

Leveraging Inclusive Finance to Reduce Urban-Rural Income Inequality: Empirical Evidence

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Abstract: The transition from a planned to a market economy has brought about significant economic growth and improved living standards in China. However, it has also led to the widening of income inequality between urban and rural areas. As urbanization accelerated, disparities in access to financial services became more pronounced, exacerbating the income gap. This paper will explore the influence of inclusive finance on the urban-rural income inequality in 31 provinces from 2018 to 2022 in China through panel modeling, the variational coefficient method, and the Euclidean distance method. The results show that, firstly, inclusive finance narrows the urban-rural income inequality; secondly, several factors significantly contribute to narrowing this gap, including the number of employees in financial institutions, the density of business outlets, insurance density, and the development level of digital inclusive finance; thirdly, while enhanced economic development and an increased share of total imports and exports in GDP help reduce urban-rural income inequality. A higher proportion of public financial expenditure in GDP, and greater contributions from industrial and service sectors to economic growth widen it.

Keywords: inclusive financial development, urban-rural income inequality, panel model

1. Introduction

Financial development has become one of the critical determinants of economic growth and social fairness in the modern global economy. With the introduction of inclusive financial systems, which seek to provide financial services to a broader range of society, the financial landscape has experienced profound changes. This change has been especially pertinent when considering China, which has seen tremendous urbanization and economic expansion in recent years.

Following China's 1978 market transition, rapid economic growth elevated living standards. From 1978 to 2022, GDP grew from 367.870 billion yuan to 1,210,207.24 billion yuan, and per capita GDP rose from 384.74 yuan to 85,698.11 yuan. Disposable income per capita increased from 171.17 yuan to 36,883.28 yuan. However, this expansion intensified income inequality [1]. As reported by the National Bureau of Statistics, the Gini coefficient of disposable income per capita was 0.473 in 2004, 0.490 in 2009, and 0.467 in 2022, exceeding 0.4, the threshold set by the relevant United Nations organizations. This discrepancy is especially noticeable between rural and urban areas, where disparities in opportunity and financial services accessibility can deepen existing economic gaps. Economic growth and urbanization continue to diversify financial needs.

As a reaction to these difficulties, "inclusive finance" has become popular. A system that offers financial services to all social segments and groups in a complete, adequate, and economical manner

is known as inclusive finance, and it was first introduced by the UN in 2005 [2]. As inclusive finance has the potential to increase financial inclusion and decrease economic disparities, it is a topic of great interest that could help close the urban-rural income gap.

Therefore, this research aims to explore the effect of inclusive financial development on the urban-rural income inequality. The main contribution is that this study will use the Thiel index to measure urban-rural income inequality by province since less literature uses the Thiel index.

2. Literature review

Defined by the United Nations in 2005, inclusive finance promotes universal access to responsible, sustainable financial services. It has evolved into a comprehensive framework providing efficient, affordable solutions to all societal segments with financial needs [3]. Some research has created an index to measure various aspects of financial inclusion instead of depending just on one metric. Sarma and Pais [4] evaluated penetration, availability, and utility to calculate a financial inclusion index (Ifi). Amidzic et al. [5] pioneered a composite metric assessing utilization (loans and deposits), outreach (demographic and geographic penetration), and quality (cost of usage, dispute resolution, and transparency requirement). Zhou et al. [6] identified a threshold effect between inclusive finance and high-quality economic development. Specifically, economic advancement is dampened when the financial inclusion index falls below 0.358. Within 0.358 and 0.522, inclusive finance positively yet modestly contributes to economic quality. Once the index surpasses 0.522, however, it exerts a significantly stronger promotive effect on high-quality development.

Some research concluded that inclusive finance contributes to economic growth and shared prosperity [7-9]. However, these studies have differing views on the role of coverage breadth, usage depth, and digital transformation. Zhou et al. [10] concluded that usage depth had the most significant impact, coverage breadth the next greatest, and digital transformation the least. Zhang et al. [9] believed that they all influence shared prosperity. Different from these two conclusions, Ji et al. [11] empirically demonstrated that solely financial inclusion's coverage breadth exerts a significant mitigating effect, whereas usage depth and digitalization show statistically insignificant impacts.

