
Impact of Digital Inclusive Finance on Industrial Structure Upgrading-Empirical Analysis Based on Systematic GMM Model

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Abstract: With the support of big data, cloud computing and other technologies, China's digital finance has been developing and deepening, and has been transferred from the consumer side to the production side. With its unique advantages, digital finance has not only eased the plight of traditional financial industries, but also had a great impact on the operation mode and development of other industries. To study the impact of digital inclusive finance on industrial structure upgrading, based on the panel data of 253 prefecture-level cities in China from 2011-2021, this paper uses the systematic GMM estimation method and the mediating effect model to study the impact of digital inclusive finance on industrial structure upgrading, and also to test the transmission effect of regional economic development between the two. It is found that digital inclusive finance has a significant promotion effect on industrial structure upgrading. However, digital inclusion in the previous period will have a negative impact on the current period's industrial structure upgrade. In testing for mediation effects, the regional economic development level has a certain transmission effect, but it shows a masking effect. The degree of impact of digital inclusive finance on industrial structure upgrading also varies among the three regions in the east, central and west, with the central region being the most obvious, followed by the western region and the eastern region being the weakest.

Keywords: Digital Inclusive Finance, Industrial Structure Upgrade, Intermediary Effect, Systematic GMM Model

1. Introduction

With the development of Internet technology and the popularity of mobile smart terminals, digital inclusive finance is developing more and more rapidly in China. As a new financial model, digital inclusive finance has quietly become a new driving force to support China's industrial upgrading, which is of great significance to deepen financial supply-side reform and promote industrial restructuring and upgrading. At the same time, in the critical period when China is turning to high-quality development, the optimization and upgrading of industrial structure is also an inevitable requirement to maintain the new normal of economic development. However, at this stage, the layout of China's industrial structure still has various problems, which restrict the further optimization and upgrading of the industrial structure. As a core component of the modern economy, the financial industry is an important

force in promoting the upgrading of industrial structure. As the digital transformation continues to deepen, the impact of digital finance on the optimization and upgrading of industrial structure and its transmission mechanism still need further research. Therefore, this paper aims to analyze the path of digital finance influencing the optimization and upgrading of industrial structure.

For the issue of the impact of financial development on the optimization and upgrading of industrial structure, scholars at home and abroad have done a lot of research. Among them, the research on the relationship between traditional financial development and industrial structure optimization is richer. Some researchers believe that the development of the financial industry significantly promotes the upgrading of industrial structure, and Luo Chaoping believes that the development of the financial industry can promote the upgrading of industrial structure in four aspects: financial operation efficiency,

financial scale, financial output rate, and financial structure ratio, which provides a new perspective to study the impact of the financial industry on the upgrading of industrial structure [1]. Xie Jiazhi argues that the inclusive nature of financial development has a significant role in promoting the upgrading of industrial structure. Some scholars also argue that the development of finance significantly inhibits the optimization and upgrading of industrial structure [2]. In addition, some scholars argue that the impact of financial development on industrial structure upgrading is non-existent or non-linear. Therefore, only by clearly verifying the relationship between the development of digital inclusive finance and industrial structure upgrading in the context of China's actual situation can we propose a more targeted development strategy for digital inclusive finance, which can truly and effectively promote industrial structure upgrading and the sustainable and healthy development of China's economy.

It can be found that the existing studies mainly focus on the impact of traditional financial development on industrial structure upgrading, while the research on the relationship between digital inclusive finance development and industrial structure upgrading is relatively weak, and empirical tests based on Chinese empirical data are particularly lacking. Therefore, the marginal contribution of this paper lies in the following aspects: first, this paper constructs a dynamic panel model using a systematic GMM estimation method to study the direct impact of digital inclusive finance on industrial structure upgrading in China. Second, theoretically, we further explore and analyze through which mechanism digital inclusive finance acts on industrial structure upgrading, and also test the transmission mechanism of regional economic development level in the process of digital inclusive finance's influence on industrial structure upgrading by constructing a mediating effect model. Third, this paper conducts empirical analysis based on the data of 253 prefectural-level cities in China, which makes the research object more micro and specific and the conclusions more abundant and reliable. Fourth, based on the fact that China's East and West are not developing in an uneven manner, this paper empirically tests the heterogeneity of the impact of digital inclusive finance development on industrial structure upgrading in different regions, which makes the research findings more meaningful for practical guidance and enriches the relevant theoretical system at the same time.

