The Impact of Digital Inclusive Finance on the Urban-Rural Income Gap in Anhui Province

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Abstract. Anhui Province, located in the core area of the Yangtze River Delta, has experienced rapid economic growth under the country's macroeconomic policies. However, it still faces problems such as unbalanced demand and development, and income disparity between urban and rural residents. Most domestic and international studies focus on the development and promotion of digital inclusive finance and the impact of traditional inclusive finance on the urban-rural income gap. Based on the digital inclusive finance index and related variables from 60 counties in Anhui Province during 2018-2022, this study sets up a panel regression model to explore and analyse these issues. The findings reveal the following: strengthening digital inclusive finance at the county level in Anhui Province can effectively reduce the income gap between urban and rural residents. From a regional perspective, the effects are more pronounced in the economically developed southern region of Anhui compared to the underdeveloped northern region of Anhui.

Keywords: Digital Inclusive Finance, Urban-Rural Income Gap, Threshold Effect.

1 Introduction

The 20th National Congress of the Communist Party of China highlighted that the main social contradiction in China has shifted to the tension between people's growing aspirations for a better life and the unbalanced and inadequate nature of development. Anhui Province, at the core of the Yangtze River Delta region, has experienced accelerated economic growth under national macroeconomic policies, with continuous improvements in GDP and public welfare. However, challenges such as regional development disparities and urban-rural income inequality persist and have yet to be effectively addressed.

The development and promotion of digital inclusive finance not only helps to reduce regional economic disparities and the income gap between urban and rural populations, but also promotes the broader development of inclusive finance [1]. This facilitates the optimisation and efficient allocation of financial resources. As an extension

S. M. Ghadiri et al. (eds.), *Proceedings of the 2025 4th International Conference on Engineering Management and Information Science (EMIS 2025)*, Advances in Computer Science Research 121,
https://doi.org/10.2991/978-94-6463-736-6_30

of traditional inclusive finance in the digital age, digital inclusive finance provides rural populations with access to convenient and efficient financial services, enabling them to explore new entrepreneurial opportunities and increase their income levels [2]. In addition, digital inclusive finance plays a key role in reducing income inequality between urban and rural residents [3]. In the context of China's ongoing economic reform and social development, an in-depth analysis of the role of digital inclusive finance in addressing income inequality in Anhui Province offers valuable academic and practical insights [4].

2 Related Work

Digital inclusive finance is an evolution of traditional inclusive finance, and different influencing factors have varying degrees of impact on its development. Existing research includes analyses of specific factors as well as multi-variable studies.

Kaidi (2020) noted that in the early stages of economic and financial development, poor people often face challenges in bearing the costs of financial intermediation due to constraints such as income levels, asset ownership and credit constraints [5]. Appleyard (2011) argued that within a region, inclusive finance can be promoted through appropriate resource allocation [6]. Koku (2015) suggested that governments in Asia can create an inclusive environment through various channels to enable disadvantaged groups to better access financial resources [7]. Fuchs and Skrzypacz (2015) highlighted the indispensable role of government intervention in asymmetric information scenarios [8].

In an empirical study, Xu Xiaohong and Dong Yuming (2022) concluded that digital inclusive finance exerts a significant positive spatial agglomeration effect on urban-rural income disparities in the Yangtze River Delta region [9]. They also found that the third wave of urbanisation effectively reduces income disparities between urban and rural residents and promotes income convergence across regions. Using a fixed-effects model and a panel threshold model, Yu Zizhe (2022) shows that digital inclusive finance has successfully reduced income inequality in Shandong Province [10]. However, this effect diminishes over time and shows a tendency to reverse. Ma Yan (2023) found a notable negative effect of the overall development of inclusive finance on rural income inequality, especially in western regions characterised by significant income disparities, low urbanisation and limited education [11]. Hu Gaoyang (2023) constructed and validated a theoretical framework for the development of digital inclusive finance in China [12]. Using a threshold model, Hu found that digital inclusive finance effectively mitigates financing barriers caused by financial exclusion, but that income thresholds persist [13]. Once the disposable income level of rural households exceeds a critical value, digital inclusive finance shows stronger convergence effects in promoting economic growth between urban and rural residents [14][15].

