

The Impact of Digital Inclusive Finance on Urban-Rural Income Gap

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Abstract: Based on panel data from 31 provincial administrative regions in China from 2011 to 2023, this paper employs the Peking University Digital Inclusive Finance Index to construct a fixed-effects model and empirically analyze the impact of digital inclusive finance on the urban-rural income gap. Furthermore, it examines the underlying mechanisms through the lenses of innovation levels and urbanization processes, while conducting heterogeneity analysis from the perspectives of urbanization levels and regional disparities. The results indicate that the development of digital inclusive finance significantly narrows the urban-rural income gap. Robustness tests confirm that this conclusion remains valid after replacing variables, lagging explanatory variables, and adjusting sample ranges. Mechanism tests reveal that digital inclusive finance primarily narrows the urban-rural income gap by promoting regional innovation levels and driving the urbanization process. Heterogeneity analysis shows that the effect of digital inclusive finance in narrowing the urban-rural income gap is more pronounced in regions with moderate urbanization levels and in the eastern and western regions of China. This study provides empirical evidence for understanding the role of digital inclusive finance in promoting coordinated urban-rural development and offers references for relevant policy formulation.

Keywords: Digital inclusive finance; Urban-rural income gap; Theil index; Urbanization; Innovation

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1. Introduction

Since the implementation of the reform and opening-up policy, China has experienced prolonged rapid economic growth, accompanied by significant structural transformations. However, the urban-rural income gap has remained a persistent challenge, constraining both social equity and the quality of economic development. Traditional financial systems, limited by high transaction costs and insufficient risk assessment mechanisms, have often failed to extend adequate services to rural populations and small and medium-sized enterprises (SMEs), resulting in widespread financial exclusion.

In recent years, the rapid evolution of digital technologies—such as the internet, big data, and mobile payment systems, has given rise to digital inclusive finance, offering a promising solution to these challenges. Digital inclusive finance has the capacity to lower service costs, expand coverage, and improve the efficiency of financial intermediation, especially in less-developed regions. Empirical studies have shown that the

development of digital finance can significantly enhance access to credit, reduce financing constraints, and promote entrepreneurial activity, all of which contribute to higher income levels and more equitable distribution^[1,2]. Furthermore, it has been found to foster technological innovation and industrial upgrading, creating new momentum for economic growth^[3].

While existing research has explored the relationship between digital inclusive finance and income distribution, there remains a need for comprehensive analyses that incorporate recent data and methodological advances. In particular, the specific mechanisms through which digital finance influences the urban–rural income gap, as well as the heterogeneity of its effects across regions and stages of urbanization, warrant further investigation. This study addresses these gaps by utilizing panel data from 31 provincial-level regions in China from 2011 to 2023, applying a fixed-effects model, and drawing on the latest evidence from both domestic and international research^[4,5]. The aim is to provide up-to-date empirical support for policies aimed at promoting coordinated urban–rural development in the digital era.

2. Literature review and theoretical mechanisms

The relationship between financial development and income distribution has been extensively studied, with a growing body of work focusing on the distinctive features and impacts of digital finance. Li and Wu (2020) found that fintech development in China has a statistically significant negative effect on income inequality, operating through improved credit access and greater financial inclusion. This aligns with the global perspective offered by Demirgüç-Kunt et al. (2022)^[6], whose analysis of the Global Findex 2021 data revealed that the proliferation of digital payment methods has expanded financial access worldwide, though disparities remain across regions.

At the national level, Zhang and Yang (2023) applied spatial econometric techniques to Chinese provincial data, demonstrating that digital inclusive finance not only narrows the urban–rural income gap but also generates positive spillover effects to adjacent areas. This finding suggests that the benefits of digital finance are not confined to the regions where it is directly implemented. In a related vein, Chen and Wang (2022) emphasized the role of fintech in stimulating entrepreneurship, which can be a key channel for improving income distribution in developing economies^[7].

Micro-level evidence further supports these conclusions. Zhao and Zhang (2021) conducted a quasi-natural experiment based on the rollout of digital payment systems in rural China, finding substantial increases in rural household income attributable to improved financial access^[8]. Meanwhile, firm-level studies highlight the importance of digital finance in promoting innovation. Liu and Xu (2023) reported that access to digital financial resources significantly enhances technological upgrading in manufacturing enterprises, potentially increasing the demand for skilled labor and raising overall income levels.