Empirical evidence confirms that inclusive finance serves as a catalyst for rural revitalization and its associated industries [12-13]. Financial inclusion significantly impacts rural households' developmental consumption but not rural households' subsistence and hedonic consumption [14]. Li et al. [15] empirically established that the expansion of inclusive finance significantly accelerates rural human capital accumulation through broader service coverage.

Additionally, inclusive finance positively impacts rural incomes [16-17]. It can narrow the urban-rural income inequality [18]. Yu et al. [19] demonstrated that inclusive finance significantly narrows urban-rural disparities in wage, property, and transfer income, yet exerts minimal influence on net business income differentials. Conversely, Ge et al. [20] found that financial inclusion has positively affected rural people's income, particularly by boosting wage, business, and transfer incomes, while it has harmed property incomes.

Inclusive finance generates significant spatial spillover effects, boosting high-quality economic development locally and in adjacent regions with similar economic conditions [21-22]. Its efficacy varies regionally, exerting stronger impacts on farmer incomes in eastern/central China than in western areas due to disparities in economic development, infrastructure, and financial literacy [20]. Zhou et al. [10] found its economic contribution is stronger in economically advanced regions with high digital inclusion and technological adoption, but weaker in underdeveloped areas with limited financial/technological access. Conversely, Zhang et al. [13] demonstrated its effect on narrowing urban-rural income gaps intensifies in socioeconomically deprived regions.

3. Data and variables

3.1. Data collecting, cleaning, and matching

China's 31 provinces (excluding Hong Kong, Macau, and Taiwan) were selected as samples for analyzing Mobile Financial Inclusion Indicators and the Theil Index. Their diverse development levels, from advanced eastern to less developed central and western regions, exhibiting substantial variations in economic growth, urban-rural income gaps, and financial landscapes, enabling comprehensive analysis of inclusive finance's impact.

Relatively complete provincial data during 2018 to 2022 from the National Bureau of Statistics (NBS), China Statistical Yearbook, Peking University, and WIND database ensure reliability. These sources provide extensive indicators including population, deposits/loans, premium income, agricultural loans, GDP, land area, and the Theil Index.

Here, data that consist of the Inclusive Finance Index are cleaned based on the following steps: (1) standardizing raw data; (2) using the coefficient of variation method to determine the weights of indicators; (3) weighted to calculate the Financial Inclusion Index. Consequently, 155 Inclusive Finance Index remained between 2018-2022. Meanwhile, the Thiel Indexes are cleaned based on the following steps: (1) total income for towns is calculated using disposable income per capita for towns and the population of towns; (2) total rural income is calculated using disposable rural income per capita and rural population; (3) calculating the Thiel Index. Consequently, 155 observations are retained. The control variables are cleaned based on the following steps: (1) using fiscal expenditure and GDP data to calculate the government behavior, which represents the extent to which local governments are involved in economic activity; (2) using total exports and imports to calculate the degree of openness to the outside world; (3) using secondary GDP, tertiary GDP, and GDP to calculate the industrial structure. Consequently, 465 observations are retained.

Because the Inclusive Finance Index, the Thiel Index, and the control variables are separate, their provinces and years should be consistent. Here, two methods were adopted: matching by location and matching by year. Accordingly, 930 observations were matched.

3.2. Variables

3.2.1. Dependent variable

According to the previous content, the Thiel Index (Gap) is the dependent variable. This research employs the Thiel Index to quantify provincial-level urban-rural income disparities. Therefore, Gap_t is measured by the equation as follows:

$$Gap_t = \sum_{j=1}^2 \left(\frac{y_{jt}}{y_t} \right) \ln \left(\frac{y_{jt}}{y_t} / \frac{p_{jt}}{p_t} \right), \quad (1)$$

For urban ($j=1$) and rural ($j=2$) areas respectively, y_{jt} denotes annual aggregate income of each sector, while y_t represents combined urban-rural income in year t . Correspondingly, p_{jt} signifies sectoral population, and p_t the total regional population annually.

3.2.2. Independent variable

The Inclusive Finance Index (IFL) was considered independent variable for research aim. This paper will select ten specific evaluation indicators from three aspects of service availability, service

utilization and service quality, and use the calculation method of Sarma and Paris [4] to comprehensively analysis the level of inclusive financial development.

