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AN EMPIRICAL STUDY ON THE IMPACT OF DIGITAL INCLUSIVE FINANCE ON THE URBAN–RURAL INCOME GAP ACROSS REGIONS

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Abstract: Drawing on regional panel data, this study empirically investigates how digital inclusive finance affects the urban–rural income disparity and explores the pathways through which this influence operates. The findings indicate that digital inclusive finance exerts a significant narrowing effect on the urban–rural income gap, suggesting that digital financial services contribute meaningfully to overcoming conventional financial exclusion, reducing barriers to financial access, and optimizing the distribution of financial resources in rural communities. The mechanism analysis demonstrates that digital inclusive finance fosters income convergence between urban and rural populations primarily through two channels: enhancing financial accessibility and stimulating entrepreneurial activity in rural areas. Furthermore, regional heterogeneity analysis reveals that the income-equalizing effect of digital inclusive finance varies across geographic regions, with the central region exhibiting a comparatively more pronounced effect. The evidence presented in this study offers empirical support for advancing digital inclusive finance development, facilitating balanced income growth between urban and rural areas, and achieving shared prosperity.
Keywords: Digital inclusive finance; Urban–rural income gap; Financial accessibility; Regional heterogeneity

1 INTRODUCTION

The disparity in income between urban and rural populations remains a pivotal concern in regional coordinated development and the realization of common prosperity. Since the era of reform and opening-up, China has maintained robust economic expansion and urban household incomes have risen considerably. Nevertheless, owing to structural imbalances in the industrial composition of agriculture and manufacturing, unequal provision of public services, skewed distribution of educational resources, and disproportionate allocation of financial resources, pronounced differences in income levels and development opportunities between urban and rural residents have persisted over the long term. According to statistics released by the National Bureau of Statistics, despite a gradual decline in the urban–rural income ratio in recent years, per capita disposable income among urban residents remains roughly 2.5 times that of their rural counterparts, and the problem of uneven urban–rural development continues to be conspicuous. The report a explicitly emphasized "steadily advancing common prosperity," positioning the reduction of the urban–rural income disparity and the promotion of integrated urban–rural development as key strategic priorities for the new phase of development. Against this backdrop, how to stimulate rural income growth and foster more equitable income distribution through effective financial instruments has emerged as a pressing research question in the course of high-quality economic development.

The conventional financial system demonstrates evident shortcomings in delivering equitable financial services across urban and rural areas. Inadequate branch coverage of financial institutions in rural regions, pronounced information asymmetry, and underdeveloped collateral and guarantee mechanisms have long placed rural residents and small business operators at a disadvantage in accessing financing, making financial exclusion a relatively pervasive phenomenon. In this context, the deep convergence of digital technology with financial services has given rise to digital inclusive finance as an emerging mode of financial delivery. By leveraging mobile payments, online credit, big data-driven risk management, and digital financial platforms, digital inclusive finance transcends the spatial and temporal limitations of conventional financial services, lowers operational costs, and enhances the accessibility and availability of financial services for rural populations, small enterprises, and communities in less-developed regions. In recent years, digital payment platforms exemplified by Alipay and WeChat Pay, together with a range of digital credit products, have rapidly penetrated rural markets, continuously expanding the reach of digital inclusive finance and presenting a significant opportunity to improve the financial service environment in rural areas.

A growing body of scholarship has accumulated on the nexus between digital inclusive finance and income distribution. Certain studies have theoretically explored the internal logic by which digital finance influences residents' income through relaxing credit constraints, reducing transaction costs, and diversifying income channels [1–3]. Others have empirically assessed the effect of digital inclusive finance on the urban–rural income gap using provincial or county-level panel data, with findings generally affirming that digital inclusive finance contributes positively to narrowing this disparity [4–6]. Furthermore, some researchers have delved into the specific pathways through which digital inclusive finance shapes income inequality, including the facilitation of rural entrepreneurship, the enhancement of consumption capacity, and improvements in human capital investment [7-8]. Nonetheless, existing research still exhibits several

notable limitations. First, insufficient attention has been devoted to regional heterogeneity in how digital inclusive finance affects the urban–rural income gap, and the differential impacts across regions with varying development levels have yet to be thoroughly explored. Second, systematic empirical examination of the dual mechanism channels of financial accessibility and rural entrepreneurship remains scarce. Third, certain studies still have scope for refinement in model specification and the handling of endogeneity concerns.

