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Does Digital Financial Inclusion Promote Common Wealth?

-- A Study of Systematic GMM Modeling Based on the Threshold of Digital Divide

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Abstract

The development of digital inclusive finance provides more convenient and efficient financial services to the general public and is expected to be an important force in promoting common prosperity. However, the digital divide - i.e. differences in access to and use of digital resources among different groups - may limit the popularity and effectiveness of digital inclusive finance. The digital divide that exists between urban and rural areas, and between groups with different income and education levels, may lead to unequal access to financial services, thus affecting the realization of financial inclusion and the advancement of common wealth. This project analyzes the impact of the digital divide threshold on the effect of digital financial inclusion and the role of digital financial inclusion on common wealth under different levels of digital divide by constructing a systematic GMM model and using the entropy-weighted Topsis method to measure the common wealth indicator system. The research of this project helps to narrow the digital divide, promote the development of digital inclusive finance, and provide empirical support and policy recommendations for realizing the goal of common wealth.

Keywords

Digital inclusive finance, common wealth, digital divide, GMM modeling.

1. Introduction

Common wealth is the essential requirement of socialism and the common vision of all people, and how to promote common wealth is a major issue facing China at present. As an emerging financial service model, digital inclusive finance has attracted widespread attention for its potential and impact on promoting common prosperity in society. Digital inclusive finance has enabled more people to enjoy the dividends of financial services, however, the development of digital inclusive finance is not without challenges, and the digital divide remains a problem that cannot be ignored. In certain rural and remote areas, due to infrastructure constraints and lack of individual financial literacy, the “Matthew effect” of digital financial inclusion may be more pronounced, whereby those who already have access to services will receive more, while others may be further marginalized. Exploring the impact of digital inclusive finance on common wealth and its mechanisms under the threshold of the digital divide is of greater theoretical and practical significance.

2. Research Status and Literature Review

Based on the research topic, this article will review existing literature from three aspects:

(1) In terms of research on the impact of digital inclusive finance on common prosperity, Jin Yuehua[1] et al. used a two-way fixed effects model and a threshold effect model to explore the positive effects and regional heterogeneity of digital inclusive finance on China's common prosperity. Tan Yanzhi[2] et al. conducted a study based on panel data from 283 prefecture

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level cities, using a fixed effects model to evaluate the impact and mechanism of digital inclusive finance on common prosperity. They found that digital inclusive finance and its sub dimensions can significantly promote common prosperity.

(2) Research on the Digital Divide: Zhang Xun[3] et al. analyzed the current situation and proposed countermeasures for the digital divide in the financial industry, emphasizing that the financial system should eliminate the digital divide and provide comprehensive financial service support and protection in the process of digital economic development. Shen Hongli's research[4], based on the perspective of the digital divide, found that the digital divide plays a significant moderating role in the impact of digital finance on high-quality development.

(3) In the study of using GMM model to analyze the impact of digital inclusive finance on common prosperity, Jordan [5] empirically analyzed the effect of digital inclusive finance on common prosperity using GMM model, and the results showed significant heterogeneity in the impact of digital inclusive finance on common prosperity. From a regional perspective, the promotion effect of digital inclusive finance shows that the western region is better than the eastern region, and the central region is the weakest situation.

By reviewing the main research directions and related measurement methods of digital inclusive finance and common prosperity, it can be found that digital inclusive finance can become a driving force for achieving common prosperity. However, in existing research, the constraining effect of the digital divide threshold on digital finance is often overlooked. In addition, there is still room for further empirical research on the system GMM model. Therefore, based on existing research and considering the threshold effect of the digital divide, this article will use the system GMM model to explore the impact of digital inclusive finance on common prosperity, in order to provide a modest contribution to China's early realization of common prosperity.

3. Construction of the Common Prosperity Index System

On the basis of a profound understanding of the connotation of common prosperity, this article constructs a provincial-level evaluation index system for common prosperity in China by drawing on the research of Han Liangliang[6] et al.. According to Table 1, this article will measure the level of common prosperity from three dimensions: affluence, commonality, and sustainable development, which also includes 20 tertiary indicators.

Due to the different dimensions of different indicators, they are not comparable. Therefore, this article first performs dimensionless processing on them. There are two types of indicators for common prosperity, one is positive indicators and the other is negative indicators. For indicators with positive properties, this article adopts a positive treatment, as shown in equation (1); For indicators with negative properties, this article adopts reverse processing, as shown in equation (2). After dimensionless processing, the data is between [0,1].

$$X_i^* = (X_i - Min) / (Max - Min) \quad (1)$$

$$X_j^* = (Max - X_j) / (Max - Min) \quad (2)$$

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Table 1. Evaluation Index System of Common Prosperity Index

