An Empirical Study on the Impact of Digital Inclusive Finance on Industrial Transformation and Upgrading
--Based on the Examination of China Data Level

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ABSTRACT

This paper compares the theoretical connotations and mechanisms related to the study of the impact of digital inclusive finance on industrial transformation and upgrading in China, and empirically investigates the relationship between digital inclusive finance and industrial upgrading by combining data at the prefecture-level city level in China. The findings show that digital inclusive finance can effectively promote industrial transformation and upgrading, and finally put forward relevant suggestions.

Keywords: theoretical mechanism; digital inclusive finance; industrial transformation and upgrading

1. INTRODUCTION

In recent years, the rapid development of digital inclusive finance, as a key embodiment of the digital economy, has attracted great attention from countries around the world, and they all hope to take this opportunity to achieve rapid transformation and upgrading of their respective industries and overtake them. Based on big data, cloud computing and other digital technologies, digital inclusive finance can effectively reduce financial transaction costs and the threshold of financial services, expand the scope and coverage of financial services, and solve the problem of financial exclusion faced by traditional finance in the process of promoting industrial development. In the context of digital inclusive finance, various types of digital inclusive financial industry and models have gradually developed, bringing new vitality to industrial development. On the one hand, digital inclusive finance can enrich industrial content and lay a good environment for the development of China's industrial base. On the other hand, digital inclusive finance has a strong role in promoting the interaction and integration of industries, which can improve the efficiency of industries and optimize the industrial structure, and provide sufficient power for industrial transformation and upgrading. Therefore, digital inclusive finance is expected to bring new opportunities for China's industrial development, support China's supply-side reform and economic transformation, and thus provide new strategic directions and path choices for China's economic development.

2. LITERATURE REVIEW

2.1. Traditional financial development and industrial structure upgrading

This kind of research can be divided into two views, the promotion theory and the inhibition theory: (1)The promotion theory argues that financial development can promote the deployment of funds in infrastructure construction projects and the flow in the capital market, improve the external financing environment for enterprises, promote technological innovation, and promote the development of regional infrastructure industries, thus leading to industrial structure upgrading [1][2]. Shi Enyi and Wang Na [3] found that the financial development of China's central and western regions has a certain degree of promoting effect on industrial upgrading under the role of financial scale and financial structure by studying the relationship between financial development and industrial transfer in China's central and western regions. (2)Inhibition theory suggests that the industrial upgrading effect of financial development is influenced by the financial structure, and the financial structure can only promote industrial upgrading if it is adjusted to the optimal structure in a timely manner according to the economic development

situation [4]. If financial development actually hinders the development of the real economy, it will make financial development and industrial upgrading run counter to each other [5]. At the same time, financial spatial characterization can cause low-end industries in a certain region to move to the surrounding areas, thus hindering industrial structure upgrading outside the region [6].

2.2. Current Situation of Digital Inclusive Finance Development

Research on the development of inclusive finance by scholars in China has mainly focused on regional differences in inclusive finance and its influencing factors, etc. Lin Chun et al [7] found, through methods such as Gini coefficient, that the differences in the development of inclusive finance among regions in China have shown a decreasing trend and the degree of polarization has improved, but there is a significant heterogeneity in the evolutionary trend of inclusive finance development among the eastern, central and western regions. Shen Li et al [8] used methods such as Kernel density estimation and spatial Markov chains to find that there are regional differences in the level of financial inclusion in China, and it is at a low level overall. Li et al [9] studied the overall and local spatial differences of inclusive finance in China through the theory and method of spatial autocorrelation analysis, and found that the level of inclusive finance in China showed an overall upward trend, but there was an obvious trend of polarization among regions.

2.3. Impact of Digital Inclusive Finance Development on Industrial Structure Upgrading

With the rise of WeChat payment, Alibaba, Jingdong and other e-commerce platforms, online payment has become an important means of payment for the public, and the wide application of the Internet has promoted the rapid development of digital inclusive finance in China [10]. More and more scholars at home and abroad have begun to pay attention to the impact of digital inclusive finance on economic and social development, and Guo Feng et al [11] constructed the Peking University Digital Inclusive Finance Index from three dimensions: breadth of coverage, depth of use, and degree of digitization, which provides more authoritative data support for the study of digital inclusive finance in China. On this basis, Tang Wenjin and Li Shuang et al [12] studied the relationship between the development of digital inclusive finance and industrial structure upgrading in China by drawing on Hansen's threshold model, and found that the development of digital inclusive finance in the eastern, central and western regions of China all contributed to industrial structure upgrading, and there was a nonlinear relationship between the two. With the development of inclusive finance, the coverage breadth of financial services has been expanded and the allocation efficiency of capital in the capital market among industries has been gradually improved, which is conducive to promoting the optimization and upgrading of industrial structure [13].