In light of the above, this study centers on the relationship between digital inclusive finance and the urban–rural income gap, constructs an econometric framework drawing on regional panel data, and systematically investigates the effects, underlying mechanisms, and regional heterogeneity of digital inclusive finance on the urban–rural income disparity. Relative to existing studies, the marginal contributions of this paper are reflected primarily in three dimensions. First, regarding research perspective, this study integrates both financial accessibility and rural entrepreneurship into a unified analytical framework, systematically testing the dual transmission channels through which digital inclusive finance influences the urban–rural income gap, thereby enriching the mechanism identification literature in this domain. Second, in terms of regional heterogeneity, this study conducts subgroup regressions for the eastern, central, and western regions to compare the differential effects of digital inclusive finance across varying development contexts, thereby offering a basis for targeted policy design. Third, this study strengthens the credibility of its conclusions through multiple robustness checks, encompassing the substitution of the dependent variable, the use of lagged explanatory variables, and winsorization treatment. The findings are expected to deepen understanding of the income distribution implications of digital inclusive finance and furnish empirical grounding for extending digital financial services to rural areas, fostering balanced urban–rural development, and advancing the goal of shared prosperity.

2 THEORETICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

2.1 Theoretical Underpinnings

The theoretical foundation for examining the nexus between digital inclusive finance and the urban–rural income gap can be derived from several strands of economic thought. First, financial development theory posits that the evolution of financial markets and institutions plays a foundational role in driving economic growth and shaping income distribution outcomes. McKinnon and Shaw's financial deepening framework contends that financial repression inhibits economic activity by curtailing credit availability, whereas financial liberalization and deepening can enhance resource allocation efficiency and facilitate broader participation in productive economic activities. In rural settings, where financial repression and exclusion have historically been more acute, the extension of financial services is anticipated to generate comparatively larger income growth effects for rural households. Second, information asymmetry theory offers a theoretical lens through which to understand why rural residents and small business operators are disproportionately marginalized from formal financial services. Given the elevated costs of screening and monitoring borrowers in rural contexts, conventional financial institutions tend to concentrate their operations in urban centers, where the costs of information acquisition are lower and collateral systems are more mature. By harnessing big data analytics and digital transaction records, digital inclusive finance can substantially attenuate information asymmetry between lenders and rural borrowers, thereby lowering credit access thresholds and broadening the supply of financial services to previously underserved groups. Third, from the standpoint of income distribution theory, access to finance is increasingly acknowledged as a significant determinant of household income and wealth accumulation. When rural residents obtain access to credit, savings instruments, insurance products, and payment services, they are better equipped to channel resources into productive endeavors, smooth consumption across time periods, manage exposure to risks, and ultimately elevate their long-run income levels. The proliferation of digital inclusive finance thus establishes a pathway through which previously excluded rural populations can engage more fully in economic growth, contributing to a gradual convergence of urban and rural incomes.

2.2 Direct Impacts of Digital Inclusive Finance on the Urban–Rural Income Disparity

The advancement of digital inclusive finance offers a novel approach to addressing conventional financial exclusion and mitigating the urban–rural income disparity. Within the traditional financial system, rural communities and low-income groups frequently encounter financial exclusion stemming from information asymmetry, elevated transaction costs, inadequate collateral, and restricted physical access to financial institutions. Consequently, rural residents and small business operators commonly face obstacles in securing sufficient financial support, which constrains their capacity to engage in productive investment and dampens their income growth potential. Underpinned by internet platforms, mobile payment systems, big data-driven risk management, and online lending services, digital inclusive finance can partially circumvent the geographic constraints of conventional finance, lower transaction costs, and enhance both the reach and efficiency of financial service delivery.

For rural households, digital inclusive finance not only improves the convenience of payment transactions but also broadens access to credit, insurance, investment, and other financial products. By enabling rural residents to utilize financial tools that were previously inaccessible or prohibitively expensive, digital inclusive finance can strengthen their ability to engage in income-generating activities and productive endeavors. Furthermore, the expansion of digital financial services reduces rural residents' reliance on informal and high-cost financing channels — such as private lending — thereby alleviating financing burdens and improving the efficiency of capital utilization. At the aggregate level, the wider penetration of digital financial services contributes to a more balanced distribution of financial

resources between urban and rural areas, which may help counteract the historically urban-skewed allocation of formal credit and financial services. Digital inclusive finance is therefore anticipated to optimize the allocation of financial resources in rural regions, elevate rural household income levels, and ultimately narrow the income gap between urban and rural residents.

Based on the foregoing analysis, this study puts forward the following hypothesis:

H1: Digital inclusive finance significantly narrows the urban–rural income gap. By reducing barriers to financial service access, broadening the coverage of financial services, and improving the efficiency of financial resource allocation, digital inclusive finance can help raise rural residents' income and alleviate the income disparity between urban and rural populations.

2.3 Mechanism Analysis: Financial Accessibility and Rural Entrepreneurship

Beyond its direct effect, digital inclusive finance may affect the urban–rural income gap through two primary mechanism channels: financial accessibility and rural entrepreneurship.

