INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN ACCOUNTING, FINANCE AND MANAGEMENT SCIENCES

OPEN ACCESS JOURNAL

Vol 13, Issue 4, (2023) E-ISSN: 2225-8329

The Impact of Digital Inclusive Financial Index from Different Perspectives on the Income Gap Between Urban and Rural Residents

Wu Wanrong, Haslindar Ibrahim

Universiti Sains Malaysia

wuwanrong@student.usm.my

Corresponding Author Email: haslindar@usm.my

To Link this Article: http://dx.doi.org/10.6007/IJARAFMS/v13-i4/19166 DOI:10.6007/IJARAFMS/v13-i4/19166

Published Online: 16 December 2023

Abstract

This study uses the Digital Inclusive Finance Index whether it can reduce the urban-rural income gap. The digital inclusive finance index is divided into three dimensions, and in this study, all three dimensions are utilized at the same time to investigate which dimension specifically has a greater effect on the reduction of the urban-rural income gap. The data are analyzed using ordinary panel regression analysis. This study explores the association between digital inclusive finance and the urban-rural income gap, analyzing 20 cities in Guangdong Province, China, over the ten-year period from -2011 to 2020. The increases in all three sub-indices of digital inclusive finance contribute to the narrowing of the overall urban-rural income gap in Guangdong Province. The coverage index has the greatest contribution, suggesting that rural residents have access to a wider range of financial services through increased coverage of financial accounts.

Keywords*:* Digital Inclusive Finance Index, Income gap, Guangdong.

Introduction

The world is moving into a fully digital society and the digital economy finance is the focus of future global economic competition and cooperation. The benefits of financial inclusion are many. Today, 60% of Kenyans reportedly trust M-Pesa (M-PESA is Africa's most successful mobile money service and the region's largest fintech platform) more than they trust cash. Crime rates have fallen and savings rates have risen, but the more interesting impact has been in response to poverty, access to credit and employment. For example, the use of mobile money has lifted 2% of Kenyan households (194,000 households) out of extreme poverty, enabled 185,000 women to move out of subsistence farming and into business, and increased access to basic credit facilities for starting a business or dealing with emergencies (McBride & Liyala, 2021).

Digital inclusion is the perfect blend of data and the advantages of financial inclusion. Digital finance relies on big data as well as technological advances in artificial intelligence. In the course of continuous iterative progress, applications such as mobile payments, internet

insurance, online finance and online loans have gradually matured, offering significant advantages over traditional tools in terms of user experience and accuracy of service. Inclusive finance originated from a United Nation (UN) initiative and has developed in various countries. Inclusive finance allows more people to use financial tools such as insurance and loans to fulfil their needs faster and more easily, while also enhancing market dynamics and promoting high-quality development of the real economy (Chen & Song, 2022).

In 2021, Internet-related technologies such as big data, cloud computing and artificial intelligence will accelerate innovation and become more quickly and better integrated into the entire field and process of developing the lives of Internet users. First, China's network capacity continues to improve. By the end of 2021, a total of 1.425 million 5G base stations had been built, and there were 355 million 5G mobile phone users16; it continued to promote network speed and quality, improve the end-to-end IPv6 penetration capacity, and promote the comprehensive development of the mobile Internet of Things. Secondly, the Internet will continue to unleash its universal effect. In 2021, China's Internet industry will continue to demonstrate its vitality and resilience, and new business models such as telecommuting, online medical care and community group buying will continue to develop. Third, the construction of information accessibility will be accelerated. The Ministry of Industry and Information Technology continues to focus on the characteristics and needs of the elderly, and guided the first batch of 227 websites and mobile phone applications (APPs) to complete the evaluation of ageing-appropriate and barrier-free modifications on schedule (Xu, 2022).

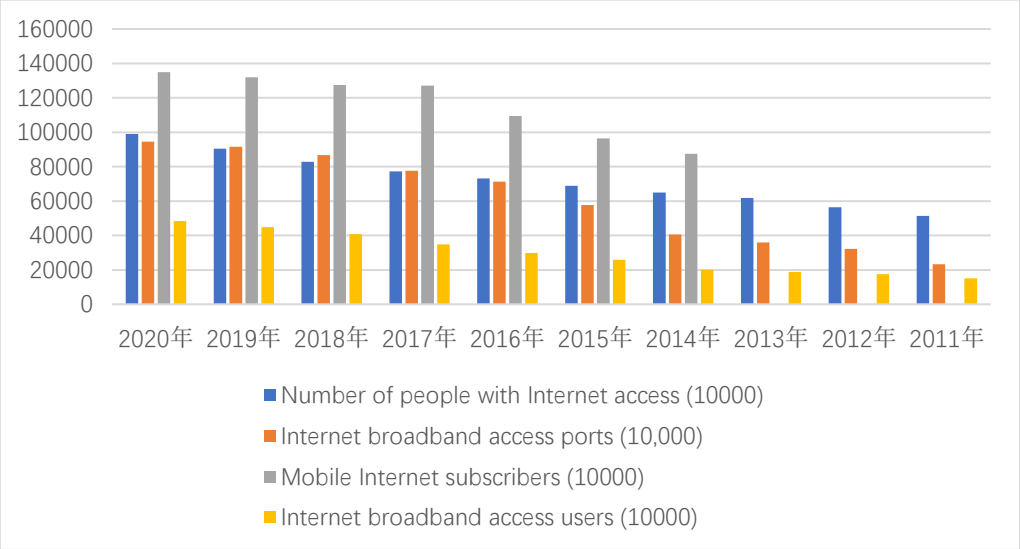

Figure 1.1 Internet Development Statistic
Source: National Bureau of Statistics of China (2021)

According to statistics from the National Bureau of Statistics (Figure 1.1), by the end of December 2020, the scale of internet users rose year on year in the decade from 2011 to 2020, and internet broadband access ports, mobile internet users, and internet broadband access users are all rising year on year, which means that the rapid development of the internet has made internet plus financial inclusion in all regions a reality.