3. THEORETICAL MECHANISM ANALYSIS OF THE IMPACT OF DIGITAL INCLUSIVE FINANCE ON INDUSTRIAL TRANSFORMATION AND UPGRADING

In the context of digital inclusive finance, factor flow is accelerated, providing sufficient impetus for industrial transformation and upgrading in terms of industrial scale, industrial efficiency and industrial structure, respectively. Specifically, first, it increases the nodes and channels of factor flow, expands the scale of factor market, and provides more development factors to support industries; second, it promotes the free and convenient flow of factors, enhances the efficiency of factor market, and promotes the synergistic development of industries; third, it enhances the benign interaction among factors, improves the factor market structure, and optimizes the industrial restructuring.

First of all, digital inclusive finance increases factor flow nodes and channels through enterprise platform, and provides abundant and continuous factor input guarantee for industrial development scale. In the context of digital inclusive finance, relying on information technology and Internet platforms, a large number of platform-based enterprises have emerged to promote the unification of multiple streams such as information flow, data flow and capital flow by integrating internal and external resources, giving rise to a large number of new financial business models. Therefore, digital technology brings scale effect and increases the number of factor inputs. At the same time, digital technology and enterprise platforming help reduce the degree of asymmetry of market information and promote the exponential increase of platform users, thus further stimulating the scale of factor inputs and laying a good foundation for industrial transformation and upgrading.

Secondly, digital inclusive finance enhances the efficiency of factor resource allocation and makes the enterprise production function more efficient. In the traditional economic theory, the key variables of enterprise production function $Y=AF(K,L)$ are capital and labor, but with the wide application of digital technology, the form of enterprise production function may undergo some changes, such as adding data elements and changing to $Y=AF(K,L,D)$. Digital technology deeply connects market parties together to achieve effective matching of complex information and

optimize factor resource allocation. Therefore, digital inclusive finance may blur the form of enterprise production function and have a positive feedback effect on factor allocation efficiency, which makes enterprise production show exponential growth characteristics.

Finally, digital inclusive finance enhances the benign interaction among factors and promotes closer integration of industries. For traditional industries, digital inclusive finance accelerates the integration and penetration of information technology and other factors into traditional industries, and promotes industrial transformation and upgrading. Specifically, the adjustment of factor resources can, on the one hand, enhance the connection between industries and promote the high quality development of industrial structure, and on the other hand, it can always flow rapidly in the direction of the lowest cost and promote the rationalization of industrial structure. Therefore, the innovations in mode and technology emerging from the development of digital inclusive finance will contribute to the rational division of labor and benign interaction of industries, and even reconstruct the industrial development mode and organization mode.

In summary, the development of digital inclusive finance will not only influence the scale of industrial development, but also enhance the efficiency of industrial integration, fully realize industrial transformation and upgrading, and may change the future development trend of the industry. Therefore, this paper will further investigate the mechanism of the role of digital inclusive finance development on industrial transformation and upgrading in conjunction with empirical analysis.

4. RESEARCH DESIGN

4.1. Model Setting

In order to test the influence of digital inclusive finance on the upgrading of China's industrial structure, the following model is constructed in this paper. Among them, the explanatory variable IND represents the industrial structure upgrading, the explanatory variable DIFI represents the degree of digital inclusive finance development, CONTROL represents the control variable, and ε represents the random disturbance term.

$$IND_i = \alpha_0 + \beta_1 DIFI_i + \sum \beta_k CONTROL_i + \varepsilon_i \qquad (1)$$

4.2. Variable settings and data description

1. Industrial structure upgrading (IND)

Regarding the industrial structure upgrading indicator variables, this paper selects the proportion of tertiary industry to GDP for examination.

2. Digital Inclusive Finance Development Index (DIFI)

This paper draws on the Digital Inclusive Finance Index (DIFI) released by the Digital Finance Research Center of Peking University, which is a composite of three aspects: breadth of coverage, depth of use and service support, and measures the level of digital inclusive finance development in each region of China. It has currently been widely used by many scholars to study the development of digital inclusive finance and its economic effects in China.