Regarding the financial accessibility channel, traditional financial institutions are often insufficiently distributed in rural regions, making it difficult for rural residents to obtain loans and other financial services. The uneven geographic distribution of bank branches and other formal financial service providers means that many rural households must travel significant distances or bear high transaction costs to access even basic financial services, creating substantial barriers to financial participation. Digital inclusive finance can fundamentally alter this landscape by expanding financial service coverage through online accounts, mobile payments, and digital credit products, thereby easing the financing constraints faced by rural households and agricultural business entities. As rural residents gain greater access to affordable credit, they are better able to invest in agricultural production, household businesses, and other income-generating activities. Furthermore, the availability of digital insurance products helps rural households manage agricultural risks more effectively, reducing the vulnerability of their income to weather shocks and other external disruptions. The improved ability to save and invest through digital financial platforms also contributes to the gradual accumulation of productive assets among rural households, supporting sustained income growth over time. Through these pathways, improvements in financial accessibility are expected to contribute to rural income growth and a narrowing of the urban–rural income gap.

Regarding the rural entrepreneurship channel, financing constraints represent a major barrier to entrepreneurial activities in rural areas. The difficulty of obtaining startup capital and working capital from formal financial institutions has historically discouraged many rural residents from pursuing self-employment, small business development, or other entrepreneurial ventures, even when viable economic opportunities exist. By lowering credit thresholds, improving the convenience of fund acquisition, expanding online transaction channels, and providing digital platforms for marketing and sales, digital inclusive finance creates more favorable conditions for rural residents to engage in self-employment, rural e-commerce, agritourism, and small business development. The growth of rural e-commerce in particular has opened new market channels for agricultural and handicraft products, allowing rural entrepreneurs to reach urban and national markets that were previously inaccessible. As more rural residents are able to establish and sustain entrepreneurial activities, the expansion of operating income among rural households contributes to the convergence of urban and rural incomes. Moreover, successful entrepreneurship generates positive spillover effects within rural communities by creating local employment opportunities and stimulating demand for supporting services, further amplifying the income growth effects of digital inclusive finance.

Drawing on the foregoing analysis, this study advances the following hypothesis:

H2: Digital inclusive finance contributes to narrowing the urban–rural income disparity through two primary channels: enhancing financial accessibility and stimulating entrepreneurial activity in rural areas. By alleviating financing constraints faced by rural residents and agricultural business entities, digital inclusive finance can bolster their productive and operational capacities, and augment rural income by fostering self-employment and new venture creation.

2.4 Regional Heterogeneity

The influence of digital inclusive finance on the urban–rural income gap is unlikely to be uniform across regions, given the considerable variation in economic development levels, digital infrastructure construction, financial service environments, and rural residents' digital literacy among China's eastern, central, and western regions.

In eastern regions, where digital infrastructure is comparatively well-developed, the financial service ecosystem is more sophisticated, and the penetration of digital financial products is already substantial, digital inclusive finance may be more readily converted into tangible income growth effects. However, given that the urban–rural income disparity in eastern regions has already been partially narrowed through preceding economic development and financial deepening, the incremental effect of further digital financial expansion on the urban–rural income gap may be relatively modest. In central regions, which have undergone considerable industrial restructuring and infrastructure investment in recent years while still sustaining a notable urban–rural income gap, digital inclusive finance is likely to encounter a more conducive combination of enabling conditions: adequate digital infrastructure to facilitate service delivery alongside meaningful residual inequality yet to be addressed. This implies that the income gap-narrowing effect of digital inclusive finance may be most pronounced in central regions. In western regions, conventional financial exclusion tends

to be more entrenched, suggesting potentially substantial marginal gains from improved digital financial access. Nonetheless, the effectiveness of digital inclusive finance in western regions may be tempered by comparatively underdeveloped digital infrastructure, lower levels of human capital and digital literacy among rural populations, and a relatively weak industrial base that restricts the income-generating opportunities available to rural entrepreneurs.

Drawing on the foregoing analysis, this study puts forward the following hypothesis:

H3: The effect of digital inclusive finance on the urban–rural income gap exhibits regional heterogeneity. Owing to regional disparities in economic conditions, digital infrastructure, and financial service environments, the income gap-narrowing effect of digital inclusive finance may diverge across eastern, central, and western regions, with the most pronounced effect anticipated in the central region.

3 RESEARCH DESIGN

3.1 Model Specification

To examine the impact of digital inclusive finance on the urban–rural income gap, this study constructs the following baseline regression model:

$$Gap_{it}=\alpha+\beta DIFI_{it}+\gamma X_{it}+\mu_i+\lambda_t+\varepsilon_{it} \quad (1)$$

where Gap_{it} denotes the urban–rural income gap in region i in year t; $DIFI_{it}$ represents the level of digital inclusive finance; X_{it} is a set of control variables; μ_i denotes regional fixed effects, which control for time-invariant differences across regions; λ_t denotes year fixed effects, which capture common shocks such as macroeconomic fluctuations and policy changes; and ε_{it} is the random error term. The coefficient of interest is β. If β is significantly negative, it indicates that digital inclusive finance helps narrow the urban–rural income gap. Conversely, a significantly positive coefficient would suggest that digital inclusive finance may widen the income disparity between urban and rural residents.

