive urbanization may hinder fintech growth to some extent.

In the central region, the impact of the digital economy on fintech development is not statistically significant, with a coefficient of -53.185. This indicates that the digital economy in the central region has yet to become a strong driver of fintech development, likely due to relatively underdeveloped digital infrastructure and fintech capabilities, as well as insufficient integration between the digital economy and fintech. Additionally, neither marketization nor openness in the central region shows a significant effect on fintech development, implying that these factors do not substantially contribute to fintech growth in the region.

In contrast, the digital economy in the western region has a significant positive impact on fintech development, with a coefficient of 108.212, significant at the 1% level. This suggests that despite the region's relatively lower economic development, the rise of the digital economy plays a crucial role in advancing fintech. Notably, government intervention in the western region negatively affects fintech development, with a coefficient of -244.499, significant at the 1% level. This implies that excessive government intervention may constrain fintech innovation in the region.

The heterogeneity test results reveal significant regional disparities in the impact of the digital economy on fintech development. While the digital economy positively influences fintech in both the eastern and western regions, its effect is weaker in the central region. These differences may stem from variations in regional economic foundations, policy environments, and technological innovation capabilities.

Endogeneity Test

To verify potential endogeneity issues in the model, an endogeneity test was conducted by using the lagged value of digital economy development as an instrumental variable for handling the endogeneity of digital economy development. The regression results show that the lagged value of digital economy development still has a significant positive effect on fintech development, with a coefficient of 91.822, significant at the 1% level. This further confirms that digital economy promotes fintech development, and this effect exhibits some persistence over time.

Table 8 Endogeneity Test

VARIABLES	FINT	
	(1)	(2)
DIG	98.946*** (5.47)	
URB	-445.356*** (-4.36)	-431.751*** (-3.85)
MARKET	-2.137 (-0.84)	-3.074 (-1.09)

OPEN	-48.648** (-2.11)	-53.330* (-1.95)
GOV	-254.034*** (-6.45)	-249.939*** (-5.92)
Innovation	-2.111 (-0.46)	-3.007 (-0.60)
L.DIG		91.822*** (4.61)
Constant	349.232*** (5.54)	366.894*** (5.08)
Individual fixed effects	YES	YES
Time fixed effects	YES	YES
Observations	330	300
R-squared	0.828	0.816
Number of id	30	30

The endogeneity test results further demonstrate that the negative impacts of urbanization level and government investment on fintech development remain statistically significant even after controlling for endogeneity. This confirms that the constraining effects of these factors on fintech growth persist when addressing potential endogenous biases.

Through rigorous endogeneity testing, we can draw more robust conclusions: the digital economy not only exerts a significant positive influence on fintech development, but this impact also exhibits temporal continuity. These findings provide additional empirical validation that the digital economy serves as a crucial driving force for fintech advancement.

Robustness Test

A series of robustness tests were conducted to validate the regression results and ensure the reliability of the model. Different regression methods and sample data were used to test the model's stability. The robustness test results are summarized in Table 9 below:

Table 9 Robustness Test

VARIABLES	FINT		FI
	(1)	(2)	(3)
DIG	52.772*** (3.20)	46.605*** (3.04)	22.874*** (3.59)
URB	-431.386*** (-4.15)	-95.535 (-0.81)	-3.737 (-0.10)
MARKET	1.637 (0.71)	1.559 (0.69)	1.940** (2.15)
OPEN	-73.606*** (-3.64)	37.983 (1.55)	-15.636* (-1.92)
GOV	-166.372***	-181.566***	-27.592**

	(-3.36)	(-5.34)	(-1.99)
Innovation	-1.679 (-0.39)	9.719** (2.50)	-2.221 (-1.38)
Constant	300.464*** (4.83)	-14.040 (-0.21)	119.048*** (5.36)
Individual fixed effects	YES	YES	YES
Time fixed effects	YES	YES	YES
Observations	240	286	330
R-squared	0.760	0.841	0.995
Number of id	30	26	30

Considering the impact of the new crown epidemic on China's economic development, the data of the special years 2020-2022 are excluded before regression, and the regression results are shown in Column (1) of Table 9, which shows that the digital economy positively affects the level of fintech development at the 1% significance level, and the model is robust.

Since the four municipalities (Beijing, Shanghai, Tianjin and Chongqing) have a special status among the provinces in China, removing them from the regression helps to reduce the influence of the municipalities on the regression results, and the results are shown in column (2) in Table 9. In the robustness regression after excluding the four municipalities, the digital economy positively affects the level of fintech development at the 1% significance level, which verifies the robustness of the model.

Using the HP financial index (FI) to measure the level of fintech development, replacing the explanatory variable financial technology development level (FINT) to do the robustness test, the regression results are shown in column (3) of Table 9, the digital economy positively affects the level of fintech development at the 1% significance level, which verifies the model's robustness even more.