3.Control variables (CONTROL)

(1) Regional economic development level (GDP)

The macroeconomic environment of each region has a large impact on both the upgrading of China's industrial structure and digital inclusive finance, so this paper uses the natural logarithm of the per capita GDP level of each region to represent the level of economic development of each region.

(2) Fiscal expenditure level (GOV)

Fiscal has a certain influence on both industrial development and digital inclusive finance development, so this paper uses the proportion of government fiscal expenditure to GDP as a measure to represent the level of fiscal expenditure in each region.

(3) Society-wide investment (FAI)

The expansion of investment helps guide social capital to relevant industrial fields and digital inclusive finance, driving industrial upgrading and the development of digital inclusive finance. Therefore, in this paper, the whole society investment situation is used as a measurement indicator, and the amount of the whole society fixed asset investment is used to express it.

(4) Information Technology Level (INF)

The development of digital inclusive finance needs the support of modern information technology penetration, and the level of information technology can reflect the degree of information technology popularization and application, which can expand the coverage of digital inclusive finance. Therefore, this paper uses the level of informatization as a measurement indicator and adopts the digital application index released by the China Information Society Measurement Report to express it.

(5) Infrastructure Construction Status (IC)

Good infrastructure construction helps to enhance the convenience of economic or industrial development and provides important impetus for industrial upgrading and the development of digital inclusive finance. Therefore, this paper uses the infrastructure

construction status as a measurement indicator and adopts the number of road miles per capita to express it.

(6) Human capital level (HR)

Both digital inclusive finance and industrial development cannot be achieved without a higher level of innovation, and human capital determines the height of its innovation. Therefore, this paper uses the level of human capital as a measure, and uses the HR index (the proportion of the number of graduates from general high schools and higher education schools to the total population of the region) to express it.

(7) Public Literacy Level (CUL)

The public literacy level can reflect the stock of knowledge and the acceptance of various things in a region. Therefore, in this paper, the number of public libraries is used as a measure of the degree of public literacy.

(8) Social security coverage degree (SEC)

The degree of social security coverage can reflect the reciprocal characteristics of economic development and drive industrial upgrading and digital inclusive finance development. Therefore, this paper uses the

degree of social security coverage as a measurement indicator and adopts the number of medical beds for representation.

(9) Dummy variables (REG)

Add the regional dummy variable, and assign a value of 1 if the city is located in the central and western regions, and 0 otherwise.

Regarding the selection of the sample, considering the availability of data, 261 provinces, cities and autonomous regions were selected for examination in this paper. The year 2015 is taken as the observation point to obtain relevant data about the variables of each region. Regarding the sources of data, except for the Digital Inclusive Finance Development Index from the Digital Inclusive Finance Index released by the Digital Finance Research Center of Peking University and the level of informatization from the Digital Application Index released by the China Information Society Measurement Report, all other indicators examined are from the China Regional Economic Statistical Yearbook and the wind database. The description of each variable above is shown in the table below：

Table 1. Descriptive statistics for each variable

Variables	Sample size	Average value	Standard deviation	Minimum value	Maximum value
IND	261	0.338	0.147	0	1
DIFI	261	0.139	0.134	0	1
GDP	261	0.478	0.179	0	1
GOV	261	0.111	0.102	0	1
FAI	261	0.133	0.141	0	1
INF	261	0.403	0.174	0	1
IC	261	0.452	0.139	0	1
HR	261	0.187	0.177	0	1
CUL	261	0.199	0.122	0	1
SEC	261	0.131	0.120	0	1
REG	261	0.532	0.4999	0	1

4.3. Analysis and testing of empirical results

The model regression results are shown in Table 2. Model (1) shows the regression results with only explanatory variables and core explanatory variables, model (2) adds economic factors at the control variable level to model (1), model (3) adds technological factors at the control variable level to model (2), and model (4) adds social factors and regional at the control variable

level to model (3) dummy variables. From the results, it can be seen that the coefficient of digital inclusive finance (DIFI) is significantly positive, indicating that for every 1 unit change in the degree of development of digital inclusive finance, industrial structural upgrading will be followed by a positive change of 0.25 units, i.e., the digital economy can effectively promote industrial structural upgrading.