Literature Review

This chapter contains hypotheses on the relationship between certain explanatory variables and digital inclusion finance. It also provides the research framework for the current study.

Empirical Review

Some scholars use different dimensions of digital inclusive finance to further analyses the impact of the urban-rural income gap. Huang (2019), on the other hand, argues through empirical analysis that the use of depth is more effective in converging the urban-rural income gap, as the level of coverage can only solve the initial problem, and to better promote development, efforts must be made in terms of depth.

From the perspective of depth of use, Fu and Huang (2018) further analyses this in terms of depth of use, arguing that there are differences in the depth of use triggered by demand, which in turn likewise have different impacts on the urban-rural income gap.

The convergence of technology and finance has led to the development of financial inclusion in a digital direction. In the Global Financial Development Report 2014, the World Bank stated that the rapid development of contemporary digital technology will greatly contribute to the spread of inclusive finance, with the rapid development of information technology such as mobile banking, QR code payment, face recognition and big data, which on the one hand has improved the operational efficiency and accessibility of financial services, and on the other hand has reduced the price of financial services. Meanwhile, in the World Development Report 2016: The Digital Dividend, the World Bank stated that the rapid development of digital and communication technologies has allowed disadvantaged and remote areas to benefit from the inclusiveness and efficiency of the internet, resulting in a whole new range of development opportunities.

Hypotheses Development

Digital Inclusive Finance (DIF) Coverage Index and Income Gap

Digital inclusive finance largely breaks the geographically restricted pattern of traditional finance, and it is largely based on digital information technology, including the Internet and mobile communications (Li, 2020). It relies on digital information technology, including the Internet and mobile communications. By relying on this information technology coverage, digital inclusive finance can break the geographical restrictions faced by traditional finance and reach rural and remote areas across space (Guo et al., 2020).

Therefore, the Digital Inclusive Finance Index compiled by Peking University measures the breadth of digital inclusive finance coverage not by the number of physical outlets, but by the number of electronic accounts (e.g., the number of Internet payment accounts and the number of bank accounts they are tied to).

In their study, Wang (2021) and (Qiu & Xiang, 2018) find in traditional financial services, the higher income levels and the more diverse needs of urban dwellers make financial products in cities often more abundant than in rural areas. However, these can be solved through digital financial inclusion. According to Yu (2019),on the one hand, the Internet allows financial information to reach rural areas in the first place, and on the other hand, through the use of big data, extreme customer segmentation can be achieved at low cost, and even complete personalization of financial products and services can be achieved.

As Zhang (2019) point out, traditional financial institutions are often reluctant to set up physical branches in rural areas due to their remote location and scattered population, which cannot support physical branches. But the emergence of digital inclusive finance can solve the problem of geographical exclusion.

According to research by Zhang (2022), the poverty-reducing effect of digital inclusive finance is reflected in, firstly, the expansion of the coverage of financial services. Rural

residents can increase their property income and build personal credit through financial services such as wealth management and savings.

Secondly, according to Jiang (2021), digital inclusive finance provides financial support for small and medium-sized enterprises (SMEs) that have difficulties in financing, and ensures the normal operation and sustainable development of SMEs, which are mostly located in the urban fringe and rural areas, and can provide jobs for a large number of surplus laborer's in rural areas, thus increasing their income and lifting them out of poverty.

The popularity of 4G has enabled financial services to break through geographical limitations, allowing financial institutions to achieve rapid business development without increasing the number of physical outlets on the one hand(Chen, 2020). Especially in rural areas, through the application of information technology, their financial services can be accessed at home through mobile banking, etc. Even if financial institutions like banks do not lay financial services outlets in rural areas, people can still conduct financial transactions and meet their financial needs with the Internet financial platform(Sun et al., 2021).

In this way, digital financial inclusion can make the problem of geographical exclusion of financial services effectively solved by the advancement of digital payment methods.

According to research by Ye et al. (2011), in terms of the breadth of financial services coverage, digital inclusive finance increases the supply of financial services, breaks the geographical limitations of traditional financial institutions' outlets, reduces geographical exclusion, improves the availability of financial services, guarantees the right of rural residents who have financial needs but struggle to be met to access services, and increases their property income. Therefore, the testable hypothesis is as follows:

H2: *The level of coverage of digital inclusive finance has a statistically significant and negative association to the urban-rural income gap.*

Digital Inclusive Finance (DIF) Depth of Use Index and Income Gap

According to the World Bank's 2017 Financial Inclusion Survey, 1.7 billion adults worldwide still do not have a financial account. Without a financial account, there is then no basis for the use of financial services. And as the previous analysis shows, the wide reach of digital financial inclusion effectively slows this down. More users are exposed to a wider range of financial services products. Examples include: online payments, online lending, internet finance, internet insurance and other businesses.