Synthesising national and international research, studies on the relationship between inclusive finance and urban-rural income disparities are relatively abundant, highlighting the central role of inclusive finance in social development. However, analyses focusing on the impact of inclusive finance at the regional level, particularly

through data covering entire provincial districts, remain limited. Moreover, much of the existing research is conducted at the national level, neglecting the significant regional disparities across China's provinces. As a result, such studies often fail to fully capture the nuanced realities of specific regions. In terms of content, the existing literature focuses mainly on financial depth, overlooking the indirect effects of inclusive finance on urban-rural income disparities. The inclusion of financial breadth in research on this topic is therefore particularly critical.

3 Research Design

This study focuses on 60 county-level regions in Anhui Province from 2018 to 2022, using the Digital Inclusive Finance Index as the dependent variable for empirical analysis. Relevant control variables were selected based on domestic and international research findings. Panel data was employed to examine the relationship between the development of digital inclusive finance in Anhui Province and the income disparity between urban and rural residents. The study aims to enhance theoretical research on inclusive finance while providing empirical comparisons for the poverty reduction effects of inclusive finance in Anhui Province and across China.

3.1 Selection of Variables

Dependent Variable. The Theil Index (Theil) is used to measure income disparity among residents across different regions. A higher Theil Index indicates greater income inequality within a region.

Independent Variable. Digital Inclusive Finance (DIFI): The level of digital inclusive finance development is measured using the Digital Inclusive Finance Index published by Peking University.

Control Variables. Economic Development Level (RGDP): The economic development level of a region significantly impacts the income disparity between urban and rural areas. This study uses per capita regional gross domestic product (GDP) as a proxy for economic development level, Fiscal Expenditure (GOV): With the acceleration of urbanisation, government fiscal spending is unevenly distributed between urban and rural areas, generally favouring urban regions. Fiscal expenditure is measured as the ratio of government spending to regional GDP, Industrial Structure (IS): The structure of regional industries also influences the income disparity between urban and rural residents. In this study, industrial structure is measured by the ratio of the added value of secondary and tertiary industries to regional GDP, Urbanisation Level (UR): Urbanisation promotes the free migration of labour, incentivises rural residents to improve labour productivity, and increases rural incomes, thereby narrowing the urban-rural income gap. Urbanisation level is measured as the ratio of the urban population to the total population.

These variables are integrated into a panel dataset, with data obtained from the Anhui Statistical Yearbook and processed using SPSS.

3.2 Data Sources

The study employs the Peking University Digital Inclusive Finance Index as the primary research data, alongside supplementary data from the Anhui Statistical Yearbook and official government reports. The Theil Index is used as the measure of income disparity between urban and rural residents. A dataset of 300 observations from 60 county-level regions in Anhui Province over the 2018–2022 period was compiled. Some data underwent logarithmic transformations to ensure robustness.

3.3 Model Design

Based on the summarised relationship between traditional inclusive finance development and urban-rural income disparity, this study hypothesises several testable linear relationships. After log-transforming the variables, the following research model is proposed:

$$Theil = \beta_0 + \beta_1 DIFI + \beta_2 UR + \beta_3 IS + \beta_4 GOV + \beta_5 RGDP + \varepsilon \quad (1)$$

Among them: Theil represents the income disparity index, DIFI quantifies the level of digital inclusive finance development, RGDP evaluates per capita GDP at the county level, GOV measures the ratio of government expenditure to GDP, UR captures the level of urbanisation, IS is the share of secondary and tertiary industries in GDP, β_1, β_2, …, β_5 are the regression coefficients that measure the effect of each explanatory variable, following a normal distribution.

4 Empirical Results Analysis

4.1 Descriptive Statistics of Variables

In order to examine the impact of digital inclusive finance development on the income disparity between urban and rural residents in Anhui Province, this study selects six variables. Among them, Theil is the dependent variable, Digital Inclusive Finance Development Level (DIFI) is the independent variable, and Economic Development Level (RGDP), Urbanization Rate (UR), Industrial Structure (IS), and Fiscal Expenditure (GOV) serve as the control variables in the empirical analysis.