Table 1: Indicators for evaluating the level of inclusive financial development

Dimension	Norm	Calculation method
Availability of services	Financial outlet density (per 10,000 people)	Number of business outlets of financial institutions/total number of persons (units/ten thousand persons)
	Financial institution employees per 10,000 population	Number of employees in financial institutions/total number of employees (persons/ten thousand)
Availability of services	Financial outlets per 10,000 square kilometers	Number of business outlets of financial institutions/total area (units/ten thousand square kilometers)
	Financial employees per 10,000 square kilometers	Number of employees of financial institutions/total area (persons/ 10,000 km2)
Utilization of services	Deposits	Balance of deposits in financial institutions/GDP (%)
	Loans	Loan balance of financial institutions/GDP (%)
	Insurance depth	Premium income/GDP (%)
	insurance density	Premium income/total number of persons (yuan/person)
Quality of services	Agricultural loans	Balance of agriculture-related loans/balance of loans from financial institutions (%)
	The case for innovative Internet finance	Peking University Digital Inclusive Finance Index

This study employs the coefficient of variation method to assign indicator weights, and the financial inclusion index is calculated using the Euclidean distance method. Firstly, standardize the raw data:

$$X'_{ij} = \frac{X_{ij} - \min\{X_j\}}{\max\{X_j\} - \min\{X_j\}} \quad (2)$$

Where X_{ij} represents the actual value of indicator j in year i , $\min\{X_j\}$ and $\max\{X_j\}$ denote the minimum and maximum values in the j th indicator, $i=1,2,\dots,n$, and $j=1,2,\dots,k$.

The next step is to calculate the coefficient of variation for each evaluation indicator:

$$V_j = \frac{s_j}{\bar{A}_j} \quad (3)$$

For the j th evaluation indicator, V_j denotes its coefficient of variation, s_j is the standard deviation, and \bar{A}_j represents the mean value.

Each indicator's weight is derived from its coefficient of variation. Denoting the j th indicator's weight as W_j , the dimensionless value D_{ij} is computed as:

$$W_j = \frac{V_j}{\sum_{j=1}^k V_j} \quad (4)$$

$$D_{ij} = W_j * X'_{ij} \quad (5)$$

The final step is calculating the inclusive finance index using the Euclidean distance method:

$$IFL_i = 1 - \frac{\sqrt{(W_1 - D_{i1})^2 + (W_2 - D_{i2})^2 + \dots + (W_k - D_{ik})^2}}{\sqrt{(W_1)^2 + (W_2)^2 + \dots + (W_k)^2}} \quad (6)$$

3.2.3. Control variables

About control variables, existing studies have explored four critical factors influencing the urban-rural income gap. According to previous studies, this paper chooses Level of economic development (*GDP*) [23], government behavior (*GOV*) [18], degree of openness to the outside world (*OPE*) [24], and industrial structure (*IS*) [25].

4. Panel data model estimation and analysis

4.1. Panel data model

Drawing on empirical data and extant literature, this research employs panel modeling to analyze inclusive finance's influence on the urban-rural income disparity. The specification is formalized as:

$$Gap_{i,t} = \beta_1 IFL_{i,t} + \beta_2 GDP_{i,t} + \beta_3 GOV_{i,t} + \beta_4 OPE_{i,t} + \beta_5 IS_{i,t} + \beta_7 + \varepsilon_{i,t} \quad (7)$$

Where $Gap_{i,t}$ represents the urban-rural income disparity in *i*th province in period *t*, $IFL_{i,t}$ denotes the level of inclusive financial development in the *i*th province in period *t*, $GDP_{i,t}$ denotes GDP per capita of the *i*th province in period *t*, $GOV_{i,t}$ denotes the share of public fiscal expenditure in GDP in period *t* for the *i*th province, $OPE_{i,t}$ denotes the share of total imports and exports of the *i*th province in GDP in period *t*, $IS_{i,t}$ denotes the sum of the value added of the secondary industry and tertiary industry of the *i*th province in period *t* as a share of GDP, $\varepsilon_{i,t}$ represents random error term.

