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A Study on the Impact of Digital Inclusive Finance on Urban-Rural Income Gap in Western China

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Abstract: *With the improvement of economic development, people's living standards are getting better and better. But the gap between urban and rural income level is large. This paper studies the relationship between digital inclusive finance and the urban-rural income gap, and puts forward scientific and reasonable suggestions to narrow the urban-rural income gap. In terms of empirical research, this paper selected relevant variables of 104 prefecture-level cities in western China from 2011 to 2019 to form panel data, conducted empirical test, and obtained the result that digital inclusive finance has a reverse relationship with urban-rural income gap, and the coefficient is -0.316. This indicates that the development of digital inclusive finance can significantly reduce the urban-rural income gap of prefecture-level cities in western China. The empirical results are robust. The research conclusion of this paper is that digital financial inclusion is indeed conducive to narrowing the urban-rural income gap. Finally, from the perspective of developing digital inclusive finance, it puts forward some policy suggestions.*

Keywords: *Digital Inclusive Finance; Urban-rural Income Gap; Panel Data; Fixed Effect*

1. Introduction

2022 will be a key year to effectively consolidate the achievements of poverty alleviation and the rural revitalization strategy once absolute poverty has been lifted. However, we should also be clearly aware that the process of poverty alleviation still faces many problems and challenges. The report to the 19th National Congress pointed out in detail that there are many weak areas in the area of people's livelihood, and the gap between urban and rural development level and income distribution is still large.

The imbalance of resource distribution among regions has led to the widening of the income distribution gap between urban and rural residents. The emergence of inclusive finance has effectively improved this situation[1].The purpose of financial inclusion is to provide more equitable access to affordable and appropriate financial services based on formal financial channels, so as to improve people's lives and incomes, especially those who are marginalized[2].In 2005, the United Nations put forward the basic concept of "financial inclusion". The purpose is to enable more social strata and groups with potential or hidden needs for financial services to obtain the required convenient and efficient financial services with affordable costs.

In terms of literature research, research on traditional inclusive finance has been quite abundant at present. With the development of technology and information technology, the term digital inclusive finance and its application have appeared in the scope of public vision and successfully attracted people's attention. In domestic scholars' research, the literature on digital inclusion finance on the income gap between urban and rural areas is mainly based on the sample data of 31 provinces or prefecture-level cities in our country, and few studies mainly focus on a specific regional perspective. At the same time, there are a large number of vulnerable groups such as farmers and low-income people in the western region. For these groups, they are the "long tail group" in the service provision process of financial service institutions, and they cannot obtain low-cost and high-coverage financial services. Therefore, this paper studies its impact on the urban and rural income gap in the whole western region from the perspective of digital inclusive finance, hoping to enrich the research results of the relationship between inclusive finance and income gap, and to solve the problems existing in the development of rural areas, it also has a certain reference significance.

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2. Theoretical analysis and research hypothesis

2.1 Financial development and income distribution

Throughout the literature at home and abroad, scholars' influence on financial development and income gap mainly focuses on three aspects. First, financial development can narrow the income gap[3]. Galor and Zeira (1993) agree with this conclusion. Based on their investigation from the perspective of human capital, they found that there is a negative relationship between financial development and the urban-rural income gap, and financial development can reduce the income gap. This is because in the imperfect financial market, due to their insufficient wealth, the poor class cannot cross the borrowing threshold of financial institutions and invest in human capital, so they can only do simple jobs to earn low income, while the rich class can make human capital investment or higher income, which widens the gap between the rich and the poor. With the improvement of the financial market, loan funds become relatively standardized, low-income people can obtain loan funds to develop themselves, thus narrowing the income gap[4]. Domestic scholars Zhang Shuai and Wang Wenli (2021) selected relevant data of provincial panel data in China to build a fixed-effect model, specifically and deeply discussed the relationship between finance and income gap. The research results found that financial development can promote the improvement of urban-rural income gap, and further concluded that the improvement effect is better in the south than in the north[5].

Second, Financial development will widen the income gap. Haber (1993) analyzed the impact of financial exclusion and pointed out that the development of financial markets would further widen the income gap between urban and rural areas[6]. Wang Yue (2020), a scholar who also holds this view, uses the panel threshold model to study and show that the expansion of financial scale and the improvement of financial structure will expand the income distribution gap in both developing and developed countries, and this expansion effect is more significant in developed countries[7].

Third, there is an "inverted U-shaped" relationship between financial development and income gap. Greenwood and Jovanovich (1990) found through research that financial development had an "inverted U-shaped" relationship with the income gap between urban and rural residents. They believed that in the early stage of financial development, the low-income class could hardly cross the borrowing threshold of financial institutions to obtain credit funds for investment activities to achieve wealth growth. The rich, on the other hand, have easy access to capital and increase their wealth. Therefore, in the early stage of financial development, developing finance will widen the income gap between urban and rural areas. With the improvement of financial products, tools and services, poor groups can cross the borrowing threshold, and the income difference between rich and poor groups will be gradually narrowed due to financial development, resulting in an "inverted U-shaped" relationship[8].

