Regional Economic Growth and Poverty Reduction Effects: Evidence from Digital Inclusive Finance in China

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Abstract: Based on Peking University Digital Inclusive Financing Index from 2011 to 2019 and provincial panel data, this paper constructs a measurement system to analyze the impact of digital Inclusive Financing development on China's economic growth. Then, combined with panel fixed effect model and threshold effect model, the impact of digital Inclusive Financing development on China's economic poverty alleviation is calculated. The results show that China can achieve regional poverty reduction through the growth of digital Inclusive Financing, and there is a nonlinear relationship between them. After the test of robustness and endogeneity, this conclusion is still valid. In addition, the impact of urbanization rate on digital inclusive financial growth and regional poverty reduction has passed single threshold test and double threshold test, which shows that the impact mechanism of urbanization rate in China varies from region to region. Specifically, East China shows a stronger poverty alleviation effect than Northeast China and Central and Western China. Finally, the paper puts forward practical policy suggestions to maximize the role of inclusive digital finance in poverty eradication.

Keywords: Digital inclusive finance; poverty reduction effects; panel fixed effects models; threshold effects

1. Introduction

Inclusive Financing refers to providing a perfect and effective financial service system for all sectors of society. Its purpose is to ensure that all people have equal access to and benefit from financial services. On the other hand, digital inclusion involves a wide range of economic activities and the use of digital technology to promote inclusive financial development. Since the introduction of the concept of Inclusive Financing in 2005, it has brought about significant improvements in financial service technology, products and systems. These improvements not only improve efficiency and quality, but also promote the innovation and comprehensive development of financial services. In 2015, document 1 of the central government emphasized the importance of strengthening inclusive digital finance. It is emphasized that the development of inclusive digital finance is very important to narrow regional economic differences, benefit people's livelihood and promote the growth of small and medium-sized enterprises. This will help China achieve high-quality regional economic development. Number 14. The five-year plan marks the transition period for the deepening development of inclusive digital finance in

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China. The plan gives priority to promoting inclusive digital finance, aiming at promoting inclusive sharing and common prosperity. This strategy is a five-year plan based on the development requirements of the first 13 years, aiming at promoting the deep and standardized growth of inclusive digital finance. Although the concept of "digital economy" was originally put forward by Canadian scholar Don Tapscott, it has been widely concerned and studied by scholars all over the world. In March 2017, China first proposed the concept of a "digital economy" and emphasized the need to develop digital infrastructure, advance digital technology, nurture new digital industry chains, and stimulate the growth of the digital economy.

Research into the economic effects of financial inclusion began in 2007, when Beck scholars proposed the concept and used financial institution outlets and ATMs as indicators[1]. Sarma later developed an inclusive finance index to measure the impact of inclusive finance across three dimensions: geographical reach, usage effectiveness, and product exposure[2]. Chakravarty further expanded on this by combining these dimensions into different measures to assess the contribution of inclusive finance in each area[3]. In China, inclusive finance is seen as a catalyst for regional economic growth, and scholars such as Chen Sanmao have used the inclusive financial development index and economic growth effect to measure the level of inclusive financial development in different provinces from 2007 to 2012[4].

Nevertheless, certain academics have contended that the advancement of inclusive finance may impede regional economic growth, indicating a non-linear correlation between inclusive finance and economic growth. Zhang Yu et al. (2023) formulated a non-equilibrium dynamic panel model, focusing on the magnitude and effectiveness of financial development and other perspectives, to examine the influence of digital inclusive finance on China's distribution industry. Their findings revealed a non-linear relationship, characterized by an inverted U-shaped pattern, between digital inclusive finance and the distribution industry[5]. Utilizing a threshold panel model, Zheng Haiyong (2020) posited that there exists a non-linear association between digital financial development and the stimulus of residential consumption. Additionally, the stimulation effect of digital inclusive finance on various consumer groups strengthens as the level of economic development rises[6]. In a study conducted by Zhou Bin et al. (2017), it was observed that inclusive finance's development has beneficial effects on regional urbanization and trade imports and exports[7]. However, it has detrimental impacts on residents' quality of life and levels of consumption in the long run. Xiang Yubing (2022) employed a threshold model with dynamic effects to investigate the relationship between the development of digital inclusive finance and residents' consumption. The findings also indicated a pronounced non-linear connection between the two variables[8]. This article takes into account the actual situation of digital inclusive finance development in China and constructs a measurement system suitable for assessing its poverty reduction effect. Furthermore, it evaluates the development of digital inclusive finance and its impact on 31 provinces and cities in inland China from 2011 to 2019 using the Digital Inclusive Finance Index from Peking University[9][10]. These evaluations serve as a solid foundation for future research on the economic impact of digital inclusive finance, affording substantial support for exploring the poverty reduction effect of digital inclusive finance. Ultimately, feasible policy recommendations are proposed based on the measurement results.