2. Review of Literature

Studies on the influence of digital inclusive finance development on industrial structure upgrading.

At present, based on the economic effects of digital inclusive finance, there are still relatively few papers that deeply study its impact on the transformation and upgrading of China's industrial structure, and most of the existing literature focuses on the direct impact of digital inclusive finance on the upgrading of industrial structure, mainly supporting two types of views: promoting and inhibiting. Scholars who hold the promoting view believe that financial

development plays a catalytic function in the process of economic development in terms of resource allocation and industrial structure change, and that financial development does contribute to industrial structure upgrading [3], and Bruhn and Love argue that inclusive finance optimizes the allocation of funds among industries by increasing the breadth of financial service coverage [4]. In turn, it promotes the upgrading of industrial structure. With the continuous development of the financial system, financial services can effectively alleviate and solve the problems of information asymmetry and transaction costs, which in turn stimulates capital accumulation and technological innovation, and promotes industrial structure optimization and economic development [5]. Zhang pointed out through a VAR model that digital inclusive finance has a significant positive effect on both the rationalization and advanced industrial structure [6]. Zhao Rui, Chen Guoqing, and He Qiuji concluded that there is a significant positive effect of digital inclusive finance on industrial structure upgrading based on the analysis of provincial panel data in China, and it has different degrees of effect in different latitudes [7]. Some scholars have also provided explanations for the magnitude of the impact of digital inclusive finance on industrial structure at different stages of development and its causes.

Scholars who hold the inhibitory viewpoint believe that financial development hinders the development of the real economy, is not conducive to industrial structure upgrading, and has an inhibitory effect on industrial structure upgrading. Specifically, the financialization of the economy will weaken the development of the real economy and cause the divergence between finance and the real economy, which is not conducive to industrial structure upgrading [8]. Ruzong Xie, Mingwan Yang, and Fuchen Bai analyzed by SVAR model and pointed out that digital inclusive finance would inhibit industrial structural upgrading in the short term, and its inhibitory effect is heterogeneous [9]. Using panel data of prefecture-level cities in China, Tang, Wenjin demonstrated through threshold regression that the effect of digital inclusive finance on industrial structure is insignificant and small when the degree of digital inclusive finance development is low, while the effect of digital inclusive finance on industrial structure is more significant and larger when the degree of digital inclusive finance development is high [10]. This is because when the digital inclusive finance system is first established, its negative effect on industrial structure performance is stronger, when the negative effect of the goal of digital inclusive finance that is contrary to commercial sustainability offsets part of the positive effect. According to Yan Xing, the impact of digital inclusive finance on industrial structure is a positive and negative offsetting effect, i.e., it is divided into positive and negative effects [11]. The positive effect mainly affects the industrial structure through resource allocation, financing facilitation and technological progress, while the negative effect is mainly manifested by the fact that the goal of digital inclusive finance is contrary to business sustainability to a certain extent.

3. Theoretical Analysis and Research Hypothesis

3.1. The Impact of Digital Inclusive Finance Development on Industrial Structure Upgrading

The transmission mechanism of digital inclusive finance development on industrial structure upgrading includes positive transmission mechanism and negative transmission mechanism. The positive transmission mechanism is mainly realized through reducing transaction costs, optimizing resource allocation efficiency and consumer demand effect; while the negative transmission mechanism is mainly realized through target shifting effect and insufficient effective demand effect.

3.1.1. Reduce Transaction Costs

Due to the support of big data and other technologies, the inequality of information is reduced, which can reduce transaction costs. In addition, because digital finance can form peer-to-peer, peer-to-face, and face-to-face transaction networks, it can better facilitate mutual selection between buyers and sellers and speed up the entire transaction process. As a result, digital finance can reduce costs while accelerating the flow of funds in the market. Furthermore, since data records are more standardized, comprehensive, and long-term, they can be easily reviewed and kept for a long time, and can be well compared horizontally and vertically, thus reducing research and evaluation costs while improving accuracy. The reduction in cost can speed up transactions, thus accelerating the flow of cash, which can then flow to sectors with higher economic efficiency through financial investment and other means, thus accelerating the change and upgrade of industrial structure.