2.2 Inclusive finance and the urban-rural income gap

Galor and Zeira (1993) studied the relationship between inclusive finance and income gap and believed that it alleviated the income gap mainly by enabling rural residents to obtain credit support and thus increase their income[4]. Corrado (2017) believes that inclusive finance meets the financial service needs of the vast number of users, especially the long-tail group, and increases the potential economic development opportunities available to them[2].The research results of Li Jianwei, Li Shusheng and Hu Bin (2015) show that the ratio of urban and rural income will shrink with the improvement of rural financial service level, and the improvement of rural financial service conditions is conducive to improving the income gap between urban and rural areas[9]. Different from the conclusions drawn by previous scholars, You Luhao (2021) reconstructed the inclusive finance index based on the panel sample data at the provincial level, conducted an empirical study on the relationship between inclusive finance development and urban-rural income gap in most provinces, and found that the two showed an "inverted U-shaped" relationship. The urban-rural income gap will first expand with the improvement of inclusive finance, and then show a downward trend at a fixed point[10].

2.3 Digital financial inclusion and the urban-rural income gap

In recent years, the construction and proposal of Peking University's Digital inclusive Finance Index has aroused the attention of domestic scholars. Zhang Biqiong et al. (2021) [11]and Ling Xueqing (2020) studied the relationship among digital inclusive finance, entrepreneurship and income distribution, and adopted empirical research based on the data from 2011 to 2017. The results showed that digital inclusive finance could significantly increase the income of residents, especially rural residents, by lowering the

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threshold of access to financial services. Thus further conducive to the narrowing of urban-rural income gap[12]. Hu Zhongli and Wang Shuhua (2021) believe that the level of urban-rural income gap will decrease with the improvement of digital financial inclusion[13]. At the same time, through the analysis of the indirect effect of inclusive finance on the income gap between urban and rural areas, it is believed that inclusive finance can effectively reduce the cost of obtaining financial services for rural residents, invest more spare funds in production, alleviate local poverty, increase residents' disposable income, and then reduce the income of urban and rural residents.

Based on the above analysis, this study proposes the hypothesis that the development of digital inclusive finance can effectively improve the income of rural residents and narrow the income gap between urban and rural areas through various mechanisms such as continuously lowering the threshold effect, trickle-down effect and inclusion effect.

3. Research design

3.1 Data source

This paper selects panel data of 104 prefecture-level cities in 12 provinces in western China from 2011-2019, all of which come from statistical yearbooks of western provinces, statistical communiques of prefecture-level cities and Digital financial inclusion Index of Beijing University.

3.2 Variable selection and descriptive statistics

3.2.1 Explained variable

Rural-urban income GAP level (GAP): This paper measures the rural-urban income gap by the ratio of the per capita disposable income of urban residents to the per capita disposable income of rural residents in 104 prefecture-level cities in western China. The larger the ratio is, the larger the income gap between urban and rural areas is in the western region.

3.2.2 Explanatory variable

Digital Financial Inclusion Development Level (INDEX): This paper measures the development level of digital financial inclusion through the Peking University Digital Financial Inclusion Index, which is published by a joint research group of Digital Financial Inclusion Research Center of Peking University, Ant Group and Shanghai New Financial Research Institute. The higher the index value, the higher the development level of digital financial inclusion. This paper predicts that the digital financial inclusion index will narrow the urban-rural income gap.

3.2.3 Control variable

This paper selects five indicators, namely the level of economic development (PGDP), the level of fiscal expenditure(FIS), the level of industrial structure(IS), the level of financial development(FIN) and the level of education(EDU), as control variables. The specific meanings of the indicators are as follows:

Economic development level (PGDP): The per capita GDP of 104 prefecture-level cities in the western region is used. It is generally believed that the urban-rural income gap is closely related to the stage and level of economic development in a region. The higher the value, the higher the level of economic development.

Fiscal expenditure level (FIS): It is measured by the ratio of the fiscal expenditure level of prefecture-level cities in the western region to the gross product of prefecture-level cities. Government intervention in economic activities such as fiscal expenditure will affect the level of urban-rural income gap. The greater the ratio, the higher the level of fiscal expenditure.

Industrial structure level (IS): It is expressed by the ratio of the added value of the gross output value of the tertiary industry of 104 prefecture-level cities in the western region to the total output value of the region. It is generally believed that the change of industrial structure will have some impact on the level of employment and income, and the larger the ratio, the larger the proportion of the tertiary industry.