2. Data sources and modeling system

2.1. Data sources

The study took into account the accuracy, dependability, and availability of the research data. The statistical information used in this paper is derived from the Statistical Yearbook of China, the Provincial and Municipal Statistical Yearbook, and the Digital Inclusive Finance Center of Peking University. The data covers the period from 2011 to 2019. Firstly, representative metrics were chosen by considering the comprehensiveness and inclusiveness of digital financial services, as well as their significance and distinguishing features. Secondly, a measurement system was established to allow for both horizontal and vertical comparisons when selecting indicators. Lastly, the constructed measurement system for digital inclusive finance should accurately reflect the diverse characteristics of the financial market. The selected indicators should encompass information related to digital infrastructure development, digitalization in daily life and applications, innovative digital practices, and the progression and evolution of digitalization. This comprehensive approach aims to thoroughly evaluate the impact of digital inclusive financing on local economic growth. Table 1 provides a breakdown of the specific variables used in the analysis.

Table 1 Research experimental variables

Type	Variables	Definition	Indicator Description
Explained variable	lnTheil	The logarithm of the Theil indicator	Regional Disparities in Population Income and Economic development levels
Core explanatory variables	lnIFI	The logarithm of the DFI index	Level of integrated regional digital inclusion development
	lnCov	The logarithm of the Cov Index	Breadth of digital financial inclusion coverage
	lnUse	Logarithm of the Use in the Breadth dex	Depth of use of digital inclusive finance
	lnDig	The logarithm of the Dig Index	Digitization of Digital Inclusive Finance
	lnEdl	The logarithm of the Edl index	GDP per capita
Control variables	lnFin	The logarithm of the financial level	The ratio of fiscal expenditure to GDP by region
	lnIs	The logarithm of the industrial structure index	The ratio of value addition to GDP in the secondary and tertiary sectors by region
Threshold variable	lnUr	The logarithm of the urbanisation rate	The ratio of the number of permanent urban residents to the total population by region

2.2. Model construction

We posit that there exists a enduring connection between the level of advancement in digital inclusive finance and the disparity between urban and rural areas. Additionally, there might be a non-linear correlation between the progress in digital inclusive finance and the effectiveness of poverty reduction at regional level. Consequently, we incorporate the squared value of the digital inclusive finance index (lnIFI2) as a benchmark for examining non-linear patterns in order to construct the panel econometric model presented in equation (1).

$$\ln Theil_{k,t} = \alpha + \beta_1 \ln IFI_{k,t}^2 + \beta_2 \ln IFI_{k,t} + \beta_3 \ln Control_{k,t} + \sum Year_{k,t} + \sum ID_{k,t} + \varepsilon_{k,t} \quad (1)$$

where α denotes the intercept term $\ln Theil_{k,t}$ is the explanatory variable of this paper, which represents the Thayer index of domestic province k in period t; $\ln IFI_{k,t}$ is the core explanatory variable of this paper, which represents the comprehensive digital financial inclusion index of province k in period t; $\ln Control_{k,t}$ refers to the control variable, which represents the indicator with influence on regional economic development; ε_{kt} denotes the error disturbance term; $\beta_i (i = 1,2,\cdots,n)$ denotes the coefficient term corresponding to the core explanatory variable.

Currently, there are significant disparities in the academic community regarding the correlation between the advancement of financially inclusive digital services and variations in economic growth across different regions. However, numerous scholars are increasingly embracing the notion that a threshold effect does indeed exist between the two factors. Based on this premise, this article proceeds to establish a model that explores whether a threshold effect exists between the development of digital inclusive finance and its impact on poverty reduction. The model incorporates the urbanization rate (Ur) as the threshold variable, and equations (2) and (3) are employed to formulate this model.