3.1.2. Optimize the Efficiency of Resource Allocation

Digital inclusive finance supported by digital technology can maximize the efficiency of financial resource allocation and guide all industrial resources to form an aggregation effect and release the vitality of industrial development. First of all, digital inclusive finance can broaden the financing channels in the process of transformation and upgrading of industrial structure, use the Internet platform to carry out online financial services, further broaden the financing channels, and provide diversified and personalized products and services such as credit, insurance, finance, payment and settlement for those in need of finance, thus effectively enhancing the confidence of China's producers, consumers and other market subjects in consumption, investment and export, and further guiding industrial resources to accelerate the gathering of advantageous industries, special industries, and filter low-energy and inefficient industries. Secondly, it can also inject liquidity into the transformation and upgrading of industrial structure. Through the wide popularization of digital financial products and services such as supply chain finance and micro finance, and the large-scale application of financial tools such as financial technology and Internet finance, it can provide continuous and stable financial guarantee for

enterprises to optimize their production and manufacturing methods and efficiently use their production and manufacturing resources, so as to alleviate the problem of capital constraints and thus promote the upgrading of industrial structure.

3.1.3. Consumer Demand Effect

Financial development not only promotes income growth, but also greatly stimulates the improvement of national consumption demand, and the change of income elasticity among products also profoundly affects the consumption structure of residents [12]. The continuous increase in consumer demand and the expansion of product markets have jointly driven a significant increase in consumer demand for product standards and services, which in turn has led to the optimization of the industrial structure on the demand side. At the same time, the demand-side consumption upgrade brought by this financial development can largely alleviate the "bottleneck" and "overcapacity" of industrial production factors in the region or even in a larger scale, and stimulate the development and development of other demand product sectors at the same time based on competitive pressure from the vertical industry chain and industry extension. It also stimulates the development and innovation of other demand product sectors based on competitive pressure from the vertical industry chain and industry extension, thus further promoting the improvement and innovation of the industrial structure [13]. An important function of digital inclusive finance is the use of network and digital technology to realize the convenience of payment and multi-scene application, which effectively extends the reach and service depth of digital finance, thus deeply releasing and stimulating the consumption vitality and demand of various social groups and promoting the upgrading of consumption structure and industrial structure optimization at the demand side level [14], while the rich diversification of financial products, gradually satisfies and stimulates residents' consumption demand and the diversification of consumption demand will promote the transformation and upgrading of the industrial structure [15].

3.1.4. Target Drift and Effective Demand Deficiency Effect

In the current development of digital inclusive finance, there is indeed a situation where reality deviates from expectations. Studies have found that microfinance companies, as an important force in promoting the development of inclusive finance and digital inclusive finance, have a certain degree of "mission drift", i.e., it is difficult to achieve both commercial sustainability and inclusive goals [11]. This will be detrimental to the upgrading of industrial structure in the region. Secondly, the effect of insufficient effective demand is examined. Compared with state-owned or large enterprises, the financial knowledge of the demand side of financial services such as small, medium and micro enterprises in China is poorer, which inhibits the effective demand, i.e., they cannot effectively match and use these financial services [16]. This will also inhibit the upgrading of industrial structure in the region.

3.2. Intermediary Effect of Digital Inclusive Financial Development Affecting Industrial Structure Upgrading

In addition to its direct impact on industrial structure, digital finance can also have positive or negative effects on industrial structure through various paths. The focus of this paper is on the transmission mechanism through the path of "digital inclusive finance, regional economic development level and industrial structure upgrading". The level of economic development is an important indicator to examine the degree of economic development of the whole society. The development of digital industry has led to the formation of "Internet+" model, which can effectively reduce costs, expand the scope of financial services and optimize risk assessment, therefore, the development of digital finance can optimize the allocation of financial resources. The effective use of financial resources can also maximize financial returns, greatly reduce the problem of "financial exclusion", reduce transaction friction and institutional friction, so that industries with low financial efficiency are gradually eliminated due to financing difficulties and low returns, and also enable sectors with high efficiency to obtain more financial support, thus generating more economic profits. This will improve the level of economic development. The increase of economic development can improve the living standard of the people, reduce the gap between urban and rural areas and alleviate the

$$Ais_{i,t} = \beta_0 + \beta_1 Ais_{i,t-1} + \beta_2 Difi_{i,t} + \beta_3 Difi_{i,t-1} + \beta_4 Difi_{i,t-2} + \varphi X_{control} + v_i + \gamma_t + \varepsilon_{i,t} \quad (1)$$