Financial development level (FIN): It is measured by the ratio of the remaining 22 RMB loans of financial institutions in 104 prefecture-level cities in the western region to the regional GDP at the end of the year. The greater the ratio, the higher the level of financial development.

Education level (EDU): The ratio of students in ordinary middle schools in prefecture-level cities to

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the total population at the end of the year is adopted. The greater the ratio, the higher the human capital level of the province, the easier the employment, the higher the income level, and the more able to narrow the urban-rural income gap.

Before the regression analysis in this paper, stata14 software was used to conduct descriptive statistical analysis of each variable. The specific results are shown in Table 1:

Table 1: Descriptive statistical analysis results of variables

Variable	Average	Std.dev.	Minimum	Maximum
GAP	2.731867	0.50725	1.619019	4.625912
INDEX	154.719	63.62362	17.02	281.086
FIS	0.29336	0.227182	0.071259	2.348759
PGDP	44202.94	31080.51	6457	256877
IS	0.392253	0.106273	0.102	0.727
FIN	1.06922	0.796091	0.165491	9.622103
EDU	0.053167	0.011855	0.01923	0.1

4. Model setup and result analysis

4.1 Scatter plot

In order to further explore the relationship between urban and rural income gap and digital financial inclusion, stata14 software is used to draw a scatter diagram of the relationship between the two, as shown in Figure 1.

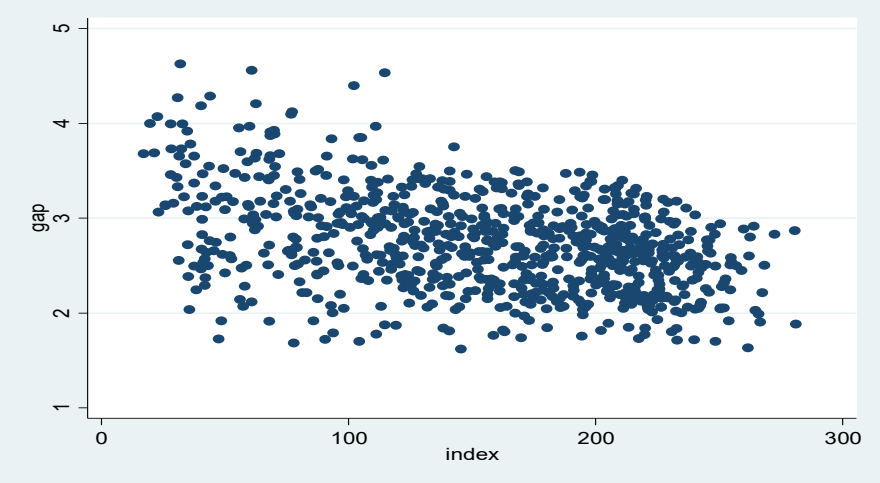

Figure 1: Scatter chart of urban-rural income gap and Digital financial inclusion index in Western China from 2011 to 2019

According to the scatter chart, the urban-rural income gap in western China is indeed negatively correlated with the development level of digital inclusive finance. The higher the development level of digital inclusive finance, the smaller the urban-rural income gap. This also provides the basis for the speculation in this paper.

4.2 Model Construction

On the basis of referring to relevant literature on the factors affecting the urban-rural income gap and relevant literature on digital financial inclusion, this paper constructs the following empirical model:

$$GAP_{i,t} = \alpha_0 + \alpha_1 lnINDEX_{i,t} + \alpha_2 lnPGDP_{i,t} + \alpha_3 FIS_{i,t} + \alpha_4 FIN_{i,t} + \alpha_5 EDU_{i,t} + \alpha_6 IS_{i,t} + \gamma_t + \gamma_i + \varepsilon_{i,t}$$

In order to make the variable series more stable, logarithmic processing is performed on the digital financial inclusion index and per capita GDP. γ_i stands for time fixed effect and γ_t stands for city fixed effect, $\varepsilon_{i,t}$ represents the error term.

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4.3 Regression analysis

Hausman test found that fixed effect estimation was better than random effect estimation. The Hausman statistical test results showed that chi2(6)=16.19, Prob>chi2=0.0235. At the 5% level, the null hypothesis was rejected and fixed effect estimation should be selected. In addition, all the estimation results were based on robust standard error. The fixed effect regression results are shown in Table 2.

Table 2: Regression results of fixed effect model

Variable	Fixed effect
LNINDEX	-0.316***
	(-3.25)
LNPGDP	-0.282***
	(-4.55)
FIS	-0.067
	(-1.23)
FIN	0.012
	(0.72)
EDU	-1.487
	(-0.86)
IS	0.314
	(1.34)
_CONS	7.088***
	(9.88)
N	816

, **and*denote significance at the 10%, 5%, and 1% levels, respectively.*

According to the regression results of fixed effect model obtained in Table 2, digital inclusive finance has a negative relationship with the urban-rural income gap, and digital inclusive finance index plays a very important role in the process of narrowing the urban-rural income gap in western China. At the same time, the regression result is significant at the significance level of 1%, and its coefficient is -0.316, which indicates that the development of digital inclusive finance can significantly reduce the urban-rural income gap of various cities in the western region, which is consistent with the predicted results in this paper.