To test whether digital inclusive finance promotes industrial structural upgrading through factor mobility, the interaction term between factor mobility (FAC) and digital inclusive finance (DIFI) is added to the regression equation, and the results are shown in model (5). Regarding the quantitative examination of factor mobility level, it is mainly measured by labor factor, capital factor, and technology factor in a comprehensive manner. Among them, the scale of labor factor flow adopts the population of the region, the scale of capital factor flow adopts the amount of regional fixed asset investment, and the technology factor flow adopts the urban innovation index (China Urban and Industrial Innovation Power Report, 2016), and combines with the entropy value method to obtain the comprehensive score of the regional factor flow level. From the regression results, the coefficient of the interaction term is significantly positive, thus testing that the development of digital inclusive finance can further promote the optimization and upgrading of industrial structure by influencing the factor flow level.

From the regression results of the control variables, they are basically consistent with the actual experience. The regression coefficient of regional economic development level (GDP) is significantly positive, indicating that a favorable economic development environment can effectively promote the upgrading of industrial structure. The regression coefficient of regional dummy variable (REG) is significantly negative, indicating that the endogenous motivation of industrial structure upgrading is insufficient in central and western cities with poor economic foundation.

Table 2. Regression results and tests

	（1）	（2）	（3）	（4）	（5）
DIFI	0.597***	0.611***	0.385***	0.250***	0.103*
	(0.057)	(0.070)	(0.085)	(0.089)	(0.050)
DIFI*FAC					0.651**
					(0.272)
GDP		0.059	0.261***	0.0224***	0.237***
		(0.062)	(0.075)	(0.085)	(0.084)
GOV		0.357***	0.319***	0.349***	0.281***
		(0.086)	(0.084)	(0.099)	(0.102)
FAI		0.251***	0.258**	0.044	-0.031
		(0.061)	(0.059)	(0.129)	(0.131)
INF			0.374***	0.332***	0.326***
			(0.084)	(0.081)	0.080
IC				-0.011	0.011
				(0.068)	(0.068)
HR				0.235***	0.250***
				(0.048)	(0.483)
CUL				0.014	0.001
				(0.093)	(0.092)
SEC				0.225*	0.123

				(0.133)	(0.139)
REG				-0.076***	-0.064***
				(0.008)	(0.008)
Obs	261	261	261	261	261
R-squared	0.298	0.389	0.433	0.488	0.560

5. CONCLUSION

This paper empirically investigates the relationship between digital inclusive finance and industrial structure upgrading, and finds that digital inclusive finance is conducive to promoting the effective implementation of China's industrial structure upgrading strategy.

Based on the above research, this paper puts forward the following countermeasures and suggestions: First, to improve the construction of China's digital inclusive finance system according to local conditions. At present, the development level of digital inclusive finance in China is still low, but the construction of financial informatization and digitalization is progressing rapidly, and the financial market has certain latecomer advantages, so it has the basic conditions to achieve "overtaking" the developed countries. The government should ensure that regulation is in place while encouraging innovation in financial services, actively guiding Internet lending, equity crowdfunding and other financing models, tailoring financial policies for innovative enterprises and high value-added industries, and broadening the financing channels for enterprises.

Second, accelerate the improvement of financial infrastructure construction and deepen financial supply-side reform. First, the government should increase the financial supply in regions with relatively backward industrial forms, and promote the upgrading of the industrial structure of the region by improving the coverage of financial products and product quality, and regions with already high industrial form can focus on industrial structure upgrading on the rationalization of industrial structure and coordinate the coordinated development of three major industries. Secondly, the government needs to speed up the construction of financial infrastructure, build an industry-financial docking platform, improve the construction of social credit system and payment system, and further promote the mutual compatibility of digital inclusive finance and the real economy. Finally, the government needs to be alert to the phenomenon of "financial excess", deepen financial supply-side reform, and avoid digital inclusive finance from becoming a "double-edged sword" for industrial structure upgrading.

Third, focus on the coordinated development of regional digital inclusive finance. From the empirical results of this paper, the development gap between regions and within regions of digital inclusive finance in China is still large. In the process of developing digital inclusive finance, the government needs to give more policy inclination to the central and western regions, break the barriers to the flow of financial resources, guide the reasonable flow of financial resources from developed regions to less developed regions, enhance the level of cooperation in the development of digital inclusive finance between regions, strengthen financial exchanges between regions, promote the complementary advantages between regions, so that a benign financial transmission mechanism can be formed between regions and improve the Utilization efficiency.

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