In the above equation, i denotes region, t denotes time, $Ais_{i,t}$ is the dependent variable denoting the level of industrial structure upgrading, $Ais_{i,t-1}$ is the one-period lagged level of industrial structure upgrading, $Difi_{i,t}$ is the independent variable denoting the level of digital financial inclusion development, $Difi_{i,t-1}$ is the one-period lagged level of digital financial inclusion development, v_i denotes individual fixed effects, γ_t denotes time fixed effects, and $\varepsilon_{i,t}$ is the unobserved random error term.

$$Ais_{i,t} = \kappa_0 + \kappa_1 Difi + \kappa_2 X_{control} + v_i + \gamma_t + \varepsilon_{i,t} \quad (2)$$

$$Rgdp_{i,t} = \alpha_0 + \alpha_1 Difi + \varphi_1 X_{control} + v_i + \gamma_t + \varepsilon_{i,t} \quad (3)$$

$$Ais_{i,t} = \theta_0 + \theta_1 Rgdp_{i,t} + \theta_2 Difi_{i,t} + \varphi_2 X_{control} + v_i + \gamma_t + \varepsilon_{i,t} \quad (4)$$

In the above equation, $Rgdp_{i,t}$ is the mediating variable regional economic development level, for the mediating effect model established in this paper, the following tests will be conducted: in the first step, the coefficients of the core explanatory variables in the baseline regression equation (2) will be tested to see whether they are significant at the confidence level; in the second step, the coefficients of the relevant variables α_1 , θ_1 , whether they are significant, will be tested using equations (3) and (4); in the third step, the coefficients of If the above coefficients are significant, it means that there is a partial mediating effect. In the fourth step, the sign of the above coefficients is compared, if the sign is the same, it indicates the existence of mediating effect, if the sign is different, it indicates the existence of masking effect.

contradiction between the rich and the poor, and also create demand, so that industries that can meet people's needs can be better developed. Through the virtuous circle, the overall industrial structure will be more scientific, more balanced and more reasonable.

4. Model Construction and Variable Data Description

4.1. Baseline Regression Model

It can be found from both real life and academic research that the relationship between finance and economic growth is dynamic, which requires that when analyzing the impact of digital inclusive finance on the real economy, we should not only consider the impact of current factors on the real economy, but also consider the impact of past factors on it. At the same time, the endogeneity of digital inclusive finance and real economy growth should be taken into account, so this paper uses the systematic GMM estimation method in dynamic panel model for empirical analysis. This estimation method can solve the problem of weak instrumental variables and endogeneity, while improving the efficiency of estimation. In order to be able to analyze the impact of digital inclusive finance on the real economy in a more systematic way, the benchmark regression model set in this paper is as follows:

4.2. Intermediation Effect Model

In order to empirically test the transmission mechanism of the impact of digital inclusive finance on the real economy, this paper will focus on the mediating effect of the regional economic development level, and further analyze it on the basis of equation (1), combined with the mediating effect model and its testing steps proposed by Wen Zhonglin and others [17]. The specific model is as follows:

4.3. Variables and Data Sources

Industrial structure upgrading index (AIS): borrowing the method of Xu Min and Jiang Yong [18], the primary, secondary and tertiary industries are included to construct the industrial structure upgrading index, and the measurement formula is:

$$\ln ais_{it} = \sum_{i=1}^3 q_i \times i = q_1 \times 1 + q_2 \times 2 + q_3 \times 3 \quad (5)$$

Digital Inclusive Finance Development Level (DIFI): this paper uses the Digital Inclusive Finance Development Index released by the Digital Finance Research Center of Peking

University in 2019 to represent the digital inclusive finance development level of each prefecture-level city, referring to the approach in the article by Yi Xingjian et al.

Level of technological innovation (INNO): this paper uses the number of patents granted by each prefecture-level city to represent the level of technological innovation in each prefecture-level city.

Economic Aggregation Level (EG): Drawing on the study by Zhang Huaming et al. the number of employed people per unit area is used to measure economic aggregation.