Single threshold model:

$$\ln Theil_{k,t} = \alpha + \beta_1 \ln IFI_{k,t} L(M_{k,t} \le \delta) + \beta_2 \ln IFI_{k,t} L(M_{k,t} > \delta) + \beta_3 \ln Control_{k,t} + \varepsilon_{k,t} \quad (2)$$

Double threshold model:

$$\begin{aligned} \ln Theil_{k,t} = \alpha &+ \beta_1 \ln IFI_{k,t} L(M_{k,t} \le \delta_1) + \beta_2 \ln IFI_{k,t} L(\delta_1 < M_{k,t} \le \delta_2) \\ &+ \beta_3 \ln IFI_{k,t} L(M_{k,t} > \delta_2) + \beta_4 \ln Control_{k,t} + \varepsilon_{k,t} \end{aligned} \quad (3)$$

where M_{kt} denotes the threshold variable, i.e. it refers to the urbanization rate indicator L denotes the determination function, where L=1 when the threshold variable meets the threshold requirement and L=0 otherwise; $\delta_k (k = 1,2)$ denotes the threshold value; $\beta_k (k = 1,2,3,4)$ denotes the coefficient to be estimated.

3. Empirical analysis

3.1. Baseline regression results

Based on the Houseman test, it is evident that the chi-square statistic is equal to 62.62, which corresponds to a sample value lower than 0.05. This demonstrates the selection of the panel fixed effect model to examine the impact of digital inclusive finance development on poverty alleviation. Moreover, the model test of this panel fixed effect model is superior to that of the panel random effect model. The estimated outcomes of the digital financial inclusion development's effect on poverty reduction are presented in Table 2.

Table 2 Regression results for the developmental effects of digital inclusive finance

	(1)	(2)	(3)	(4)		
	OLS estimation results			Subdimensional regression results		
$lnIFI^2$	-0.054**	-0.054***	-0.046**			
	(0.014)	(0.019)	(0.011)			
lnIFI	0.342**	0.373***	0.376***			
	(0.164)	(0.132)	(0.126)			
lnCov				0.181***		
				(0.013)		
lnUse					0.097**	
					(0.026)	
lnDig						0.072**
						(0.027)
lnEdl		0.097**	0.083**	0.019**	0.014**	0.069**
		(0.099)	(0.088)	(0.043)	(0.107)	(0.121)
lnFin			0.0873**	0.081**	0.086*	0.040*
			(0.038)	(0.048)	(0.042)	(0.019)
lnIs			0.735***	0.952***	0.896***	0.655***
			(0.103)	(0.181)	(0.177)	(0.139)
_cons	-2.266***	6.659***	5.342***	3.197***	2.106***	4.366***
	(0.255)	(1.163)	(1.066)	(1.455)	(0.188)	(1.152)
Year	Yes	Yes	Yes	Yes	Yes	Yes
ID	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.816	0.877	0.908	0.913	0.894	0.854
adj. R^2	0.809	0.869	0.898	0.905	0.884	0.850

Standard errors in parentheses $^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

In the results of the model test (1), the regression coefficient of the primary explanatory variable (lnIFI) was 0.342, with statistical significance at the 5% threshold. This suggests that the expansion of digital inclusive finance could potentially contribute to reducing regional poverty.

In the subsequent analysis (2), additional control variables measuring residents' quality of life were included in the model estimation. The regression results revealed a coefficient of 0.373 for digital financial inclusion, surpassing the 1% significance test.

Building upon these findings (3), all control variables were incorporated into the model, revealing a regression coefficient of 0.376 for digital FPS, which exhibited significance at the 1% level. This demonstrates that the integrated development of digital finance plays a crucial role in narrowing the regional economic divide and has a significant impact on poverty alleviation.