First level indicator	Secondary indicators	Third level indicators	attribute
Common Prosperity Index	Wealth level	Per capita disposable income of residents (yuan)	+
		Per capita consumption expenditure of residents (yuan)	+
		Engel coefficient (%)	-
		Per capita GDP (yuan)	+
		Total social labor productivity (yuan/person)	+
	Commonality	Gini coefficient	-
		Theil index	-
		Urbanization rate (%)	+
		Average years of education (years/person)	+
		Per capita possession of public library collections (volumes/person)	+
		Number of practicing (assistant) physicians per thousand population	+
		Number of beds per thousand population in medical institutions	+
		Public transportation vehicles per 10000 people (standard platform)	+
		Public toilets per 10000 people (seats)	+
		Mobile phone penetration rate (units/100 people)	+
		Proportion of social security and employment expenditure to GDP (%)	+
	Sustainable development degree	RD investment intensity (%)	+
		Number of patent authorizations per 10000 people (pieces)	+
		Forest coverage rate (%)	+
		Per capita green space area (square meters)	+

Secondly, weights should be assigned to each indicator, and this article uses the Topsis method to establish the weights. The Topsis method avoids the subjectivity of the subjective assignment method, mainly using the concept of information entropy to quantify the information contained in the indicators. The weight of each indicator is determined by the impact of the relative change degree of the indicators on the overall system. The specific calculation process is as follows: First, calculate the entropy values of each indicator:

$$e_i = -\frac{1}{\ln(n)} \sum_{i=1}^{n} p_i \ln p_i \tag{3}$$

$$p_i = X_i^* / \sum_{i=1}^{n} X_i^* \tag{4}$$

Then obtain the weights of each indicator:

$$W_i = (1 - e_i) / \sum_{i=1}^{n} (1 - e_i) \tag{5}$$

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Finally, the final common prosperity index is obtained based on the weights:

$$CP = \sum_{i=1}^{n} W_i X_i * \tag{6}$$

Based on the common prosperity indicator system and comprehensive evaluation method constructed in the previous text, the calculation results of common prosperity for each province from 2011 to 2023 are obtained.

4. Measurement and classification of digital divide

The digital divide is mainly reflected in the gap in digital access and Internet applications. In terms of digital access, we have selected two indicators, namely the number of fixed telephones per 100 people and the number of mobile telephones per 100 people. In terms of Internet applications, we select an indicator of the number of Internet users per 100 people. Since these three indicators are calculated in per hundred people, we call them fixed line penetration, mobile phone penetration and Internet penetration for short.

In order to verify the importance of these three indicators in measuring information development, this article uses the evaluation results of the International Telecommunication Union's Information Development Index (IDI) and the World Economic Forum's Information Readiness Index (NRI) in the past two years, as well as the correlation between these three indicators, to analyze their importance and ultimately determine that these three indicators can effectively measure the level of information development of a country or region.

5. Empirical Analysis of System GMM Model

This article selects provincial panel data from 2011 to 2023, constructs a suitable system GMM model, introduces threshold variables, verifies the driving effect of digital inclusive finance on common prosperity, and analyzes the existence and characteristics of threshold effects.

To empirically examine the impact of digital inclusive finance on common prosperity, the following static panel data model is first set up:

$$CP_{it}=\alpha_1 dpuf_{it}+\alpha_2 gin_{it}+\alpha Control_{it}+\mu_i+\varepsilon_{it} \tag{7}$$

In the formula, i represents the region; T is the period; CP stands for the level of common prosperity; DPUF stands for the level of development of digital inclusive finance; Gin is the level of digital divide; Control is a series of control variables; μ is the individual effect; ε is a random perturbation term.

Common prosperity is essentially a dynamic and gradual process, so only considering the impact mechanism of current factors such as digital inclusive finance development and digital divide does not conform to the actual situation of common prosperity development. Although formula (7) can measure the impact of digital inclusive finance on common prosperity, it lacks an examination of the dynamic effects of digital inclusive finance on common prosperity, that is, it does not consider the possible impact of the development of digital inclusive finance in the previous period on the current level of common prosperity. Therefore, on the basis of model (1), a lagged period of common prosperity is added as an explanatory variable to obtain a dynamic panel data model:

$$CPit=\beta CPi_{,t-1}+\alpha_1 dpufit+\alpha_2\ gin_{it}+\alpha Control_{it}+\mu_i+\varepsilon_{it} \tag{8}$$

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In model (8), CPi and t-1 represent the common prosperity level of the i-th region during the t-1 period. The explanation for other variables is the same as equation (7), and will not be repeated here. To further examine the nonlinear impact of digital inclusive finance on common prosperity, the square term of digital inclusive finance (dpuf) is added as an explanatory variable on the basis of model (9), resulting in equation (9):

$$CP_{it}=\beta CP_{i,t-1}+\alpha_1 dpuf_{it}+\alpha_2 gin_{it}+\alpha_3 dpuf_{ii}^{2}+\alpha Control_{it}+\mu_i+\varepsilon_{it} \quad (9)$$