Regional economic development level (RGDP): In this paper, the local GDP per capita is used to measure the regional economic development level.

The research data used in this paper are obtained from the China City Statistical Yearbook and the Digital Finance Research Center of Peking University, and are logarithmically processed in the regression analysis.

5. Empirical Tests

5.1. Impact of Digital Inclusive Finance on Industrial Structure Upgrading

The baseline regressions of this paper use the systematic GMM estimation method, and the explanatory variables are selected as exogenous variables with a first-order lag, and the results of the systematic GMM regressions with the explanatory variable being the level of industrial structure upgrading and the core explanatory variable being digital inclusive finance are given in Table 1.

Table 1. System GMM model regression results.

Variable	AIS
	Eq (1)
AIS _{t-1}	0.169** (2.17)
DIFI	0.220*** (6.21)
DIFI _{t-1}	-0.098*** (-4.80)
RGDP	-0.084*** (-4.57)
RGDP _{t-1}	0.044*** (2.68)
EG	0.080* (1.67)
INNO	-0.098*** (-4.80)
Constant	0.460*** (5.54)
AR (1)	0.008
AR (2)	0.074
AR (3)	0.968
Number of samples	2530

Notes. *, **, *** represent the statistical values of the results that are significant at the 10%, 5%, and 1% levels respectively.

In the systematic GMM estimation, the p-value of AR (1)

test is <1%, the p-value of AR (2) test is >5%, and the p-value of AR (3) test is >10%, indicating that there is no third-order serial autocorrelation in the change regression, which indicates that the model effectively overcomes the endogeneity problem. As shown in Table 1, the effect of the lagged first order of industrial structure upgrading on the current period is significant and the effect coefficient is 0.169, indicating that the industrial structure upgrading of each prefecture-level city in China in the previous period has a significant driving effect on the industrial structure upgrading in the current period. The regression coefficient of the core explanatory variable digital inclusive finance is 0.220 and is significant at the 1% level, indicating that the development of digital inclusive finance can significantly promote industrial structure upgrading, while the regression coefficient of digital inclusive finance with a lag of one order -0.098 and is significant at the 1% level, indicating that digital inclusive finance in the previous period has a certain inhibitory effect on industrial structure upgrading in the current period. The reason for this may be due to the difficulty of compatibility between the inclusion goal and commercial sustainability mentioned earlier, and when the time span is lengthened, the development of inclusive finance may inhibit the upgrading of industrial structure.

As for the control variables, the regression coefficient of the regional economic development level is -0.084 and the regression coefficient of the lagged period is 0.044, both of which are significant at the 1% level, indicating that there is a "lag effect" of the economic development level on the promotion of industrial structure upgrading, and the regional economic development level in the current period will inhibit the industrial structure upgrading in the current period. The regression coefficient of economic agglomeration is 0.1. The regression coefficient of economic agglomeration is 0.080, which is significant at the 10% level, indicating that economic agglomeration has a positive effect on the upgrading of industrial structure. The regression coefficient of science and technology innovation level is -0.098, which is significant at 1% level, indicating that science and technology innovation has a certain inhibitory effect on industrial structure upgrading, which may be due to the fact that, however, the output of science and technology innovation is slow and has a lag, and the independent innovation ability of Chinese enterprises is still insufficient in a short period of time, and there is a lack of high-level innovators, which leads to the problem of lack of innovation in the development of real economy and the problem of lack of ability for industrial structure Insufficient ability to promote the upgrading of industrial structure.

5.2. The Intermediary Effect Test of Regional Economic Development Level

According to the model set above, we test whether the regional economic development level plays a mediating transmission role in the process of digital inclusive finance promoting the upgrading of industrial structure. The regression results in the first column of Table 2 show that the

regression coefficient of digital inclusive finance is 0.046 and is significant at the 1% level, indicating that digital inclusive finance has a significant role in promoting industrial structure upgrading, and the regression results in the second and third columns show that α_1 (0.509), θ_1 (-0.014), θ_2 (0.053) are significant and θ_1 have opposite signs to α_1 and θ_2 , indicating that the regional economic development level has a certain The masking effect of regional economic development level inhibits the promotion effect of digital inclusive finance on industrial structure upgrading. This means that digital inclusive finance can directly promote the industrial structure for upgrading and also promote the regional economic development level, but because China is in the stage of high-quality economic development, financial investment, production factors and other resources do not all flow to high-quality, high-tech industries, and the resources flowing to other aspects have to some extent crowded out the technology and investment needed for industrial structure upgrading, so it shows that regional economic Therefore, the regional economic development has an inhibiting effect on the upgrading of industrial structure.