Furthermore (4), the digital Pratt & Whitney financial index (lnIFI) was substituted with coverage (lnCov), depth (lnUse), and digital degree (lnDig) to examine the development effects of digital Pratt & Whitney finance from various perspectives. The results indicated a regression coefficient of 0.376 for coverage, use depth, and digital degree, which held statistical significance at the 1% level. These results suggest that digital inclusive finance has a substantial effect on reducing regional disparities and poverty, as indicated by the positive coefficients and significant tests for coverage, use depth, and digitalization level.

Moreover, the findings presented in Table 2 indicate that the subordinate element of the lnIFI2, which pertains to digital financial inclusion development, exhibits a detrimental regression

coefficient value in the outcomes (1) - (3), thereby confirming the initial hypothesis. Therefore, it can be inferred that there exists a non-linear association between the effects of enhancing digital financial inclusion and alleviating regional poverty. This non-linear relationship will now be explored in greater detail.

3.2. Heterogeneous results of regional poverty reduction

To further explore the regional poverty reduction effects of digital inclusive finance development in China, this paper divides the 31 regions of China into four regions, namely the eastern, central, northeastern, and western regions, and explores the poverty reduction effects of each region in conjunction with equation (1). The specific results are shown in Table 3 below.

Table 3 Estimated results of regional poverty reduction effects

	Eastern lnTheil	Northeast lnTheil	Central lnTheil	Western lnTheil
$lnIFI^2$	-0.144** (0.054)	-0.076** (0.029)	-0.093** (0.074)	-0.075*** (0.024)
lnIFI	0.478** (0.395)	0.511** (0.411)	0.451** (0.395)	0.766*** (0.512)
lnEdl	0.254** (0.312)	0.212* (0.301)	0.239* (0.325)	0.125** (0.109)
lnFin	0.221** (0.141)	0.207** (0.133)	0.285 (0.201)	0.121 (0.103)
lnIs	0.633** (0.193)	0.522* (0.184)	0.455 (0.149)	0.525** (0.188)
_cons	2.213*** (1.012)	1.196*** (0.688)	1.043*** (0.654)	0.757*** (1.148)
Year	Yes	Yes	Yes	Yes
ID	Yes	Yes	Yes	Yes
R^2	0.867	0.845	0.839	0.841
adj. R^2	0.854	0.836	0.826	0.832

Standard errors in parentheses $^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

From the result of Table 3, it can be seen that the regression coefficients of lnIFI2 indicators are all negative, indicating the non-linear relationship between each region's economic development level and digital financial inclusion. In addition, from the results of the regional poverty reduction effect, each of China's four regions passes the significance test within 5% of the digital inclusive finance index (lnIFI), but the western region has the best effect, indicating that for every 1 percentage point increase in the level of the digital inclusive finance development index in the western region, the economic gap in the western region will be reduced by 0.766 percentage points on average.

3.3. Robustness tests

We are of the opinion that the panel model utilized in this paper inevitably encounters anomalies during the estimation process, thus diminishing the credibility and reasoning of the estimation outcomes. As a result, we implemented a modified approach to examine the robustness of the model. Through modified trials, all the variables in the model were subjected to tail manipulation of 1%, 5%, and 10%, and subsequently, the regression test was re-administered. The findings are exhibited in Table 4 below. Interestingly, the digital financial inclusion index

and its quadratic index continued to exhibit a substantial positive correlation with the explanatory variables, successfully passing the 1% significance test. This demonstrates that the progression of digital inclusive finance in China between 2011 and 2019 remarkably impacts poverty alleviation and formulates opportunities to bridge the economic development divide amongst different regions.

Furthermore, the decline in the lnIFI2 also yielded negative results, confirming statistical significance at both the 5% and 10% level. This finding highlights the nonlinear association between digital financial integration and the reduction of regional economic poverty. The outcomes of the robustness test align with the information provided in Table 4.