The adoption of a two-way fixed effects specification is motivated by several considerations. Regional fixed effects are incorporated to absorb time-invariant regional characteristics that may concurrently influence digital financial development and the urban–rural income gap, including geographic endowments, historical institutional legacies, and deeply embedded cultural factors. Year fixed effects are introduced to account for aggregate temporal trends and common macro-level shocks affecting all regions simultaneously, such as national policy adjustments, technological advancements, and broader macroeconomic dynamics. By controlling for both dimensions of unobserved heterogeneity, the two-way fixed effects framework helps attenuate potential omitted variable bias and enhances the credibility of the estimated coefficient on digital inclusive finance. It bears noting that the panel fixed effects approach relies on within-region temporal variation to identify the effect of digital inclusive finance, rendering it more appropriate than cross-sectional comparisons that may be confounded by persistent regional disparities.

Nonetheless, potential endogeneity concerns warrant attention. On one hand, reverse causality may arise if regions characterized by a narrower urban–rural income gap tend to attract greater investment in digital financial infrastructure. On the other hand, certain time-varying unobservable factors — such as local governance capacity or regional innovation potential — may simultaneously shape both digital financial development and income distribution outcomes. To mitigate these concerns, this study employs several robustness checks, including the introduction of lagged explanatory variables, as elaborated in the empirical results section.

Building on the baseline model, this study further carries out mechanism analysis and regional heterogeneity analysis. The mechanism analysis investigates whether digital inclusive finance influences the urban–rural income gap through two pathways: improving financial accessibility and fostering rural entrepreneurship. Concretely, mechanism variables are introduced into the regression framework to observe shifts in the coefficient of digital inclusive finance and the directional effects of the mechanism variables. For the regional heterogeneity analysis, the full sample is partitioned into eastern, central, and western regions in accordance with regional development disparities, and separate regressions are estimated to compare the differential effects of digital inclusive finance across regions.

3.2 Variables and Data

The dependent variable in this study is the urban–rural income gap, quantified by the ratio of urban per capita disposable income to rural per capita disposable income. This indicator directly captures the relative income disparity between urban and rural residents: a larger value signifies a wider income gap, whereas a smaller value reflects a more equitable income distribution across the urban–rural divide. This ratio-based measure is widely employed in the extant literature owing to its intuitive interpretability and suitability for cross-regional comparison. To strengthen the robustness of the empirical findings, the Theil index is additionally adopted as an alternative measure in the robustness checks. As an entropy-based inequality metric, the Theil index encompasses both within-group and between-group income disparities, and its application as an alternative dependent variable enables a more thorough evaluation of the sensitivity of the baseline results to different inequality indicators.

The core explanatory variable is the level of digital inclusive finance, proxied by the Peking University Digital Financial Inclusion Index. Constructed by the Digital Finance Research Center of Peking University in collaboration with Ant Group, this index systematically captures the development of digital inclusive finance across regions based on an extensive volume of actual transaction data. The index encompasses three principal dimensions: coverage breadth, reflecting the scale of digital financial account ownership and user penetration; usage depth, capturing the intensity and

diversity of digital financial product utilization across categories including payments, credit, insurance, and investment; and the degree of digitalization, measuring the extent to which financial services are delivered through digital rather than conventional channels. A higher index value signifies a more advanced level of digital financial development, stronger financial service accessibility, and greater convenience and intensity in financial service use. The adoption of this index as the primary measure of digital inclusive finance aligns with a substantial body of empirical scholarship, ensuring comparability with prior findings while drawing on the index's comprehensive coverage of multiple facets of digital financial development.

With respect to control variables, this study selects several factors likely to affect the urban–rural income gap on the basis of existing theoretical and empirical research. Economic development is proxied by per capita GDP, since higher overall development levels are generally associated with stronger demand for financial services and may influence urban–rural income distribution through labor market dynamics and structural transformation. Industrial structure is measured by the share of the tertiary sector in GDP, given that the expansion of the service industry tends to generate more diversified employment opportunities and may alter the relative income positions of urban and rural workers. Urbanization is captured by the proportion of the urban population in the total population, as urbanization entails the spatial reallocation of labor and capital between urban and rural areas, directly affecting relative income levels. Education level is reflected by the share of education expenditure or mean years of schooling, indicating the role of human capital formation in determining income distribution outcomes. Conventional financial development is proxied by financial institution loans as a share of GDP, controlling for the degree to which traditional financial services already serve the local economy and may interact with or substitute for digital financial services. Government intervention is measured by fiscal expenditure as a share of GDP, capturing the influence of public resource allocation on income distribution through transfer payments, rural development initiatives, and infrastructure investment.