The results of the robustness test show that the positive impact of the digital economy on FinTech development is robust under different models and methods, while the impact of other variables (such as the level of urbanization, the degree of openness to the outside world, and the level of government investment) shows some volatility in different contexts. This implies that the impact of the digital economy, as the main factor driving fintech development, is relatively stable, while the role of other variables may be more dependent on specific regions and policy environments.

Conclusion and Recommendations

Conclusion

Through empirical analysis of the relationship between digital economy, urbanization level, marketization level, openness, government intervention, and innovation capacity, the paper reaches the following conclusions:

1. Digital Economy Significantly Promotes Fintech Development. Whether in baseline regressions, heterogeneity tests, or endogeneity tests, the positive impact of digital economy on

fintech development is significant and robust. The development of digital economy, especially in the eastern and western regions, plays a strong role in driving fintech progress. Therefore, policymakers should increase investment in digital infrastructure, particularly in central regions, to promote balanced development and foster fintech progress nationwide.

2. Urbanization Rate May Have a Suppressive Effect on Fintech Development. The analysis suggests that urbanization rate may negatively affect fintech development, especially in highly urbanized eastern regions. This is likely because the fintech infrastructure in highly urbanized areas is already saturated, leaving little room for further improvement. Therefore, attention should be given to updating and optimizing fintech infrastructure while promoting urbanization.

3. Government Intervention May Limit Fintech Innovation. The negative impact of government governance on fintech development is evident in multiple analyses, suggesting that excessive government intervention may hinder fintech innovation. Policymakers should focus more on creating a supportive market environment for fintech innovation, reducing unnecessary interventions, and promoting the independent development of fintech enterprises.

Policy Recommendations

Based on the empirical analysis of digital economy and fintech development, the paper proposes the following key policy recommendations to promote the coordinated development of digital economy and fintech:

1. Strengthen Digital Infrastructure and Reduce Regional Disparities. Digital infrastructure is a core element of digital economy development, directly influencing fintech innovation. The analysis finds that digital economy significantly promotes fintech in eastern and western regions, but the effect is less pronounced in the central region. Therefore, efforts should be made to invest in digital infrastructure, especially in the central and western regions, through the development of networks such as the internet, 5G, and cloud computing. This will help drive the digital transformation and provide better support for fintech enterprises.

2. Optimize the Integration of Urbanization and Fintech Infrastructure. The urbanization process has a negative impact on fintech development, particularly in highly urbanized regions. Governments and enterprises should take measures to synchronize the urbanization process with fintech infrastructure construction, such as upgrading financial technology infrastructure in urban areas, building data centers, and financial information service networks, to ensure that fintech infrastructure keeps pace with urban development.

3. Reduce Unnecessary Government Intervention and Enhance Market Vitality. Government intervention has been found to negatively impact fintech development in some cases. While the government plays an important role in policy guidance and industry regulation, excessive intervention may limit fintech innovation. Therefore, policymakers should lower the entry barriers for fintech industries, particularly in innovative enterprises, and provide more policy support for their registration, operation, and financing.

4. Promote Innovation Policies and Drive Independent R&D in Fintech. Innovation capacity is a key driver of fintech development. The analysis indicates that innovation capacity has an indirect effect on fintech, and that the application of innovation in fintech is still in its early stages. Policymakers should set up special funds to encourage fintech enterprises to conduct independent research and development in areas such as blockchain, artificial intelligence, and

big data. Collaboration between research institutions, universities, and fintech enterprises should also be encouraged to enhance innovation capacity.

5. Promote International Cooperation and Learn from Global Best Practices. As fintech develops globally, Chinese fintech enterprises must integrate with the global market. By actively participating in international fintech standard-setting, particularly in areas like data security, cross-border payments, and blockchain technology, Chinese enterprises can enhance their global competitiveness.

6. Ensure Data Security and Privacy, and Build a Sustainable Fintech Ecosystem. The development of fintech relies heavily on data, and data security and privacy have become critical issues. Governments should introduce more comprehensive data privacy protection policies, and fintech enterprises should invest in data security technologies. A transparent data usage mechanism should be established, and companies should notify users about the scope and purpose of data collection.

Through an empirical analysis of the digital economy and FinTech development, this paper puts forward policy recommendations such as strengthening the construction of digital infrastructure, optimizing the integration of the urbanization process and FinTech infrastructure, reducing government intervention, and promoting innovative policies. These recommendations not only help to promote the sustainable development of China's FinTech industry, but also provide an important reference for FinTech innovation on a global scale. In the future development, FinTech enterprises and the government should work together to promote technological innovation and market vitality, and realize the deep integration of digital economy and FinTech.

● **Conflict of Interest Statement**

Not Applicable

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