Table 4 Robustness test results

	Tailwind 1% level lnTheil	Tailwind 5% level lnTheil	Tailwind 10% level lnTheil
$lnIFI^2$	-0.052**	-0.050**	-0.056*
	(0.011)	(0.010)	(0.013)
lnIFI	0.453***	0.389***	0.396**
	(0.331)	(0.252)	(0.302)
lnEdl	0.114**	0.112**	0.118**
	(0.105)	(0.103)	(0.101)
lnFin	0.143*	0.125*	0.188
	(0.118)	(0.127)	(0.125)
lnIs	0.515***	0.653***	0.574***
	(0.188)	(0.196)	(0.191)
_cons	1.976***	2.378**	0.657
	(1.148)	(1.457)	(1.138)
Year	Yes	Yes	Yes
ID	Yes	Yes	Yes
R^2	0.887	0.875	0.835
adj. R^2	0.845	0.852	0.818

Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

3.4. Endogeneity tests

In order to accurately measure the progress of digital financial integration and the effectiveness of poverty reduction in a specific region, it is crucial to consider the internal causality of variables and the variables themselves. To address this issue, it is necessary to conduct an endogenous test on the model. Consequently, we have chosen the time delay 1 and time delay 2 of the digital financial integration index as instrumental variables for the model. The endogenous test was conducted using the two-stage 2 SLS least squares method and system difference GMM. The outcomes of this test can be observed in Table 5 provided below.

Table 5 Endogeneity test results

	2SLS		GMM	
	Lagging 1 period	Lagging 2 period	Lagging 1 period	Lagging 2 period
$lnIFI^2$	-0.089***	-0.055**	-0.217**	-0.534*
	(0.026)	(0.048)	(0.090)	(0.285)
lnIFI	0.451***	0.668**	0.771**	0.422*
	(0.108)	(0.145)	(0.171)	(0.104)

L1.lnIFI	1.156*** (0.176)			
L2.lnIFI		0.812*** (0.254)		
Wald			245.97	199.56
Hansen J			24.11	21.55
AR(1)			0.89	0.66
AR(2)			1.15	-0.92
R^2	0.945	0.921		

Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results in Table 5 indicate that, after taking into account the endogenous issue, the article successfully passed the significance test for all the fundamental explanatory factors of the model at a 10% significance level. This suggests that the aforementioned model effectively tackles the potential causality problem. Furthermore, the model also passed both the Wald test and Hansen J test. The outcomes of AR (1) and AR (2) demonstrate significant evidence of no first order or second order autocorrelation in the disturbance terms of the model. This implies that the chosen instrumental variables are valid and the estimation of the model is trustworthy and plausible.

3.5. Threshold effect test results

With the progress of urbanization, a significant number of rural residents in various regions of China are relocating to urban areas. This movement has a profound impact on the level of regional economic development and contributes to the increasing economic disparity between different areas. In this study, the urbanization rate index (Ur) is employed as the variable of distinction in the threshold regression analysis. Prior to conducting the threshold regression, the study explores the threshold effect of the urbanization rate index. The findings are presented in Table 6. The urbanization rate did not satisfy the criteria for the double-triple threshold test, yet it successfully passed the single threshold test with a significance level of 1%, corresponding to a threshold value of 0.5623. This result confirms the presence of a nonlinear relationship between the integrated development of digital finance and the effectiveness of poverty reduction initiatives at the regional level.

Table 6 Results of the test for the threshold effect of the urbanization rate indicator

Threshold variables	Category	F-statistic	Prob	Bootstrap	Threshold values		
					1%	5%	10%
lnUr	Single Threshold	18.12***	0.009	300	31.045	21.922	14.755
	Double threshold	5.56	0.866	300	27.224	20.633	17.424
	Triple Threshold	45.77	0.354	300	128.354	117.551	83.425

Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

According to the threshold obtained by the threshold test, when the urbanization rate is lower than or equal to the threshold ($\delta_1 = 0.5623$), the regression coefficient corresponding to digital inclusive finance is 0.0754, which is significant at 10%; when the urbanization rate exceeds the threshold ($\delta_1 = 0.5623$), the regression coefficient corresponding to digital inclusive finance is 0.0841, which is significant at 1% level, indicating that when the regional urbanization rate exceeds the threshold, the impact of digital inclusive finance on regional poverty reduction is still very significant, and the regression coefficient indicates that the threshold effect of China's

overall urbanization rate in China is gradually enhanced. The results of the specific threshold regression are shown in Table Table 7.