4.2. Statistical profiles and associations

Table 2 reports descriptive statistics for all variables. The variable *Gap* shows substantial dispersion (mean=0.073, SD=0.032) across observations, while *IFL* exhibits significant interprovincial variation (mean=0.134, SD=0.124). With a mean of 73871.088 and a standard deviation of 33262.669, *GDP* per capita has the most significant diversity among the studied regions, indicating substantial economic differences. The average and standard deviation of *GOV* are 0.282 and 0.194, respectively. The *IS* has a mean of 0.908 with very low variability (SD = 0.052), whereas the *OPE* has a mean of 0.239 and a standard deviation of 0.230.

Table 2: Descriptive statistics of all the variables

Name	Obs	Mean	SD	Min	Median	Max
<i>Gap</i>	155	0.073	0.032	0.017	0.069	0.158
<i>IFL</i>	155	0.134	0.124	0.037	0.094	0.688
<i>GDP</i>	155	73871.088	33262.669	31336.125	62900.000	1.90e+05
<i>GOV</i>	155	0.282	0.194	0.105	0.227	1.289
<i>OPE</i>	155	0.239	0.230	0.008	0.142	0.948
<i>IS</i>	155	0.908	0.052	0.747	0.914	0.998

Table 3 shows the correlations of all the variables. A lower urban-rural income gap is connected with better levels of inclusive financial development, economic growth, openness, and industrial structure, as indicated by the *Gap*'s negative correlations with *IFL* (-0.6080), *GDP* (-0.6854), *OPE* (-0.6984), and *IS* (-0.4134). On the other hand, there is a positive correlation between the *Gap* and *GOV* (0.5350), indicating that greater government participation in the economy is linked to a broader income disparity.

Table 3: Correlations of all the variables

	<i>Gap</i>	<i>IFL</i>	<i>GDP</i>	<i>GOV</i>	<i>OPE</i>	<i>IS</i>
<i>Gap</i>	1.0000					
<i>IFL</i>	-0.6080	1.0000				
<i>GDP</i>	-0.6854	0.7895	1.0000			
<i>GOV</i>	0.5350	-0.1825	-0.3702	1.0000		
<i>OPE</i>	-0.6984	0.8384	0.8675	-0.3980	1.0000	
<i>IS</i>	-0.4134	0.5955	0.7137	-0.2393	0.6426	1.0000

Table 4 reveals significantly higher weights for three spatial penetration metrics in inclusive finance: financial outlet density (0.1892), employee density (0.2282), and insurance density (0.1015) per 10,000 square kilometers. This indicates that financial institution employee density substantially impacts inclusive finance and reduces urban-rural income disparity. Secondly, outlet distribution enhances financial accessibility, particularly in rural/remote areas, narrowing income gaps. Additionally, insurance density reflects product penetration, providing risk protection to boost economic stability and equity. Internet finance weighting confirms digital inclusion's significant impact on urban-rural disparity.

Table 4: Weights and descriptive statistical values for each evaluation indicator

Dimension	Norm	Weight s	Ob s	Mean	SD	Min	Median	Max
Availability of services	Number of financial institution outlets per 10,000 population	0.0688	155	1.708	0.332	1.176	1.604	2.649
	Financial institution employees per 10,000 population	0.0828	155	30.503	10.316	16.776	27.829	72.661

Table 4: (continued).

Availability of services	Number of financial institution outlets per 10,000 square kilometers	0.1892	155	0.081	0.139	0.001	0.044	1.034
	Number of financial institution employees per 10,000 square kilometers	0.2282	155	1.779	3.671	0.008	0.699	20.185
	Deposits	0.0991	155	2.029	0.766	1.177	1.793	5.263
Utilization of services	Loans	0.0636	155	1.709	0.422	0.979	1.616	2.942
	Insurance depth	0.0587	155	0.040	0.012	0.018	0.038	0.087
	insurance density	0.1015	155	2958.524	1855.624	944.952	2575.096	12630.449
Quality of services	Agricultural loans	0.0475	155	0.264	0.105	0.022	0.295	0.440
	The case for innovative Internet finance	0.0607	155	343.464	44.266	263.124	342.042	460.691

4.3. Model regression results and analysis

The R-squared values represent the dependent variable's variance as a function of the independent factors. The R-squared values for the inside, between, and overall categories are 0.7362, 0.4034, and 0.4137, respectively. A moderately negative correlation (-0.5469) exists between the fixed effects and the independent variables.