Table 1. Descriptive Statistics

	N	Minimum	Maximum	Mean	Standard Deviation
thile	300	0.0151	0.1097	0.0592	0.0205
DIFI	300	92.0600	129.9000	115.4900	6.4100

GOV	300	0.0800	0.5800	0.2000	0.0800
IS	300	0.6600	0.9700	0.8600	0.0600
RGDP	300	9190	134777	51690.10	25226.43
UR	300	0.1000	0.77000	0.3300	0.1300
Number of finite cases (in rows)	300				

From the table 1, it can be observed that the average Theil index is 0.0592, with a minimum of 0.0151 and a maximum of 0.1097, indicating that the income disparity between urban and rural residents in Anhui Province has not yet been fundamentally addressed. Therefore, it is crucial to effectively alleviate the income imbalance between urban and rural residents in the province. The average DIFI value is 115.49, with a minimum of 92.06 and a maximum of 129.90, suggesting that the overall development of digital inclusive finance in the province is continuously improving. However, due to regional constraints, significant disparities remain between the development levels in northern and southern Anhui. The average UR value is 0.33, with a minimum of 0.10 and a maximum of 0.77, reflecting the rapid urbanization process in Anhui during this period, indicating a steady increase in the migration of the population to urban areas. The average IS value is 0.86, with a minimum of 0.66 and a maximum of 0.97, indicating that the industrial structure in Anhui has generally maintained a high level during this period, with regional variations influenced by the specific environments of southern and northern Anhui. The average GOV value is 0.20, with a minimum of 0.08 and a maximum of 0.58. Despite increased national support for economic development, the resources are more concentrated in non-agricultural sectors, while agriculture receives relatively fewer resources, which may exacerbate the income gap between urban and rural residents. The average RGDP value is 51690.10, with a minimum of 9190 and a maximum of 134777, indicating that the livelihood in Anhui has significantly improved during this period. However, the gap between the rich and poor remains large, and economic development is still uneven across different regions, with the economic development of counties in the Wanjiang Economic Belt being significantly higher than that of the mountainous areas in southern Anhui and the northern and poorer regions.

4.2 Correlation Analysis

After adding all variables to the model, the natural logarithms of each variable were taken, and a correlation analysis was conducted.

Table 2. Correlation Analysis

	theil	(DIFI)	(GOV)	(IS)	(UR)	(RGDP)
theil	1					
(DIFI)	-0.389**	1				
(GOV)	0.461**	-0.397**	1			
(IS)	-0.396**	0.536**	-0.501**	1		

(UR)	-0.345**	0.587**	-0.403**	0.535**	1	
(RGDP)	-0.595**	0.768**	-0.609**	0.691**	0.742**	1

Note: *Significance levels: * p < 0.1, ** p < 0.05, *** p < 0.01.

From the table 2, it can be seen that Theil shows significant correlations with the five variables (DIFI, GOV, IS, UR, and RGDP). Specifically, Theil has a correlation coefficient of -0.389 with the Digital Inclusive Finance Index (DIFI), which is significant at the 0.01 level, indicating a significant negative correlation between Theil and DIFI. The correlation between Theil and fiscal expenditure (GOV) is 0.461, also significant at the 0.01 level, suggesting a significant positive correlation. Theil's correlation with industrial structure (IS) is -0.396, also significant at the 0.01 level, indicating a significant negative relationship. Theil has a correlation coefficient of -0.345 with urbanization level (UR), which is significant at the 0.01 level, showing a negative correlation. Finally, Theil and economic development level (RGDP) have a correlation coefficient of -0.595, which is significant at the 0.01 level, indicating a significant negative relationship.

4.3 Regression Results Analysis

In this study, one explanatory variable and four control variables are selected. To verify the sensitivity of the results to each variable, linear regression is used. The significance of the Theil index is analyzed; if removing a variable results in significance (p-value less than 0.05 or 0.1), it indicates that the variable has an impact on the dependent variable.