4.4 Fractal regression analysis

In order to test the impact of the three dimensions of the digital financial inclusion index, namely coverage breadth, use depth and digitalization degree, on the urban-rural income gap, this paper takes the data of these three indicators as the core explanatory variables. Among them, the explained variable and the control variable remain unchanged, and the fixed effect regression of panel data is carried out. The results are shown in Table 3 below.

Table 3: Regression results of fixed effect model in three dimensions

Variable	Coverage span	Service depth	Degree of digitization
three dimensions	-0.167***	-0.090*	0.079**
	(-3.28)	(-1.85)	(2.41)
FIS	-0.066	-0.093	-0.097
	(-1.28)	(-1.53)	(-1.66)
FIN	0.014	0.013	0.013
	(0.79)	(0.71)	(0.69)
IS	0.329	0.26	0.230
	(1.46)	(1.05)	(0.93)
LNPGDP	-0.257***	-0.329***	-0.324***
	(-4.40)	(-5.32)	(-5.29)
EDU	-1.537	-1.4	-1.524
	(-0.89)	(-0.78)	(-0.84)
_CONS	6.226***	6.737***	6.054***
	(9.45)	(10.32)	(9.25)
N	816	816	816

, **and*denote significance at the 10%, 5%, and 1% levels, respectively.*

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The empirical results show that the two dimensions of coverage breadth and use depth under the dimension of digital inclusive finance index are negatively correlated with the urban-rural income gap in western China. The degree of digital support shows a positive correlation with the income gap between urban and rural areas, which may be because urban residents have a higher awareness of digital inclusive finance than rural residents, and are better at understanding and making deep use of the convenience and low cost of digital inclusive finance to facilitate their borrowing activities and increase their income. And rural residents can not use effectively, resulting in urban and rural income gap instead of widening.

5. Robustness test

In order to make the conclusion of this study more credible, this paper uses two methods to test its robustness.

First, consider the lag effect of explanatory variables. The specific approach is to replace the current values of all explanatory variables in the model with those one period behind, and conduct fixed effect regression analysis. The results are shown in Table 4. The regression results show that under the significance level of 1%, the development of digital inclusive finance still has a promoting effect on narrowing the urban-rural income gap, indicating that the core conclusion of this paper is robust.

Second, remove some samples. In order to make the results more rigorous, sample data of prefecture-level cities in three provinces are put forward in this paper, and then fixed regression effect is estimated. The regression results are shown in Table 4. It can be seen from the table that the core conclusions of this paper are still valid after some samples are removed, which once again indicates that the regression results of this paper have a certain robustness.

Table 4: Robustness test results

Variable	One stage lag	Eliminate samples
LNINDEX	-0.304***	-0.186**
	(-3.22)	(-2.25)
LNPGDP	-0.048	-0.326***
	(-0.69)	(-4.20)
FIS	-0.022	-0.493
	(-0.52)	(-1.62)
FIN	0.070***	0.002
	(3.03)	-0.11
EDU	-1.309	-3.873*
	(-0.80)	(-1.98)
IS	0.578**	0.323
	(2.23)	-1.4
_CONS	4.464***	7.272***
	(5.77)	(8.16)
N	816	692

, **and*denote significance at the 10%, 5%, and 1% levels, respectively.*

6. Conclusion

In this paper, the urban-rural income gap and digital financial inclusion index are taken as explained variables and explanatory variables, and the level of industrial structure (IS), level of economic development (PGDP), level of financial development (FIN), level of educational development (EDU) and financial expenditure (FIS) are taken as control variables. The fixed-effect model is used to estimate 816 sample data from 104 prefecture-level cities in 12 provinces in western China. The results show that the core explanatory variable in this paper, namely the digital financial inclusion index, has a negative coefficient, which can promote the reduction of urban-rural income gap at the significance level of 1%. That is, the development level of digital inclusive finance continues to improve, followed by the per capita disposable income ratio of urban and rural residents will become smaller and smaller.

The conclusion can be used for reference in developing digital inclusive finance, narrowing urban-rural income gap and achieving common prosperity. Therefore, three policy suggestions are put forward. First, we need to improve the basic institutions for digital financial inclusion and develop digital financial inclusion in a targeted way. Second, we need to improve relevant laws and regulations and standardize

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supervision over digital financial inclusion. Third, we need to increase the publicity and impact of digital financial inclusion.

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