These variables serve to control for the effects of regional economic conditions, industrial composition, public resource allocation, and financial development environments on the urban–rural income gap, thereby mitigating the risk of omitted variable bias in estimating the coefficient on digital inclusive finance. The incorporation of this comprehensive set of control variables ensures that the estimated effect of digital inclusive finance reflects its independent contribution to income gap dynamics rather than being attributable to correlated regional development factors.

To investigate the mediating channels through which digital inclusive finance influences the urban–rural income gap, this study introduces two mechanism variables. Financial accessibility is measured by financial service coverage or loan availability, capturing the degree to which rural residents and small business operators can obtain formal financial services. An improvement in this variable is anticipated to reflect the broadening of financial service reach facilitated by digital financial platforms. Rural entrepreneurship is proxied by the number of private enterprises or self-employed businesses per unit of rural population, reflecting the level of entrepreneurial activity among rural residents. An increase in this variable suggests that a growing number of rural residents are engaging in self-employment and small business operations, which is hypothesized to constitute one of the channels through which digital inclusive finance translates into rural income growth.

This study draws on regional panel data from China for empirical analysis. Data on digital inclusive finance are sourced from the Peking University Digital Financial Inclusion Index, while information on urban and rural residents' income and other socioeconomic indicators are primarily collected from the China Statistical Yearbook, provincial statistical yearbooks, and relevant official statistical databases. To mitigate the influence of heteroscedasticity and extreme values, select continuous variables are logarithmically transformed or winsorized where appropriate. Descriptive statistics are presented in Table 1.

Table 1 Variable Definitions

Variable type	Variable	Symbol	Measurement
Dependent variable	Urban–rural income gap	Gap	Ratio of urban per capita disposable income to rural per capita disposable income
Core explanatory variable	Digital inclusive finance	DIFI	Peking University Digital Financial Inclusion Index
Control variable	Economic development	PGDP	Per capita GDP
Control variable	Industrial structure	INS	Share of tertiary industry in GDP
Control variable	Urbanization	URB	Urban population as a share of total population
Control variable	Education level	EDU	Education expenditure share or average years of schooling
Control variable	Traditional financial development	FIN	Financial institution loans as a share of GDP
Control variable	Government intervention	GOV	Fiscal expenditure as a share of GDP
Mechanism variable	Financial accessibility	FA	Financial service coverage or loan availability
Mechanism variable	Rural entrepreneurship	ENT	Number of private enterprises or self-employed businesses

4 EMPIRICAL RESULTS AND DISCUSSION

4.1 Baseline Regression Results

Table 2 reports the baseline regression results for the impact of digital inclusive finance on the urban–rural income gap. Model (1) includes only the core explanatory variable, Model (2) further controls for socioeconomic factors, Model (3) adds regional fixed effects, and Model (4) includes both regional and year fixed effects. The results show that the coefficient of the digital inclusive finance index is consistently negative and statistically significant across all model specifications, indicating that digital inclusive finance significantly narrows the urban–rural income gap.

Table 2 Baseline Regression Results

Variable	Model (1)	Model (2)	Model (3)	Model (4)
DIFI	-0.018***	-0.026***	-0.031***	-0.034***
	(0.006)	(0.007)	(0.008)	(0.007)
PGDP		-0.012**	-0.009*	-0.011**
		(0.005)	(0.005)	(0.004)
INS		-0.021**	-0.018*	-0.020**
		(0.009)	(0.010)	(0.009)
URB		-0.035***	-0.028**	-0.030**
		(0.011)	(0.012)	(0.012)
EDU		-0.014*	-0.016**	-0.018**
		(0.008)	(0.007)	(0.007)
FIN		-0.010	-0.013*	-0.015*
		(0.007)	(0.007)	(0.008)
GOV		0.009	0.006	0.005
		(0.006)	(0.006)	(0.006)
Regional fixed effects	No	No	Yes	Yes
Year fixed effects	No	No	No	Yes
Observations	310	310	310	310
R^2	0.214	0.386	0.521	0.574

The stepwise introduction of control variables and fixed effects across the four model specifications facilitates an evaluation of how stable the core coefficient estimate remains. The bare-bones Model (1), which omits all controls and fixed effects, yields a coefficient of -0.018 that is statistically significant at the 1% level. When socioeconomic controls are incorporated in Model (2), the coefficient magnitude rises to -0.026 in absolute value, implying that excluding relevant regional characteristics biases the estimated effect of digital inclusive finance downward. This upward shift likely reflects the fact that regions with more developed digital finance ecosystems tend simultaneously to exhibit higher urbanization rates and stronger overall economic performance, both of which exert independent downward pressure on the income gap; their absence from simpler models thus partially counteracts the digital-finance coefficient. The coefficient settles at -0.031 in Model (3) once regional fixed effects are added, and at -0.034 in the fully specified Model (4) after year fixed effects are also included, confirming that the gap-narrowing effect persists after netting out unobserved time-invariant regional characteristics as well as economy-wide temporal shocks.