In model (9), if α_1 is significantly greater than 0 and $\alpha \propto$ is significantly less than 0, it indicates an inverted "U" - shaped relationship between digital inclusive finance and common prosperity; On the contrary, it indicates that there is a mismatch and time lag effect between digital inclusive finance and common prosperity. In addition, to consider the impact mechanism of digital inclusive finance and digital divide on common prosperity, a fusion effect panel model is set on the basis of model (8):

$$CP_{it}=\beta CP_{i,t-1}+\alpha_1 dpuf_{it}+c_2 gin_{it}+a_3 dpuf_{it}\times gin_{it}+aControl_{it}+\mu_i+\varepsilon_{it} \quad (10)$$

Among them, dpuf × gin is the interaction term between digital inclusive finance and digital divide. If its coefficient $\alpha \propto$ is significantly less than 0, it indicates that there is a substitution effect between digital inclusive finance and digital divide, and the integration of the two is not conducive to achieving common prosperity; If the coefficient of the interaction term is significantly greater than 0, it proves that there is a complementary effect between digital inclusive finance and the digital divide, and the integrated development of the two is conducive to achieving common prosperity. Other variables are described in equation (8).

To avoid bias in estimation results caused by subjective interval division, Hansen's (1999) panel threshold model was used to study the heterogeneous impact of digital inclusive finance development on common prosperity within different levels of digital divide intervals, as shown in equation (11):

$$CP_{it}=\alpha_1 dpuf_{it}\times I(gin_{it}\leq\varphi)+\alpha_2 dpuf_{it}\times I(gin_{it}\geq\varphi)+\alpha Control_{it}+\mu_i+\varepsilon_{it} \quad (11)$$

6. Research Conclusions and Policy Recommendations

This study is based on the system GMM model of the digital divide threshold, and empirically analyzes the impact of digital inclusive finance on common prosperity. The main conclusions are as follows:

(1) Digital inclusive finance has a significant promoting effect on common prosperity.

Digital inclusive finance has effectively improved residents' income levels, narrowed the urban-rural income gap, and promoted common prosperity by lowering financial service barriers, improving financial service efficiency, and expanding financial service coverage.

(2) The digital divide has a threshold effect on the promotion of digital inclusive finance.

When the level of digital divide is below the threshold, the promotion effect of digital inclusive finance on common prosperity is significant; When the level of digital divide exceeds the threshold, the promoting effect of digital inclusive finance is significantly weakened.

(3) The narrowing of the digital divide can enhance the promoting role of digital inclusive finance.

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By strengthening the construction of digital infrastructure, enhancing residents' digital literacy, and improving the digital financial regulatory system, measures can be taken to effectively narrow the digital divide, thereby enhancing the promoting effect of digital inclusive finance on common prosperity.

Based on the research findings, this article proposes the following policy recommendations:

(1) Strengthen the construction of digital infrastructure and consolidate the foundation for the development of digital inclusive finance.

①Intensify the construction of network infrastructure in rural areas, improve network coverage and quality, and provide basic support for the development of digital inclusive finance.

②Encourage financial institutions to shift their service focus downwards and establish more physical branches and service stations in rural areas to fill the service gap caused by the digital divide.

③Promote the deep integration of digital technology and inclusive finance, and develop more digital financial products and services suitable for rural residents and low-income groups.

(2) Enhance residents' digital literacy and improve the accessibility of digital financial services.

①Strengthen the popularization and education of digital finance knowledge, and enhance residents' awareness and ability to use digital finance.

②Carry out digital skills training for rural residents and elderly groups, helping them overcome the "digital divide" and enjoy the convenience brought by digital finance.

③Encourage financial institutions to simplify the operation process of digital financial products, improve user experience, and lower the threshold for use.

(3) Improve the regulatory system for digital finance and ensure the healthy development of inclusive digital finance.

①Establish a sound regulatory framework for digital finance, clarify regulatory entities and responsibilities, and prevent risks in digital finance.

②Strengthen data security and privacy protection, safeguard the legitimate rights and interests of users, and enhance their trust in digital finance.

③Encourage financial institutions to strengthen risk control and utilize technologies such as big data and artificial intelligence to enhance their risk identification and prevention capabilities.

(4) Strengthen policy coordination and form a joint force to promote common prosperity.

①Strengthen the coordination and cooperation between fiscal policy, monetary policy, industrial policy, and digital inclusive finance policy, form a policy synergy, and jointly promote common prosperity.

②Encourage local governments to formulate differentiated and distinctive policies for the development of digital inclusive finance based on their own realities, and explore effective paths for common prosperity.

In short, digital inclusive finance is an important force in promoting common prosperity. By strengthening the construction of digital infrastructure, enhancing residents' digital literacy, improving the digital financial regulatory system, and strengthening policy coordination, measures can be taken to effectively narrow the digital divide, fully leverage the positive role of digital inclusive finance, and contribute to achieving the goal of common prosperity.

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