The coefficients for *IFL*, *GDP*, *GOV*, and *IS* are statistically significant at 1% level. The negative coefficient for *IFL* (-0.2165) suggests that the higher financial inclusion development, the lower urban-rural income disparity. Other things being equal, a one-unit increase in inclusive finance can reduce the urban-rural income disparity by 0.2165 units.

Among control variables, GDP's coefficient (-3.14e-07) places China on the declining segment of the inverted U-curve (Kuznets hypothesis), indicating that higher economic development levels correlate with reduced income inequality. The coefficient of government behavior influence on the urban-rural income disparity is 0.0832 and is significant. This implies that increased government fiscal expenditure on towns and cities has widened the urban-rural income disparity. A lower income difference is linked to a more sophisticated industrial structure, as indicated by the positive coefficient for *IS* (0.5946). However, the coefficient of OPE is not statistically significant at 5% level, showing that trade openness exerts no significant influence on urban-rural income inequality.

Table 5: the influence of inclusive finance on the urban-rural income disparity

	(1) <i>Gap</i>
<i>IFL</i>	-0.217*** (0.0493)
<i>GDP</i>	-3.14e-07*** (5.36e-08)
<i>GOV</i>	0.0832*** (0.0141)
<i>OPE</i>	-0.0245 (0.0150)
<i>IS</i>	0.595*** (0.0774)
Constant	-0.433*** (0.0727)
Observations	155
Number of ids	31
R-squared	0.736

*** p<0.01, ** p<0.05, * p<0.1

5. Conclusions and discussions

5.1. Main findings

Inclusive finance is a key factor in urban-rural income disparities. This research leverages provincial panel data in China from 2018 to 2022 to empirically assess financial inclusion's impact on such disparities, yielding three key insights. First, Advancing inclusive finance significantly narrows the income gap. Second, Increasing financial institution staffing, service outlets, and insurance density enhances accessibility and service quality, promoting both growth and equity, while digital innovation reduces regional inequality. Third, while heightened economic development and trade openness alleviate income inequality, increased public expenditure share in GDP and industrial and service sectors' economic contributions inadvertently amplify the disparity.

5.2. Policy recommendations

Combined with actual situation of China's inclusive financial development and the results of this paper's researchers, it mainly puts forward policy recommendations from the following four aspects.

First, governments should increase their investment in and support inclusive finance and promote inclusive financial services. On the one hand, the government should increase financial investment in developing inclusive finance, including financial support, tax incentives, and operating subsidies, to encourage more financial institutions to participate actively in inclusive financial services. On the other hand, investment in building financial infrastructure in rural and remote areas, such as automated teller machines (ATMs), mobile banking, and electronic payment terminals, improves access to financial services.

Second, governments should increase staffing in financial institutions, expand service outlets, and enhance insurance penetration. This requires funding targeted financial education programs, particularly in rural and remote areas, to cultivate professionals, while attracting talent to underserved regions through fiscal incentives and welfare policies. Concurrently, infrastructure improvements in these areas must be prioritized to facilitate outlet establishment. Additionally, governments ought to

strengthen insurance education, innovate products tailored to rural and low-income populations, and promote uptake via policy incentives.

Third, the coverage of digital financial services should be expanded, and the digital financial literacy of the population should be enhanced. Governments should invest in Internet and mobile communications infrastructure in rural and remote areas to ensure residents can access digital financial services easily. At the same time, extensive financial literacy and digital skills training has been carried out, especially for rural residents, the elderly, and low-income groups, to help them acquire basic skills in using digital financial tools.

5.3. Limitations and further work

While relatively robust, the fixed effects model used in this study has limitations and may not be able to fully explain all of the unobserved heterogeneity or potential endogeneity between financial inclusion and income disparity. Moreover, this study is limited to a specific geographic context, and the results may not apply to other regions or countries with different economic structures, financial systems, and regulatory environments. Future research should aim to collect more comprehensive and detailed data over longer time horizons and in different regions to provide a more nuanced understanding of the relationship between inclusive financial development and income disparity.

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