Table 7 Results of region-wide threshold estimates

	Threshold estimation results
	lnTheil
lnIFI	0.108***
	(0.0194)
$Ur \leq \delta_1$	0.0754*
	(0.0246)
$Ur > \delta_1$	0.0841***
	(0.0139)
R^2	0.845

Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8 displays the outcomes of examining the threshold impact of digital inclusive finance development in the 31 inland provinces and cities of China. These regions were classified into four categories based on their geographical location: eastern, northeast, central, and western regions. Additionally, the threshold effect of the urbanization rate was also explored in each region.

Table 8 Results of sub-regional threshold estimates

Threshold variables	Region	Category	F-statistic	Prob	Bootstrap	Threshold values		
						1%	5%	10%
lnUr	Eastern	Single Threshold	25.36**	0.046	300	37.085	24.718	19.187
		Double threshold	23.34**	0.017	300	26.802	15.145	12.196
		Triple Threshold	5.75	0.963	300	67.322	47.521	37.382
	Northeast	Single Threshold	15.51***	0.007	300	17.625	9.654	9.452
		Double threshold	9.18	0.221	300	30.252	16.246	11.132
		Triple Threshold	7.68	0.788	300	89.410	44.485	29.232
	Central	Single Threshold	8.93**	0.036	300	36.665	20.537	14.163
		Double threshold	1.56	0.952	300	23.352	19.366	13.923
		Triple Threshold	6.85	0.853	300	13.785	10.063	1.168
	Western	Single Threshold	17.25**	0.015	300	56.352	35.785	13.655
		Double threshold	16.22	0.185	300	26.885	19.785	17.023
		Triple Threshold	7.65	0.793	300	42.056	29.685	26.986

Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8 illustrates a dual threshold effect in the urbanization rate in East China. The initial threshold is 0.8104, while the second threshold is 0.8405. The test for a single threshold yielded a significant result at the 1% level, with a threshold value of 0.6411. In both the central and western regions, a singular threshold effect was observed, with significance at the 5% level and a threshold value of 0.6411. Table 9 displays the estimates of the disparity in the threshold effect of the urbanization rate across different regions. The outcomes of the heterogeneity analysis for the urbanization rate according to each region are presented in Table 9.

Table 9 Results of estimating regional heterogeneity in the threshold effect of urbanization rate

	Eastern (1)	Northeast (2)	Central (3)	Western (4)
lnIFI	0.745*** (0.524)	0.402** (0.341)	0.396** (0.185)	0.569** (0.196)
$\ln Ur \leq \gamma_1$	0.066*** (0.017)			
$\gamma_1 < \ln Ur \leq \gamma_2$	0.038** (0.011)			
$\ln Ur > \gamma_2$	0.097*** (0.122)			
$\ln Ur \leq \theta_1$		0.048** (0.041)		
$\ln Ur > \theta_1$		0.036* (0.039)		
$\ln Ur \leq \varphi_1$			0.054** (0.034)	
$\ln Ur > \varphi_1$			0.028** (0.014)	
$\ln Ur \leq \omega_1$				0.011** (0.016)
$\ln Ur > \omega_1$				0.084** (0.102)
R^2	0.812	0.940	0.913	0.887

Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

According to the findings presented in Table 9, the impact of digital inclusive finance on regional poverty reduction is significantly positive in East China, regardless of whether the overall urbanization rate is below the first critical value, between the first and second critical values, or above the second critical value. Likewise, in the northeast and central and western regions, the development of digital inclusive finance has a significant positive impact on poverty reduction, regardless of whether the urbanization rate is below or above the first threshold, as demonstrated in columns (2) to (4).

In East China, there are two thresholds for the impact of urbanization rate on the development of digital inclusive finance; both thresholds have a significant positive effect on regional poverty reduction. This can be attributed to the region's long-standing tradition of inclusive finance, abundant digital economic resources, strong integration of digital industry and inclusive finance, and the East's stable economic growth, which provides favorable conditions for the further integration of digital inclusive finance. In contrast, the northeast and central and western regions have a single critical point between urbanization speed and the development of digital inclusive

finance. In these regions, the impact of digital inclusive finance on narrowing the regional economic growth gap in the northeast and central China diminishes as the urbanization rate improves. The delay in the development of digital inclusive finance in these two regions compared to East China, the imperfect regulatory system for digital inclusive finance, and the aging population in the northeast and central regions are reasons for this decrease. Narrowing the digital divide has become a key obstacle to achieving coordinated economic growth in these regions.