In Model (4), after controlling for regional and year fixed effects, the coefficient of digital inclusive finance is -0.034 and significant at the 1% level. In terms of economic magnitude, this implies that a one-unit increase in the digital inclusive finance index is associated with a reduction of approximately 0.034 in the urban–rural income ratio, holding other factors constant. Given that the urban–rural income ratio in China has typically ranged between 2.5 and 3.5 during the sample period, this represents a non-trivial reduction in relative income disparity. This suggests that digital inclusive finance retains a stable narrowing effect on the urban–rural income gap even after controlling for economic development, industrial structure, urbanization, education, traditional financial development, and government intervention. A possible explanation is that digital inclusive finance lowers the threshold for rural residents to access financial services and improves the availability of credit, payment, and insurance services in rural areas, thereby enhancing their capacity to participate in productive and income-generating activities.

Among the control variables, several findings are also noteworthy. The coefficient of per capita GDP is consistently negative and significant, suggesting that regions with higher overall economic development tend to have a narrower urban–rural income gap, which is consistent with the later stages of the Kuznets curve hypothesis. The coefficient of urbanization is also significantly negative, indicating that a higher degree of urbanization is associated with a smaller urban–rural income gap, possibly because urbanization facilitates labor migration from rural to urban areas and increases rural residents' non-agricultural income. The coefficient of industrial structure is negative and generally significant, reflecting the income-equalizing effect of tertiary sector expansion. The coefficient of education is consistently negative and significant, suggesting that greater investment in human capital contributes to narrowing income disparities between urban and rural residents. The coefficient of traditional financial development is marginally significant in some specifications, while government intervention does not exhibit a statistically significant effect, possibly reflecting the mixed distributional consequences of fiscal expenditure across different regions and time periods.

Figure 1 plots the digital inclusive finance coefficient across the four regression specifications. The coefficient remains negative throughout as controls and fixed effects are successively added, indicating that the gap-narrowing finding is not an artifact of any particular model setup. The monotonic drift toward -0.034 as the specification becomes more

demanding reinforces confidence that the estimated relationship between digital financial development and the urban–rural income gap reflects a substantive causal link rather than a coincidental association driven by omitted confounders.

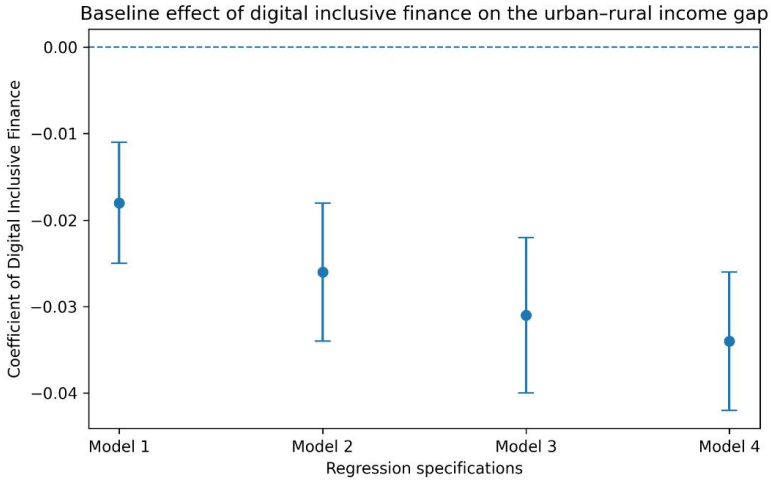

Figure 1 Baseline Effect of Digital Inclusive Finance on the Urban-Rural Income Gap

4.2 Robustness Tests

To verify the reliability of the baseline results, this study conducts several robustness tests. First, the dependent variable is replaced by the Theil index to examine whether the results are sensitive to alternative measurements of the urban–rural income gap. Second, the one-period lagged digital inclusive finance index is used to alleviate potential reverse causality. Third, the main continuous variables are winsorized at the 1% level to reduce the influence of extreme values.

Table 3 Robustness Test Results

Variable	Theil index	Lagged DIFI	Winsorized sample
DIFI / Lagged DIFI	-0.027***	-0.029***	-0.032***
	(0.008)	(0.009)	(0.007)
Control variables	Yes	Yes	Yes
Regional fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	310	279	310
R^2	0.548	0.536	0.569

Table 3 confirms that the negative coefficient on digital inclusive finance survives all three robustness exercises — substituting the Theil index as the dependent variable, lagging the key explanatory variable by one period, and winsorizing continuous variables at the 1% threshold. Notably, the lagged specification yields a coefficient of -0.029, suggesting that the income-equalizing influence of digital inclusive finance is not confined to the contemporaneous year but carries forward over time. Taken together, these checks reinforce the main finding that the development of digital inclusive finance exerts a durable compressive effect on the urban–rural income disparity.