The convenience and speed of internet payments has made conventional financial services available to populations in remote areas. The data generated by online payments provides the basis for financial institutions to obtain customers' consumption habits. The financial institutions concerned rely on this data and provide personalized services to their customers with the information technology behind them, greatly enhancing the depth of use of digital inclusive finance. Internet lending includes online lending services provided by traditional banks as well as personal and micro and small business loans provided by Internet banks such as Ali.com Business Loans. Digital means, a short time to interface with the data in the background, data mining, analysis, to complete the credit assessment of individuals, small and micro enterprises. This approach has greatly solved the previous problems of small amounts and high frequency of individuals and micro and small enterprises in the financing process (Guo et al., 2020).

Internet investment and finance has promoted the public's awareness of financial management. It is because of the intervention of information technology that the sales

channels of traditional financial management and investment products have been expanded, the cost of services and thresholds have been reduced, and more users have participated in the sequence of investment and finance. The Internet insurance business is also developing very rapidly, where the companies involved in the business of Internet insurance products are no longer just traditional insurance companies, but have expanded to include Internet insurance operators similar to Internet banks. This change has also greatly enriched the range of Internet insurance products. It is also embedded with digital technology, making it cheaper, easier to insure and quicker to settle claims. By means such as big data behind the scenes, the business of insurance has been brought deeper into everyone's daily life, and the depth of use of digital inclusive finance has been enhanced. The depth of use of the Peking University Digital Inclusion Index is portrayed by the number of users, number of transactions, activity and frequency of use of specific business products (Hu, 2020). Therefore, the testable hypothesis is as follows:

H3: *The depth of use of digital inclusive finance has a statistically significant and negative association to the urban-rural income gap.*

Digital Inclusive Finance (DIF) Digitalization Degree Index and Income Gap

According to the previous analysis, the most fundamental feature of digital inclusive finance is the digitalization of services. The digitalization degree of digital inclusive finance is mainly depending on the following points: firstly, the digital infrastructure conditions, the speed and efficiency of Internet broadband, the development of mobile Internet 4G and 5G, and the deep coverage of urban and rural areas. On this basis, the communications industry has been developing rapidly, and the penetration rate of mobile phones or smartphones has greatly increased.

According to the researcher by Bao (2021), inclusive finance is faced with information asymmetry and needs to collect information from customers to alleviate the information asymmetry. Traditional inclusive finance is collected and processed manually, which can cause human errors on the one hand, and low-cost efficiency on the other, which is not conducive to the risk identification of inclusive finance. As Feng (2016) point out, the development of inclusive finance relies on the establishment of a social credit system. In the past, urban areas had more robust credit systems than rural areas, so financial institutions were biased towards providing financial services to customers with complete credit records.

In their study, Hu (2020) and Li (2021) find that digital inclusive finance starts at the source by using information technology such as big data to collect and process customer data, which on the one hand avoids human error and on the other hand allows for more objective results through model predictions and avoids human interference.

Currently, big data and artificial intelligence have led to a reconfiguration of the social credit system and the improvement of the credit system in rural areas, thus facilitating risk assessment of rural areas by financial institutions and alleviating the information asymmetry between the two parties. In addition, the improvement of the credit system in rural areas can also benefit small and micro enterprises, thus promoting the economic development of rural areas and narrowing the income gap between urban and rural areas(Hu, 2020).

According to the researchers by Peng (2021), the rise of digital technologies such as cloud computing, big data and artificial intelligence today has a significant impact on risk prevention and control and the collation and collection of data, and how risks can be accurately screened is a problem that financial institutions are striving to solve. Digital technology provides new

tools for risk prevention and control for financial institutions. In the past, the credit collection system only covered urban areas, and the credit situation of rural residents was not available(Qi, 2021).

In their study, Xu (2022) and Zhao (2019) find that the scale of Internet users has been increasing year by year and the Internet penetration rate has been rising. Secondly, the booming development of information technology has further pushed financial services towards better development. Big data for financial institutions to greatly improve the efficiency of decision-making related to services, cloud computing can improve the stability of traditional financial institutions to provide financial services and reduce costs. The capitalization of digital inclusive finance relies on the steady development of the mobile communications industry, the in-depth development of the Internet industry, the growing scale of users and the accelerated development of emerging technologies, and these digital infrastructure conditions have driven the development of digital inclusive finance(Niu, 2021). The Peking University Digital Inclusion Index portrays this dimension by measuring the convenience and cost of digital financial services, such as the share of mobile payments in terms of number of strokes and amount, and the average interest rate on loans for individuals and micro and small operators(Guo et al., 2020).

Artificial intelligence enhances financial risk management capabilities, according to (Wang, 2020), greatly expands the scope of business groups and enables financial institutions to provide more refined services through the information they obtain. Overall, information technology has solved the information shortage and motivation problems faced by traditional financial institutions, enhancing efficiency and reducing costs for the development of inclusive finance, allowing a range of innovative financial services products to emerge. Therefore, the testable hypothesis is as follows

H4: *The higher the capitalization degree of digital inclusive finance has a statistically significant and negative association on the urban-rural income gap.*

Research Methodology

Research Method and data sources

Based on the availability of data, balanced short panel data for 20 prefecture-level cities in Guangdong Province from 2011-2021 are used in the course of this paper's empirical analysis. The relevant data were obtained from the Digital Finance Research Centre of Peking University and the Guangdong Provincial Bureau of Statistics. The period 2011-2021 is chosen as the time frame for the sample data in this paper.