Table 3. Regression Analysis

Model	Unstandardized Coefficients		Standardized Coefficients	t	Significance
	B	Standard Error	Beta		
(Constant)	0.143	0.026		5.401	0.000
Digital Inclusive Finance Index (DIFI)	-0.001	0.000	-0.167	-2.572	0.011
Fiscal Expenditure (GOV)	0.080	0.015	0.314	5.342	0.000
Industrial Structure (IS)	-0.041	0.023	-0.114	-1.747	0.082
Urbanization Level (UR)	-0.010	0.011	-0.060	-.9130	0.036
a. Dependent Variable: Theil					

From the table 3, it can be observed that after excluding the insignificant variable of economic development level (RGDP), the Digital Inclusive Finance Index (DIFI), fiscal expenditure (GOV), urbanization level (UR), and industrial structure (IS) are used as independent variables. The analysis shows that when a variable is excluded and it exhibits significance (p-value less than 0.05 or 0.1), the results are as follows:

The coefficient for the Digital Inclusive Finance Index (DIFI) is -0.001, with a t-value of -2.572 and a significance level of 0.011, indicating a significant negative correlation between the Digital Inclusive Finance Index and the dependent variable.

The coefficient for fiscal expenditure (GOV3) is 0.080, with a t-value of 5.342 and a significance level of less than 0.001, suggesting a significant positive impact of fiscal expenditure on the dependent variable. The coefficient for industrial structure (IS) is -0.041, with a t-value of -1.747 and a significance level of 0.082, showing a significant negative correlation between industrial structure and the dependent variable. The coefficient for urbanization level (UR) is -0.010, with a t-value of -0.913 and a significance level of 0.036, indicating a negative relationship between urbanization level and the dependent variable, though this relationship is not statistically significant.

In conclusion, fiscal expenditure has the most significant impact on the dependent variable, while the Digital Inclusive Finance Index, industrial structure, and urbanization level show significant effects on the dependent variable to varying degrees.

Through correlation analysis, all variables are correlated with the income disparity between urban and rural residents. The correlation between the Theil index in Anhui Province and the Digital Inclusive Finance Index (DIFI) is -0.389, indicating that the development of inclusive finance will gradually reduce the income disparity between farmers in Anhui Province. The statistical data show that DIFI has a significance level of $P<0.01$. Empirical analysis reveals a clear positive correlation between Digital Inclusive Finance and the income gap among farmers in Anhui, and the development of inclusive finance progressively narrows the gap.

The correlation study between Anhui Province's industrial structure (IS) and the Theil index (Theil) shows that the Theil index decreases as the share of the secondary and tertiary industries increases, suggesting that the economic disparity in the province is diminishing. Optimizing the industrial structure can promote the transformation of the secondary and tertiary industries, accelerate development, and improve rural employment opportunities. This, in turn, increases labor efficiency in rural areas and leads to higher income for farmers, thus more effectively reducing the income gap between urban and rural areas.

Through empirical analysis and based on the regression results, it can be seen that the correlation coefficient between fiscal expenditure (GOV) and the Theil index (Theil) is 0.461, indicating that an increase in government expenditure has a significant positive impact on reducing the income disparity between urban and rural residents. As the government continues to increase investment in rural areas, the income gap between urban and rural areas will gradually narrow. From the empirical analysis, it is evident that the government's financial support for rural areas is greater than for cities. Therefore, the government can provide direct aid to rural areas through poverty alleviation methods such as transfer payments, which will further improve the quality of life in rural areas. The relatively low correlation coefficient is primarily due to the theoretical assumption that an increase in government expenditure positively impacts the income disparity between urban and rural residents, thus creating a positive relationship between income distribution in urban areas.

Through empirical analysis and based on the regression results, the correlation coefficient between urbanization rate (UR) and the Theil index (Theil) is -0.345, which indicates that the increase in urbanization level has a significant negative impact on reducing the income disparity between urban and rural residents. As urbanization accelerates, large numbers of people from rural and remote areas are moving to cities.