However, in western China, the increasing urbanization rate has a growing impact on narrowing the regional economic growth gap through the development of universal benefits. This may be because the relatively sparsely populated nature of western China and its low population density make digital inclusion less affected by the digital divide, thereby contributing to overall economic growth. Additionally, China's strategies of promoting the "great development of the western region" and the "rise of the central region" have led to a shift in the country's economic growth pattern, characterized by faster growth in the west and slower growth in the east. This has gradually narrowed the economic gap between the central and western regions and the eastern regions, creating conditions for the coordinated development of digital benefits and the regional economy.

4. Conclusions and recommendations

4.1. Conclusions

In order to examine the influence of the growth of digital inclusive finance on China's economic progress, this study establishes a measurement system based on the digital inclusive finance index and inter-provincial panel data from Peking University during the years 2011 to 2019. Additionally, it measures the effect of China's digital inclusive finance development on poverty reduction by employing the panel fixed effect model and threshold effect model. The findings of this research are as follows: (1) Digital financial inclusion has a significant impact on reducing the regional economic growth gap and alleviating poverty on a regional scale. This effect is observed in terms of coverage, usage depth, and digitalization. Additionally, there exists a nonlinear relationship between the impact of digital financial inclusion development and regional poverty reduction. (2) When considering regional differences, the role of digital inclusive finance in reducing poverty in China is subject to a single threshold determined by the urbanization rate. Beyond this threshold, the impact of digital inclusive finance development on poverty reduction is enhanced. However, it should be noted that the urbanization rate threshold varies across different regions in China, with the greatest poverty reduction effect observed in the eastern region, followed by the northeast, central, and western regions.

4.2. Recommendations

Based on the conclusion of the empirical analysis of this paper, we make the following policy recommendations:

First, our focus will be on promoting the establishment of comprehensive digital financial infrastructure in the central and western areas, as well as enhancing the mechanisms for recruiting technical personnel. In comparison to the eastern region, the central and western areas

lack well-developed economic infrastructure, technological systems, and talent mechanisms required for digital inclusive finance. Consequently, there exists a significant gap between these regions. Therefore, it is crucial for the central and western areas to take appropriate measures in accordance with their local conditions. It is necessary to accurately respond and fully comprehend this gap, while also planning the construction of inclusive financial and digital economic infrastructure. The objective is to strive towards creating a new hub for the advancement of digital inclusive finance in the central and western regions. Additionally, equal attention will be given to the training and recruitment of professionals in the fintech industry. Appropriate preferential policies will be formulated to ensure the balanced development of digital inclusive finance in the central and western areas, ultimately aiding in the overall economic growth. By achieving a harmonious development of inclusive finance and high-quality economic progress, the central and western regions will explore a unique path towards digital inclusive finance.

Second, the government departments should actively promote and enhance the reform of inclusive finance in the digital sector, expand the scope of the financial service market, and facilitate the sustainable and balanced progress of digital inclusive finance in China. To achieve the comprehensive development of digital inclusive finance and the effective expansion of regional economy, the initial step is to expedite the growth of the digital science and technology economy. Secondly, considering the economic development of diverse regions, we ought to establish reasonable fiscal and monetary policies, increase appropriate financial assistance, and effectively guide the progress of the digital inclusive financial industry. Thirdly, while upgrading the level of big data digital economy and technology, we should enhance the digital inclusive financial system with a focus on propelling the digital inclusive financial service market using advanced economic and technological advantages. This will ultimately lead to the effective expansion of digital inclusive finance and regional economy.

Third, we need to objectively assess the diversity of digital inclusive finance development and economic growth in different parts of China, and create tailored development strategies. To address the lack of digital financial infrastructure and promote economic growth, we should learn from the success of advanced digital economy regions and prioritize the development of digital infrastructure. By continually uncovering people's demand for digital financial services, we can build a strong foundation for future digital transformation and ensure that the development of digital financial services benefits a wider population and enhances people's involvement in the digital economy. The advancement of digital inclusive finance can improve people's livelihoods, enhance their participation in digital inclusive financial services, and drive the deeper and broader progress of the digital economy.

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