Table 3.1
Explanation of variables

		Dependent variable	
Urban-rural income gap	Theil	Weighted sum of the logarithms of the ratios of the income shares to the population shares for each region, with the weights being the income shares	(Liang, 2021)
		Independent variables	
Digital Inclusion Finance level of Coverage Index	Cov Index	Peking University Digital Inclusive Finance Index	Peking University Digital Inclusive Finance Index (2011-2021)
Digital Inclusive Finance Depth of Use Index	Dep Index		
Digital Inclusive Finance Capitalization Index	Digi Index		
		Control variables	
Industrial structure	IS	Secondary and tertiary industries/ Gross Domestic Product	(Liang, 2021)
Level of fixed asset investment	FAI	Fixed asset investment/ Gross Domestic Product	(Liang, 2021)
Government Competition	GC	Ratio of local government on-budget expenditure to on-budget revenue	(Duan, 2021)
Agricultural Policy	AP	Agriculture, forestry and water expenditure/Financial expenditure	(Luo & luo, 2019)
Traditional finance level	TF	Balance of deposits and loans of financial institutions/ Gross Domestic Product	(Yu, 2019)
Level of openness to the world	OW	Total imports and exports/ Gross Domestic Product	(Liu, 2020)

Data Analysis Technique

This paper conducts an overall empirical analysis of the relationship between both digital inclusive finance and the urban-rural income gap in Guangdong Province, and constructs the following balanced panel model as the benchmark model and studies the impact of digital inclusive finance on the urban-rural income gap.

The proposed formulas for studying the relationship between the indexes of the breadth of coverage, depth of use and degree of digitization of digital inclusive finance and the urban-rural income gap are as follows:

$$theil_{i,t} = \beta_0 + \beta_1 Cov_{i,t} + \beta_2 IS_{i,t} + \beta_3 FAI_{i,t} + \beta_4 GC_{i,t} + \beta_5 AP_{i,t} + \beta_6 TF_{i,t} + \beta_7 OW_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$theil_{i,t} = \delta_0 + \delta_1 Dep_{i,t} + \delta_2 IS_{i,t} + \delta_3 FAI_{i,t} + \delta_4 GC_{i,t} + \delta_5 AP_{i,t} + \delta_6 TF_{i,t} + \delta_7 OW_{i,t} + \varepsilon_{i,t} \quad (2)$$

$$theil_{i,t} = \chi_0 + \chi_1 Digi_{i,t} + \chi_2 IS_{i,t} + \chi_3 FAI_{i,t} + \chi_4 GC_{i,t} + \chi_5 AP_{i,t} + \chi_6 TF_{i,t} + \chi_7 OW_{i,t} + \varepsilon_{i,t} \quad (3)$$

Where

i denotes each city in Guangdong Province, t denotes time; theil represents the urban-rural income gap in Guangdong Province. In further analysis, this study examines the impact of digital financial inclusion on the urban-rural income gap using the three sub-dimensions of the level of coverage (Cov), depth of use (Dep) and degree of digitalization (Digi) respectively, so as to explore more specifically its intrinsic impact mechanism. Replacing the explanatory variables in Equation 3-1 with Cov, Dep and Digi respectively yield.

Results

Descriptive Statistics

From Table 4.1, we can see that the mean value of the theil index (theil) is 0.039 and the standard deviation is 0.021, the maximum value is 0.107 while the minimum value is only 0.005, indicating that there is a certain difference in urban and rural income disparity between counties in Guangdong Province, reflecting the current problem of unreasonable income distribution in Guangdong Province. The standard deviation of the level of coverage (Cov) is 0.1735, indicating that there is some difference in the level of digital inclusive finance development between municipalities, but it is not too large. Depth of use (Dep) has a mean value of 1.86, with a minimum value of 0.561 and a maximum value of 3.17, indicating a large difference in depth of use between municipalities compared to the breadth of digital inclusion development, which is important to note at this point. The degree of digitalization (dig) has a mean value of 2.112, a standard deviation of 0.759, a minimum value of 0.446 and a maximum value of 3.206, indicating a relatively large difference in the degree of digitalization between municipalities.

Table 4.1

Descriptive Statistics Table of Variables

Variable	Obs	Mean	Std.Dev.	Min	Max
Theil	200	0.039	0.021	0.005	0.107
Cov	200	1.735	0.682	0.225	3.06
Dep	200	1.86	0.713	0.561	3.17
Digi	200	2.112	0.759	0.446	3.206
IS	200	0.896	0.069	0.751	0.997
FAI	200	0.557	0.204	0.124	1.143
GC	200	2.539	1.246	1.005	7.387
AP	200	0.088	0.055	0	0.579
TF	200	2.296	0.785	0.941	4.949
OW	200	0.456	0.453	0.035	2.298
gap	200	1.909	0.26	1.455	2.725

Note: This table provides the descriptive satisfies for the study variable. Theil= Urban-rural income gap. Cov= Digital Inclusion Finance of Coverage Index. Dep= Digital Inclusive Finance Depth of Use Index. Digi= Digital Inclusive Finance Digitalization Degree Index. IS= Industrial structure. FAI= Fixed Asset Investment. GC= Government Competition. AP= Agricultural Policy. TF= Traditional finance level. OW= Degree of Openness to The World.