The theoretical mechanisms through which digital inclusive finance influences the urban–rural income gap can be summarized as follows. First, by reducing information asymmetry and transaction costs, digital finance enables SMEs and rural households to obtain financing that was previously inaccessible, thus supporting income-generating activities^[1]. Second, the stimulation of innovation and industrial upgrading creates new employment opportunities and raises productivity, with potential benefits for both urban and rural residents^[3]. Third, digital finance can accelerate urbanization by facilitating e-commerce and the development of digital industries in rural areas, lowering the cost of migration and allowing rural labor to participate in higher-wage urban sectors^[5]. These mechanisms are likely to vary depending on regional characteristics, such as the level of urbanization and the existing digital infrastructure, which underscores the value of conducting heterogeneity analysis.

Collectively, the recent literature points to a robust and multi-dimensional linkage between digital inclusive finance and income distribution. The present study builds upon these findings by incorporating the latest available data and analytical approaches to examine both the aggregate effects and the underlying mechanisms in the Chinese context.

3. Research design

3.1. Sample selection and data sources

The data in this paper are sourced from the index reports published by the Peking University Digital Finance Research Center and the CSMAR database. Given that the existing data published by the Peking University Inclusive Finance Institute has missing years, this paper selects data from 31 provincial administrative regions in China from 2011 to 2023 as the sample data.

3.2. Variable selection and model construction

3.2.1. Dependent variable

The dependent variable in this paper is the urban-rural income gap, measured using the Theil index. The urban-rural income ratio is also utilized for robustness testing.

3.2.2. Independent variable

The core independent variable is digital inclusive finance, which encompasses three dimensions: coverage breadth, usage depth, and digitalization level. To standardize the data scale, this paper applies a logarithmic transformation to the index.

3.2.3. Control variables

To minimize interference from other factors on the urban-rural income gap, this paper incorporates a series of control variables into the model, including economic development level (lngdp), industrial structure (iso), foreign trade level (O), local government role (V), and education expenditure level (E).

3.2.4. Model construction

This paper constructs the following model to explore the impact of digital inclusive finance on the urban-rural income gap:

$$\text{Theil}_{it} = \delta + \beta \text{Digital}_{it} + \text{Control} + \gamma_t + \varepsilon_{it}$$

where represents the dependent variable (urban-rural income gap), denotes the independent variable (digital inclusive finance), represents the control variables (economic development level, industrial structure, etc.), signifies year fixed effects to eliminate uncontrollable factors changing over time, and represents robust standard errors.

4. Empirical results analysis and robustness testing

4.1. Baseline regression

Table 1 reports the baseline regression results of digital inclusive finance on the urban-rural income gap. Column (1) presents a univariate regression without control variables, where the coefficient of digital inclusive finance is -0.0281 and highly significant at the 1% level, preliminarily indicating that the development

of digital inclusive finance helps narrow the urban-rural income gap. Column (2) further incorporates a series of control variables, including economic development level, industrial structure, foreign trade level, local government role, and education expenditure level, and controls for year fixed effects. The results show that after controlling for other factors, the coefficient of digital inclusive finance becomes -0.0713, still significantly negative at the 1% level.

Table 1. Estimation result

Variables	(1)	(2)
	Theil	
Digital	-0.0281*** (-10.9792)	-0.0713*** (-5.7804)
Ln gdp		-0.0032 (-1.4759)
Upgrade		-0.0971*** (-3.0372)
Foreign trade		-0.2814*** (-4.8184)
Government role		0.0686*** (7.9484)
Education level		0.4300*** (7.8042)
Constant	0.2355*** (16.9830)	0.5027*** (8.0163)
Observations	403	403
R-squared	0.2311	0.7006
year fe		yes