4.3 Mechanism Analysis

To shed light on the pathways through which digital inclusive finance compresses the urban–rural income gap, this study examines financial accessibility and rural entrepreneurship as two candidate transmission channels. Table 4 presents the results of the mediation analysis. Models (1) and (2) separately assess how digital inclusive finance affects each mechanism variable, while Models (3) and (4) augment the baseline income-gap specification with the respective mechanism variable to gauge its mediating role.

Table 4 Mechanism Analysis Results

Variable	Financial accessibility	Rural entrepreneurship	Gap with FA	Gap with ENT
DIFI	0.046***	0.038***	-0.025***	-0.027***
	(0.011)	(0.010)	(0.008)	(0.008)
FA			-0.019**	
			(0.008)	
ENT				-0.022**
				(0.009)
Control variables	Yes	Yes	Yes	Yes

Variable	Financial accessibility	Rural entrepreneurship	Gap with FA	Gap with ENT
Regional fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	310	310	310	310
R^2	0.502	0.487	0.586	0.591

The estimation results indicate that digital inclusive finance exerts a statistically significant positive effect on both financial accessibility and rural entrepreneurship, confirming that expanded digital financial services broaden rural residents' access to formal credit and other financial resources while simultaneously creating a more enabling environment for self-employment and small-scale business formation. When either mechanism variable is introduced into the income-gap equation, its coefficient is negative and significant, corroborating that greater financial accessibility and heightened entrepreneurial activity each independently contribute to a reduction in the urban–rural income disparity. Importantly, the coefficient on digital inclusive finance declines in absolute value once the mechanism variable is included but retains its significance, consistent with partial rather than full mediation: the two channels account for a meaningful share of the total effect, yet a direct income-equalizing effect of digital finance remains.

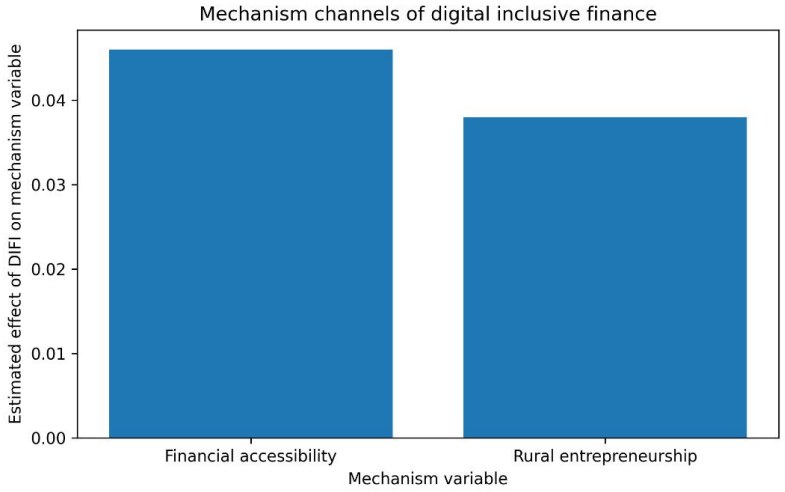

Figure 2 Mechanism Channels of Digital Inclusive Finance

Figure 2 presents the estimated magnitudes of the digital-inclusive-finance effects on the two mechanism variables. The effect channeled through financial accessibility is somewhat larger than that operating through rural entrepreneurship, suggesting that the primary transmission route runs through the broadening of financial service reach and improved resource access in rural areas. Rural residents can then leverage this enhanced financial foundation to fund entrepreneurial ventures, reinvest in productive assets, and ultimately grow their operating incomes.

4.4 Regional Heterogeneity

Given the substantial differences in economic conditions, digital infrastructure, and financial development across regions in China, this study further divides the sample into eastern, central, and western regions to examine regional heterogeneity. Table 5 reports the regional regression results.

Table 5 Regional Heterogeneity Analysis

Variable	Eastern region	Central region	Western region
DIFI	-0.021**	-0.039***	-0.028**
	(0.010)	(0.011)	(0.012)
Control variables	Yes	Yes	Yes
Regional fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	110	90	110
R^2	0.552	0.603	0.546

The region-specific estimates in Table 5 share a common negative sign, confirming that digital inclusive finance reduces the urban–rural income gap in all three zones, yet the magnitudes differ considerably. The central-region coefficient of -0.039 is the largest in absolute value and is significant at the 1% level, marking the central zone as the primary beneficiary of digital financial expansion. One plausible interpretation is that central provinces combine a

reasonably developed digital infrastructure — capable of supporting broad service delivery — with a still-substantial urban–rural income gap, creating fertile ground for digital finance to generate meaningful equalizing effects.