Pairwise Correlation

Researchers use a correlation matrix to gain a broad overview of the study data. In this study, the correlation matrix reveals the degree of correlation between the independent and dependent variables. It also looks into the multicollinearity problem between

independent variables. The Pearson correlation analysis was used to evaluate and explain the strength of the relationship between the variables in this study. According to some researchers, multicollinearity may be an issue if the correlation in the correlation matrix created by all of the independent variables is greater than 0.80.

The Pearson correlations in Table 4.2 show that the lowest negative correlation between the digital inclusive finance index, degree of coverage, depth of use, and degree of digitization can be as low as 0.982. Such a low correlation suggests that the sample consists of similar observations, such as data collected from a single region or industry; this can increase the internal validity of the analysis and reduce the influence of extraneous variables. This can make strong correlations between independent variables higher. According to Table 4.2, such a strong correlation occurs mainly due to the fact that the digital inclusive finance index is the aggregate variable, while the degree of coverage and depth of use and digitization are all sub-dimensions of the digital inclusive finance index. The digital inclusive finance index comprises the degree of coverage, depth of use, and degree of digitalization. Although the correlation is very strong, the regression analyses in the following regression analyses are done separately and individually, not combined together, so they are not doing the same repetitive analyses. However, it is important to note that correlation does not imply causation and other factors may be at play in this relationship.

Table 4.2
Pairwise Correlation

	Theil	Cov	Dep	Digi	IS	FAI	GC	AP	TF	OW
Theil	1									
Cov	-0.681***	1								
Dep	-0.505***	0.908***	1							
Digi	-0.461***	0.891***	0.921***	1						
IS	-0.567***	0.371***	0.189***	0.041	1					
FAI	0.186***	0.133*	0.261***	0.318***	-0.380***	1				
GC	0.215***	0.053	0.266***	0.337***	-0.596***	0.517***	1			
AP	0.176**	-0.056	-0.005	0.073	-0.302***	0.192***	0.355***	1		
TF	-0.465***	0.584***	0.398***	0.310***	0.569***	-0.172**	-0.391***	-0.195***	1	
OW	-0.428***	0.136*	-0.112	-0.177**	0.694***	-0.387***	-0.594***	-0.262***	0.421***	1

Note: This table provides the correlation among variables of the present study. Theil= Urban-rural income gap. Cov= Digital Inclusion Finance of Coverage Index. Dep= Digital Inclusive Finance Depth of Use Index. Digi= Digital Inclusive Finance Digitalization Degree Index. IS= Industrial structure. FAI= Fixed Asset Investment. GC= Government Competition. AP= Agricultural Policy. TF= Traditional finance level. OW= Degree of Openness to The World.

Variance Inflation Factor (VIF)

Table 4.3 displays the results of the variance inflation factor (VIF), a substitute test for multicollinearity occurring when two or more independent variables in a regression equation correlate highly. A mean (VIF) value of less than ten indicates the absence of multicollinearity among the independent variables (Ahmad et al., 2016; O'Brien, 2007).

Table 4.3 presents the results of (VIF) for the four models and the results show that none of the highest values of (VIF) exceeded 5. The mean (VIF) of all variables for the first model was 2.02, the mean (VIF) of all variables for the second model was 2.03, the mean (VIF) of all variables for the third model was 2.03, the mean (VIF) of all variables for the fourth model was 2.02, the mean (VIF) of all variables for the fourth model was 2.02, and the mean (VIF) of all variables for the third model was 2.03. VIF) was 1.93. According to Hair et al. (2010), acceptable values for collinearity are considered from the tolerance value of more than 1.0 or the (VIF) value of less than 10 to show slight or no multicollinearity. These findings show that the mean (VIF) value (1.94) is less than 10. It indicates that there is no multicollinearity problem in this study.

Table 1.3
Variance Inflation Factor

	Model 1			**Model 2**			**Model 3**	
	VIF	1/VIF		VIF	1/VIF		VIF	1/VIF
Cov	2.03	0.492004	Dep	1.91	0.523903	Digi	1.67	0.598735
IS	2.88	0.347215	IS	2.97	0.336803	IS	2.69	0.371659
FAI	1.44	0.692382	FAI	1.45	0.689326	FAI	1.45	0.687628
GC	2.37	0.421956	GC	2.52	0.396799	GC	2.42	0.412885
AP	1.16	0.860839	AP	1.17	0.856933	AP	1.16	0.861025
TF	2.17	0.460396	TF	1.92	0.521292	TF	1.85	0.540823
OW	2.17	0.460963	OW	2.31	0.43281	OW	2.23	0.448513
Mean VIF	2.03		Mean VIF	2.03		Mean VIF	1.93	

Note: Theil= Urban-rural income gap. Cov= Digital Inclusion Finance of Coverage Index. Dep= Digital Inclusive Finance Depth of Use Index. Digi= Digital Inclusive Finance Digitalization Degree Index. IS= Industrial structure. FAI= Fixed Asset Investment. GC= Government Competition. AP= Agricultural Policy. TF= Traditional finance level. OW= Degree of Openness to The World.