This process is driven by local economic policies, which have prompted many rural residents to migrate to urban areas in search of higher incomes. Consequently, farmers have gained more opportunities for work and development, resulting in higher income levels and an improved quality of life. Additionally, the establishment of more enterprises in rural areas has increased the flow of funds into these regions, generating more job opportunities and further reducing the income gap between urban and rural residents.

Through empirical analysis and based on the regression results, it is evident that the correlation coefficient between economic development level (RGDP) and the Theil index (Theil) is -0.595, showing that the degree of economic development in the region also has a significant negative impact on the income disparity between urban and rural residents. As Anhui Province continues its rapid economic development, the income gap between rural and urban residents will gradually widen. This is because the level of economic development and the income disparity between urban and rural residents are interrelated. Although farmers' incomes have risen in line with economic development, in recent years, Anhui has overly focused on urban development and continuously built various metropolitan economic zones, somewhat neglecting the development of the rural economy. This has resulted in an imbalance in urban-rural development, leading to a negative relationship between economic development in Anhui and the income gap between urban and rural residents.

5 Conclusions and Recommendations

5.1 Research Conclusions

This study empirically analyzed the heterogeneous effects of digital inclusive finance across different regions in China using data from 60 counties in Anhui Province (2018-2022) and relevant statistics from the Anhui Statistical Yearbook. The key conclusions drawn from the empirical analysis are as follows:

1. The development of digital inclusive finance in Anhui Province effectively reduces the income gap between urban and rural areas.
2. The Theil index analysis reveals that the Theil index is correlated with the income disparity between urban and rural residents.
3. A comparative analysis of the southern and northern regions of Anhui Province indicates a larger income gap in the southern regions (Wan Nan) and a relatively smaller gap in the northern regions (Wan Bei).
4. The empirical analysis using four control variables demonstrates high significance in relation to the dependent variable (Theil index).

In summary, digital inclusive finance plays an effective role in narrowing the income gap between urban and rural areas.

5.2 Policy Recommendations

Coordinated Development of Inclusive Financial Services. For economically developed regions in Anhui Province, the government should actively adopt advanced financial technologies to continuously optimize financial services, broadening their scope and depth. Additionally, enhancing financial coverage is essential to ensure that financial services reach every corner of society, especially underserved populations that are traditionally difficult to access by conventional financial systems. In economically poorer regions, it is important to explore new methods and strategies, such as using digital technologies to precisely identify impoverished groups and tailor financial products and services. Financial instruments, such as agricultural loans and insurance, should be introduced to reduce the income gap between rural and urban areas and support rural economic development, thereby increasing farmers' incomes.

Building an Inclusive Financial Ecosystem. To address the limitations of digital inclusive finance in meeting people's needs, it is necessary to effectively integrate various stakeholders, with the provincial government playing a leading role. Strengthening collaboration between various parties will foster a conducive social environment that enhances public services in digital inclusive finance. As digital technologies integrate with financial services, the traditional two-way connections between financial institutions and users will be disrupted. An ecosystem composed of service providers, government regulators, technology companies, and third-party service agencies should be established to optimize and improve the industrial structure.

Optimizing the Inclusive Financial Regulatory System. Anhui Province should establish a comprehensive, systematic, and coordinated regulatory framework to ensure effective supervision of the financial system at all levels. The use of digital technologies, such as big data and artificial intelligence, should be leveraged to build risk warning mechanisms. Volunteer programs, particularly targeting university students, should be launched to spread financial literacy and knowledge of financial laws and regulations in rural areas. This will help improve the financial literacy of local residents and create a safe, transparent, and efficient digital inclusive financial environment. By providing reliable financial services to more people, the income gap between urban and rural residents in Anhui Province can be reduced.

Acknowledgement

This study was supported by 2022 Anhui Province Social Science Innovation and Development Research Project: Mechanism and Path Research on Inclusive Finance Assisting Rural Revitalization in Anhui Province (2022CX199), the General projects of the 2022 Excellent Youth Talent Support Program in universities (gxyq2022131), and Provincial Quality Engineering Project in 2021 - Xindao Cloud Financial Industry College, Anhui Xinhua University (2021cyxy038).

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