4.2. Robustness testing

This paper first replaces the Theil index with the urban-rural income ratio (Gap) as the dependent variable to test whether the conclusion is affected by the measurement method of the dependent variable. Column (1) shows that the coefficient of digital inclusive finance is -0.8544, significantly negative at the 1% level, highly consistent with the baseline regression conclusion, indicating that the conclusion that digital inclusive finance narrows the urban-rural income gap is not influenced by the measurement method of the dependent variable. Column (2) lags the digital inclusive finance variable by one period to mitigate potential endogeneity issues. The regression results show that the coefficient of the lagged digital inclusive finance is -0.0661, significantly negative at the 1% level, suggesting that the development level of digital inclusive finance in the previous period still has a significant negative impact on the current urban-rural income gap. This result further supports the baseline regression conclusion, indicating that the narrowing effect of digital inclusive finance on the urban-rural income gap is persistent. Column (3) adjusts the sample size by excluding data from the four municipalities directly under the central government (Beijing, Shanghai, Tianjin, and Chongqing) from the baseline regression. The results show that the coefficient of digital inclusive finance is -0.0667, significantly negative at the 1% level (t-value of -4.5002), with a coefficient size and significance level largely consistent

with the baseline regression (-0.0713). This result indicates that special regions do not influence the baseline regression results and that the conclusion exhibits good robustness.

Table 2. Estimation result

Variables	(1)	(2)	(3)
	Gap	Theil	
Digital	-0.8544*** (-5.2941)		-0.0667*** (-4.7326)
Ln gdp		-0.0661*** (-4.7701)	
Upgrade	-0.1521*** (-6.0012)	-0.0087*** (-4.0108)	-0.0083*** (-4.0653)
Foreign trade	1.0238*** (2.8934)	-0.0110 (-0.3601)	-0.0144 (-0.4942)
Government role	0.2940 (0.2373)	-0.3149*** (-2.7738)	-0.3222*** (-3.2058)
Education level	0.2092** (2.1629)	0.0501*** (6.0166)	0.0528*** (6.6541)
Constant	3.9301*** (5.2790)	0.4828*** (8.8469)	0.4717*** (8.8001)
	7.0186*** (7.9049)	0.4446*** (6.0819)	0.4541*** (6.0431)
Observations			
R-squared			
year fe	351	324	351
Variables	0.4815	0.6435	0.6480
Digital	yes	yes	yes

5. Mechanism testing

The baseline regression confirms the causal relationship between digital inclusive finance and the urban-rural income gap, but how does digital inclusive finance affect the urban-rural income gap through specific transmission mechanisms? As previously analyzed, digital inclusive finance may narrow the urban-rural income gap by promoting innovation and advancing the urbanization process. The following sections empirically test these mechanisms, with regression results presented in **Table 3**.

Column (1) uses innovation level as the dependent variable to test the impact of digital inclusive finance on innovation level. The regression results show that the coefficient of digital inclusive finance is 1.1262, highly significant at the 1% level, suggesting that digital inclusive finance indirectly narrows the urban-rural income gap by enhancing regional innovation levels. Specifically, improved innovation levels promote technological progress and industrial upgrading, creating more high-value-added employment opportunities and raising the income levels of urban and rural residents. Simultaneously, the technological diffusion effect drives development in rural areas, thereby narrowing the urban-rural income gap.

Column (2) uses the urbanization rate as the dependent variable to test the impact of digital inclusive finance on the urbanization process. The regression results show that the coefficient of digital inclusive finance is 0.3060, highly significant at the 1% level, suggesting that digital inclusive finance indirectly narrows the urban-rural income gap by promoting urbanization. An increase in the urbanization rate means more rural populations move to cities to access

higher wages and better development opportunities, thereby narrowing the urban-rural income gap. Simultaneously, the optimization and upgrading of the industrial structure during the urbanization process also drive economic development in rural areas, forming a virtuous cycle of urban-rural integrated development.

Table 3. Estimation result

Variables	(1)	(2)
	Innovation level	Urbanization process
Digital	1.1262*** (5.2354)	0.3060*** (6.1252)
Ln gdp	1.1603*** (26.2648)	-0.0685*** (-8.0904)
Upgrade	2.7796*** (4.7151)	1.2006*** (8.9331)
Foreign trade	3.6520*** (2.8553)	2.1682*** (9.1513)
Government role	-0.3952** (-2.2978)	-0.8348*** (-23.2733)
Education level	3.1501** (2.4463)	-2.2130*** (-10.8436)
Constant	-10.2400*** (-9.1690)	2.5654*** (9.6090)
Observations	403	403
R-squared	0.9392	0.8927
year fe	yes	yes