Hausman Test

The Hausman test determines whether a fixed or random effect is better for running the panel data regression. The fixed effect model is considered the suitable model if the probability of H-statistic is significant at less than 0.05. Based on the Hausman test result in Table 4.4, the random effect model outperforms the fixed effect model for the four models. Their critical values are 0.2722, 0.4782, 0.1173, and 0.2505, respectively, which are not

significant. Therefore, the random effect model is most suitable for the regression analysis of these four models.

Table 4.4
Hausman (1978) Specification Test

	Model 1	Model 2	Model 3	Model 4
Chi-square test value	8.74	6.54	11.53	9.03
P-value	0.2722	0.4782	0.1173	0.2505

Notes: significance level 1% 5% and 10%

Regression Results

As shown in Table 4.4, according to the Hausman test, the (REM) model should be selected for Models 2, 3, and 4, and the REM model is the best model for the regression analysis of this sample.

Table 4.5 shows that the relationship between the extent of digital inclusive finance coverage index and the Theil index is negative and significant at the 1% level. All the control variables in the first column are introduced into the model regression analysis, at which time the estimated value of the coefficient of the index of the degree of coverage of digital inclusive finance is negative 0.016, and this result indicates that every 1% increase in the degree of coverage of digital inclusive finance can promote the urban-rural residents of Guangdong Province to reduce the income gap by 0.016%. Among the control variables, the three variables of industrial structure, government competition and degree of openness to the outside world passed the significance test, in which every 1% increase in the level of industrial structure (IS) will reduce the income gap between urban and rural residents by 0.111%. For every 1% increase in the level of government competition (GC), the urban-rural income gap decreases by 0.002%. For every 1% increase in the level of openness to the outside world (OW), the urban-rural income gap narrows by 0.012%. Fixed Asset Investment (FAI), Agricultural Support Policy (AP) and Traditional Financial Development (TF) do not pass the test, i.e., there is no relationship between these three variables and the urban-rural income gap.

Table 4.5 shows that the relationship between the depth of digital inclusive finance use index and the Theil index is negative and significant at the 1% level. All the control variables in the second column are introduced into the model regression analysis, at which point the coefficient estimate of the index of the depth of digital inclusive finance use is negative 0.008, a result that suggests that every 1% increase in the depth of digital inclusive finance use can contribute to the reduction of the income gap between urban and rural residents in Guangdong Province by 0.008%. Among the five control variables, the industrial structure, fixed asset investment, government competition, traditional financial development and openness to the outside world passed the significance test, in which every 1% increase in the level of industrial structure (IS) will reduce the income gap between urban and rural residents by 0.154%; every 1% increase in the level of investment in fixed assets implies a reduction in the income gap between urban and rural residents by 0.021%; every 1% increase in the level of governmental competition (GC) reduces the income gap between urban and rural residents by 0.004%; and the level of traditional financial development reduces the income gap between urban and rural residents by 0.004%; for every 10% increase in the level of traditional financial development, the income gap between urban and rural residents narrows by 0.005%; for every 5% increase in the level of openness to the outside world (OW), the

income gap between urban and rural residents narrows by 0.010%. Agricultural support policy (AP) does not pass the test, so there is no relationship between this variable and the urban-rural income gap.

Table 4.5 shows that the relationship between the degree of digital inclusive finance digitalization and the Theil index is negative and significant at the 1% level. Introducing all the control variables in the third column into the model regression analysis, the coefficient estimate of the index of the degree of digital inclusive finance digitalization is negative 0.009, which indicates that every 1% increase in the degree of digital inclusive finance digitalization can contribute to the reduction of urban-rural residents' income gap in Guangdong Province by 0.009%. Among the control variables, industrial structure, fixed asset investment, government competition and openness to the outside world passed the significance test, in which every 1% increase in the level of industrial structure (IS) will narrow the urban-rural residents' income gap by 0. 145%; every 1% increase in the level of fixed asset investment implies that the urban-rural residents' income gap is narrowed by 0.016%; every 1% increase in the level of government competition (GC) will narrow the urban-rural residents' Every 1% increase in the level of fixed asset investment means a 0.016% decrease in the income gap between urban and rural residents; every 1% increase in the level of government competition (GC) means a 0.004% decrease in the income gap between urban and rural residents; every 1% increase in the level of openness to the world (OW) means a 0.011% decrease in the income gap between urban and rural residents. Agricultural support policy (AP) and traditional financial development (TF) do not pass the test, i.e., these two variables have no relationship with the urban-rural income gap.

In summary, as shown in Table 4.5, the regression results of the three sub-dimensions of the digital inclusive finance index and the Thiel index indicate that the breadth of coverage, depth of use, and degree of digitization of digital inclusive finance in Guangdong Province are negatively correlated with the urban-rural income gap, and that most of the variables negatively affect the reduction of urban-rural income.

Table 4.5

Regression Results for Theil and Sub-dimensions of Digital Inclusive Finance

	M2	M3	M4
VARIABLES	Theil	Theil	Theil
Cov	-0.016***		
	(-9.44)		
Dep		-0.008***	
		(-4.70)	
Digi			-0.009***
			(-6.29)

IS	-0.111***	-0.154***	-0.145***
	(-2.90)	(-3.60)	(-3.51)
FAI	-0.008	-0.021***	-0.016***
	(-1.47)	(-3.28)	(-2.58)
GC	-0.002**	-0.004***	-0.004***
	(-2.25)	(-3.20)	(-3.33)
AP	-0.009	-0.014	-0.008
	(-0.75)	(-1.08)	(-0.67)
TF	0.003	-0.005*	-0.004
	(1.17)	(-1.94)	(-1.52)
OW	-0.012***	-0.010**	-0.011***
	(-3.07)	(-2.29)	(-2.64)
Constant	0.176***	0.230***	0.221***
	(5.27)	(6.27)	(6.19)
Observations	200	200	200

Note: This table presents the results of Theil and Sub-dimensions of Digital inclusive finance. *** p<0.01, ** p<0.05, * p<0.1.