The eastern-region coefficient of -0.021, while statistically significant, is smaller in magnitude. The comparatively muted response is consistent with the notion that both digital and conventional financial markets in eastern provinces are already well established, leaving limited scope for additional digital financial services to shift the income distribution. In the western region the coefficient stands at -0.028, indicating a meaningful but somewhat attenuated effect. The weaker impact relative to the central region likely reflects the compounding constraints of underdeveloped digital infrastructure, lower average digital literacy among rural residents, and an industrial base that restricts the range of income-generating activities rural entrepreneurs can pursue even when financing becomes more accessible.

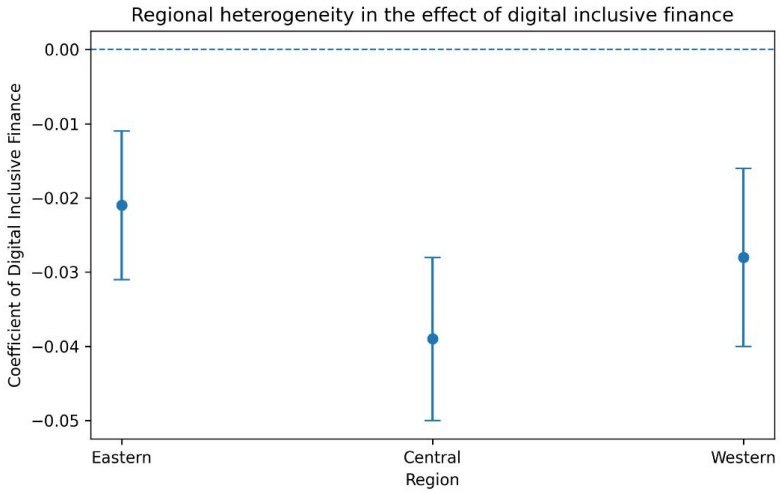

Figure 3 Regional Heterogeneity in the Effect of Digital Inclusive Finance

Figure 3 plots the point estimates and their confidence intervals by region, making the gradient across the three zones immediately apparent. The central region displays the steepest coefficient, reinforcing the view that it represents the most responsive context for digital financial policy. The pattern as a whole underscores that the income-equalizing potential of digital inclusive finance is contingent on local conditions: the same expansion of digital financial services can yield markedly different outcomes depending on a region's economic foundations, digital connectivity, institutional capacity for financial service delivery, and the digital capabilities of its rural population.

5 CONCLUSION

Drawing on regional panel data from China, this study constructs an econometric framework to assess how digital inclusive finance shapes the urban–rural income gap. The evidence consistently points to a significant income-equalizing effect: the proliferation of digital financial services helps overcome the geographic constraints of conventional finance, lowers the threshold for rural households to access credit and payment tools, and facilitates a more equitable allocation of financial resources across the rural–urban divide. Mechanism tests reveal that this gap-narrowing influence operates primarily through two channels — broadening financial accessibility and stimulating rural entrepreneurship — each of which partially mediates the total effect. The regional analysis further shows that the compressive effect is heterogeneous across China's three broad geographic zones, with the magnitude being most pronounced in the central region.

Several policy implications follow from these findings. To begin with, the rollout of digital financial services should be actively extended to rural communities and less-developed regions, with priority given to expanding credit access, streamlining payment infrastructure, and improving insurance and investment offerings for smallholder farmers and micro-entrepreneurs. Alongside supply-side expansion, sustained investment in rural digital infrastructure — broadband connectivity, smartphone penetration, and digital payment terminals — is essential to ensure that residents possess the technological foundations needed to benefit from these services. A parallel effort should focus on financial and digital literacy programs so that rural populations can use digital tools effectively and critically. Policy design should also seek synergies between digital financial services and the broader rural development agenda — including e-commerce ecosystems, agricultural supply chains, and rural tourism — so that improved capital access translates more directly into durable income growth. Finally, given the pronounced regional heterogeneity documented in this study, policy responses should be calibrated to local conditions rather than applied uniformly, with differentiated support packages tailored to the distinct development stages and institutional environments of eastern, central, and western regions.

Several avenues remain open for future inquiry. The present study relies on province-level panel data, which inevitably masks within-province variation; disaggregated county-level or household-level microdata would permit more precise identification of distributional effects across income strata and household types. Future work could also enrich the analytical framework by incorporating dimensions such as digital literacy, platform-economy penetration, and fintech

regulatory environments, which may condition how effectively digital finance translates into income gains for different groups. In addition, the current analysis treats the effect of digital inclusive finance as static and locally bounded; subsequent studies could employ spatial econometric models or dynamic panel methods to examine whether income-equalizing gains diffuse across regional boundaries over time through factor mobility and supply-chain linkages.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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