6. Heterogeneity analysis

6.1. Heterogeneity by urbanization level

Considering that the impact of digital inclusive finance on the urban-rural income gap may vary across regions with different urbanization levels, this paper divides the full sample into three groups (low urbanization rate, moderate urbanization rate, and high urbanization rate) for grouped regression. The results in **Table 4** show that the coefficient of digital inclusive finance is -0.0012 (insignificant) in the low urbanization rate group, -0.0460 (significant at the 5% level) in the moderate urbanization rate group, and -0.0008 (insignificant) in the high urbanization rate group. This result has important policy implications: the effect of digital inclusive finance in narrowing the urban-rural income gap is only significant in regions with moderate urbanization rates and insignificant in regions with high and low urbanization rates.

Table 4. Estimation result

Variables	High urbanization	Moderate urbanization	Low urbanization
	Theil		
Digital	-0.0069	-0.0460**	-0.0182

	(-0.4985)	(-2.2635)	(-0.6841)
Ln gdp	0.0108***	0.0006	-0.0204**
	(4.7830)	(0.2678)	(-2.2170)
Upgrade	-0.4310***	0.0955***	-0.1408
	(-8.2676)	(3.9798)	(-0.9903)
Foreign trade	-0.0321	-0.1642*	-3.6109***
	(-1.0985)	(-1.9137)	(-4.3420)
Government role	0.1376***	0.1583***	-0.0429*
	(4.7957)	(7.0613)	(-1.7919)
Education level	0.1931***	0.3850***	0.0542
	(4.1260)	(6.8356)	(0.3463)
Constant	0.3256***	0.1425	0.5544***
	(6.1021)	(1.1902)	(3.2993)
Observations	74	250	79
R-squared	0.8879	0.4845	0.6366
year fe	yes	yes	yes

6.2. Regional heterogeneity

Considering significant disparities in economic development and financial ecology across China's eastern, central, and western regions, this paper further conducts grouped regression by region, with results presented in **Table 5**. The regression results show that the coefficient of digital inclusive finance is -0.0286 (significant at the 5% level) in the eastern region, -0.0012 (insignificant) in the central region, and -0.0501 (significant at the 1% level) in the western region. This result indicates that the effect of digital inclusive finance in narrowing the urban-rural income gap is significant in the eastern and western regions but insignificant in the central region.

Table 5. Estimation Result

Variables	East	Central	West
		Theil	
Digital	-0.0286***	-0.0404	-0.0501***
	(-4.2709)	(-1.5712)	(-2.9602)
Ln gdp	0.0148***	0.0477***	0.0022
	(8.8947)	(6.2071)	(0.7464)
Upgrade	-0.3565***	0.4022***	0.1909**
	(-16.1279)	(10.0054)	(2.3513)
Foreign trade	-0.0670***	-1.8320***	-1.7882***
	(-2.7174)	(-5.4467)	(-6.4233)
Government role	-0.0244	0.4458***	0.0527***
	(-1.1090)	(6.6665)	(7.2436)
Education level	0.0058	0.1191	0.7437***
	(0.1976)	(1.2773)	(10.4606)
Constant	0.3978***	-0.6549***	0.0655
	(12.2383)	(-3.7070)	(0.5446)

Observations	143	104	156
R-squared	0.9326	0.8284	0.7726
year fe	yes	yes	yes

7. Conclusion and policy recommendations

Based on panel data from 31 provincial administrative regions in China from 2011 to 2023, this paper empirically analyzes the impact of digital inclusive finance on the urban-rural income gap. The results indicate that the development of digital inclusive finance significantly narrows the urban-rural income gap and operates through promoting innovation levels and driving the urbanization process.

Based on the above conclusions, this paper proposes the following policy recommendations: First, further improve digital financial infrastructure construction to enhance the coverage of the internet and digital financial services in rural areas. Second, encourage financial institutions to develop digital financial products suitable for rural areas to improve the accessibility of financial services for rural residents. Third, promote the integration of digital finance with technological innovation to facilitate industrial upgrading. Fourth, advance urban-rural integrated development and new urbanization construction to achieve coordinated regional development.

Disclosure statement

The author declares no conflict of interest.

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