Robustness Tests

The stability test employed in this research utilizes a methodology known as research method exchange. Table 4.6 illustrates the results of the stability test conducted after replacing the Random Effects Model (REM) with the Fixed Effects Model (FEM) and the Pooled Ordinary Least Squares (POLS) model. This alteration was made to enhance the robustness and credibility of the findings.

The outcomes of the stability test reveal that, whether considering the digital inclusive finance coverage index, the depth of usage of digital inclusive finance, or the level of digitization in digital inclusive finance, all these factors exhibit both positive and negative impacts on income inequality. These results are consistent with the findings from previous

regression analyses, reinforcing the conclusion that digital inclusive finance exerts a detrimental influence on income inequality.

Table 4.6

Robustness Tests of Sub-dimensions of Digital Inclusive Finance

VARIABLES	POLS	FEM	POLS	FEM	POLS	FEM
Cov	-0.0216***	-0.0157***				
	-0.00196	-0.00186				
Dep			-0.0158***	-0.00651***		
			-0.00203	-0.00174		
Digi					-0.0150***	-0.00814***
					-0.00173	-0.00151
IS	-0.0637***	-0.101*	-0.0728***	-0.171***	-0.103***	-0.131**
	-0.023	-0.0568	-0.0261	-0.0646	-0.0242	-0.063
FAI	0.0158***	-0.0121**	0.0141**	-0.0257***	0.0152**	-0.0207***
	-0.00553	-0.00603	-0.00617	-0.00657	-0.00602	-0.00645
GC	-0.000278	-0.00255***	-0.00044	-0.00411***	-0.000644	-0.00395***
	-0.00116	-0.00104	-0.00133	-0.00122	-0.00127	-0.00112
AP	0.0118	-0.00986	0.00449	-0.0146	0.0136	-0.00997
	-0.0185	-0.0116	-0.0206	-0.0134	-0.02	-0.0127
TF	0.00456**	0.00327	0.000461	-0.00690**	0.000359	-0.00414
	-0.00176	-0.00324	-0.00184	-0.00346	-0.00176	-0.00332
OW	-0.00964***	-0.0109**	-0.0137***	-0.0103*	-0.0119***	-0.0103**
	-0.00305	-0.00474	-0.00351	-0.00546	-0.00335	-0.00523
Constant	0.118***	0.168***	0.132***	0.251***	0.159***	0.210***
	-0.0204	-0.0519	-0.0229	-0.0586	-0.0212	-0.0573
Observations	200	200	200	200	200	200

Discussion

This study analyzes the impact of the digital inclusive finance index, including the three sub-dimensions of digital inclusive finance (coverage, depth of use, and digitalization) on the urban-rural income gap. In addition, this study incorporates spatial econometric modeling to better understand the current literature on how digital inclusive finance is reducing the urban-rural income gap. To the best of the researcher's knowledge, the current direction of the study focuses mainly on China as a whole primarily, or the provinces studied are those that have areas that are included in the list of poor areas in China, and to a lesser extent, the situation in Guangdong Province.

Every study has limitations and this study is no exception. Firstly, due to the data availability, this study cannot follow the Beijing-Tianjin-Hebei, Guangdong-Hong Kong-Macao-Great Bay Area, etc., which can be given a more novel division to study the regional variability of impacts in the future. Secondly, due to the mutilation and unavailability of data, this study can only improve the model variables as much as possible at the provincial level, and the sample size needs to be further expanded to more accurately analyze the impact of digital inclusive finance on poverty reduction in poor areas.

The impetus for this study comes from the current urban-rural income gap in Guangdong Province, which suggests that the urban-rural income gap should not be underestimated. The large urban-rural income gap is also due to the fact that the Pearl River Delta region of Guangdong Province has experienced rapid economic development, but the rural areas have not been able to catch up with the pace of the urban areas. This study provides conclusive evidence that digital inclusive finance can reduce the urban-rural income gap in Guangdong Province.

In today's era, our way of life has changed a lot, and these are the results of the continuous progress of science and technology. For the financial industry, the impact of scientific and technological progress is greater, we no longer need to go to the business network to line up for financial services, the variety of financial products is also more and more, these innovations have changed the way of development of finance, but also to bring certain challenges to the financial supervision. As an innovative product combining science and technology and finance, the development of digital inclusive finance has also attracted widespread attention and requires a standardized regulatory system to carry out scientific and effective supervision. The manifestation of digital inclusive finance is relatively special, and ordinary regulatory methods are not applicable to its development. Therefore, the relevant regulatory authorities should Combined with the characteristics of the development of digital inclusive finance, to regulate it in a scientific way and method, which is mainly through the Internet channel to provide users with the required financial services, which makes the information of both sides of the transaction can be obtained on the Internet, the information security of both sides of the transaction need to pay attention to the problem, and the establishment of a perfect credit system can to a certain extent protect the user's information security. Therefore, it is very important to establish a safe protection system for users, and the regulatory authorities should seize the technological dividend brought about by the faster development of science and technology, and really do it at the level of scientific and technological development to ensure the safe development of digital inclusive finance, and establish a scientific regulatory system suitable for the development of digital inclusive finance.

References

Bao, W. (2021). *A study on the impact of digital inclusive finance on the urban-rural income gap* [Master, Shandong University of Finance and Economics].

Chen, S. (2020). *A study on digital inclusive finance and the urban-rural income gap in China* [Master, Suzhou University].

Chen, Y., & Song, C. (2022). The Impact of Financial Inclusion Development on the Urban-Rural Income Gap in the Yangtze River Delta Region - An Analysis Based on a Static Spatial Panel Model. *Journal of Shenyang University of Technology (Social Science Edition)*, *15*(06), 537-542. https://kns.cnki.net/kcms/detail/21.1558.C.20210930.1507.002.html

Duan, K. (2021). *A study on the impact of digital inclusive finance on the urban-rural income gap in China* [Master, Shanxi University of Finance and Economics].

Feng, L. (2016). *The impact of financial development on the income gap between urban and rural residents in China* [Master, Hunan University].

Fu, Q., & Huang, Y. (2018). The Heterogeneous Impact of Digital Finance on Rural Financial Needs - Evidence from the China Household Finance Survey and Peking University Digital Inclusive Finance Index. *Financial Research* (11), 68-84.

Guo, F., Wang, J., Wang, F., Kong, T., Zhang, X., & Cheng, Z. (2020). Measuring the Development of Digital Inclusive Finance in China: Indexing and Spatial Characteristics. *Economics (Quarterly)*, *19*(04), 1401-1418. https://doi.org/10.13821/j.cnki.ceq.2020.03.12

Guo, Q. (2020). *An empirical study on the impact of digital inclusive finance on the urban-rural income gap in Henan Province* [Master, Henan University of Economics and Law].

Hu, H. (2020). *A study on the impact of digital inclusive finance development on poverty alleviation* [Master, Southwest University of Finance and Economics].

Huang, J. (2019). *An empirical study on the impact of financial inclusion development on the income of rural residents* [Master, Guangdong University of Foreign Studies].

Jiang, D. (2021). *A study on the impact of the development of digital inclusive finance on the urban-rural income gap in China* [Master, Southeastern University].

Li, H. (2021). *A study on the impact of digital inclusive finance on the urban-rural income gap in Northwest China from a spatial perspective* [Master, Shihezi University].

Li, Y. (2020). *A study on the impact of digital inclusive finance on the urban-rural income gap in China* [Master, Nanjing Agricultural University].

Liang, W. (2021). *An empirical study on the impact of digital inclusive finance on the urban-rural income gap in Shanxi* [Master, Shanxi University of Finance and Economics].

Liu, L. (2020). *An empirical study of digital inclusive finance to narrow the urban-rural income gap* [Master, South China University of Technology].

Luo, H., & luo, J. (2019). A study on the impact of financial inclusion on rural poverty reduction from a multidimensional perspective. *Contemporary Economic Management*, *41*(03), 80-88. https://doi.org/10.13253/j.cnki.ddjjgl.2019.03.012

McBride, N., & Liyala, S. (2021). Memoirs from Bukhalalire: a poetic inquiry into the lived experience of M-PESA mobile money usage in rural Kenya. *European Journal of Information Systems*, 1-22. https://doi.org/10.1080/0960085X.2021.1924088

Niu, Y. (2021). *A study of digital financial inclusion based on the mediating effect of industrial structure on narrowing the urban-rural income gap* [Master, Shanxi University of Finance and Economics].

Peng, C. (2021). *The impact of China's digital inclusive finance development on the urban-rural income gap* [Master, Tianjin University of Finance and Economics].

Qi, J. (2021). *The impact of digital inclusive finance development on the urban-rural income gap* [Master, Shandong University].

Sun, Y., Zhang, D., Wang, X., & Li, D. (2021). Current Situation, Problems and Prospects of Digital Inclusive Finance Development in China. *Quantitative Economic and Technical Economics Research*, *38*(02), 43-59. https://doi.org/10.13653/j.cnki.jqte.2021.02.001

Wang, W. (2020). *A study on the poverty alleviation effects of digital inclusive finance development in China* [Master, Southwest University of Finance and Economics].

Wang, X. (2021). *A study on the impact of digital inclusive finance on the income gap between urban and rural residents* [Master, Xinjiang University].

Xu, J. (2022). *An empirical study on the impact of digital inclusive finance on the income gap between urban and rural residents* [Master, Hebei College of Finance].

Ye, Z., Chen, X., & Zhang, S. (2011). Can financial development reduce the urban-rural income gap? -- Evidence from China. Financial Research (02), 42-56.

Yu, X. (2019). *A study on the impact of digital inclusive finance on the urban-rural income gap in China* [Master, Yunnan University of Finance and Economics].

Zhang, Q. (2019). *Financial Inclusion, Economic Growth and Income Inequality* [Master, Zhongnan University of Economics and Law].

Zhang, T. (2022). *A study on the impact of digital inclusive finance on the urban-rural income gap in China* [Master, Yunnan University of Finance and Economics].

Zhao, J. (2019). *A study on the impact of financial inclusion on the urban-rural income gap* [Master, Qingdao University].