Table 2. Results of the intermediary effect test.

Variable	AIS	RGDP	AIS
	Eq (2)	Eq (3)	Eq (4)
DIFI	0.046*** (19.42)	0.509*** (32.31)	0.053*** (19.26)
RGDP			-0.014*** (-5.04)
LAB	0.001 (0.18)	0.055*** (7.83)	0.001 (0.92)
GOV	0.034* (1.93)	-3.78*** (-32.37)	-0.20 (-0.98)
EG	0.002 (0.70)	0.055*** (3.39)	0.002 (1.02)
R ²	0.132	0.537	0.139

5.3. Regional Heterogeneity Test

Since the development of digital inclusive finance and the real economy in different regions and cities in China differ greatly, this paper further divides the sample data into eastern, central and western regions, provincial capitals and non-capital cities, and empirically tests whether there are differences in the impact of digital inclusive finance on the real economy in different regions.

Table 3. Sub-regional regression results.

Variable	(1)	(2)	(3)	(4)	(5)
	East	Central	West	Provincial cities	Non-Provincial Cities
DIFI	0.060* (1.91)	0.247*** (32.31)	0.131*** (4.01)	0.013*** (3.31)	0.228*** (6.15)
DIFI _{t-1}	-0.008 (-0.45)	-0.111*** (-4.18)	-0.060*** (-3.35)	-0.002 (-0.14)	-0.101*** (-4.61)
AR (1)	0.019	0.026	0.012	0.000	0.013
AR (2)	0.159	0.259	0.329	0.243	0.105
Control variables	yes	yes	yes	yes	yes

Overall, within the three major regions, the development of digital inclusive finance can promote industrial structure upgrading, indicating that the systematic GMM estimation results of this paper are robust. However, the impact coefficients of digital inclusive finance vary across regions, with the largest impact coefficient in the central region (0.247), followed by the western region (0.131), and the smallest in the eastern region (0.060). Analyzing the reasons for this, it may be because in the eastern region, where the economic base is more developed, the contradiction between the goal of financial inclusion and business sustainability is more obvious, leading to the impact of digital inclusive finance on industrial structure upgrading has a certain negative impact, thus offsetting part of the positive promotion effect, while in the western region, various infrastructures of the industrial structure still need to be improved, and the promotion effect of digital inclusive finance is somewhat restricted, so the impact coefficient is smaller than that of the central region. For provincial capitals, the impact of digital finance on industrial structure upgrading is weaker than that of non-capital cities, probably because provincial capitals are more economically developed and the negative impact of "mission drift" is more obvious.

5.4. Robustness Test

The following robustness tests have been conducted, and the results indicate that the conclusions of the empirical analysis are more reliable.

Replacing the core explanatory variables: In the robustness test, the original value of digital inclusive finance is adopted to measure the level of digital inclusive finance development, eliminating the operation of taking logarithm.

Static panel-based robustness test: This paper uses the systematic GMM method for estimation, so the relationship between digital inclusive finance and industrial structure upgrading is analyzed by choosing to construct a static panel, and the empirical results show that the development of digital inclusive finance still promotes industrial structure upgrading.

Table 4. Robustness tests.

Variable	(1)	(2)
	AIS	AIS
DIFI	0.001*** (49.52)	0.049*** (40.53)
R ²	0.160	0.130
Control variables	yes	yes

6. Conclusions and Policy Recommendations

This paper constructs a dynamic panel model based on panel data of 253 prefecture-level cities in China from 2011-2021, and selects a systematic GMM estimation method and a mediating effect model to analyze the impact of digital inclusive finance on industrial structure upgrading. It is found that: first, digital inclusive finance development can significantly promote industrial structure upgrading, but digital inclusive finance in the previous period will have a negative impact on industrial structure upgrading in the current period. Second, the regional economic development level has a transmission effect in the process of digital inclusive finance influencing industrial structure upgrading, which is manifested as a masking effect. Thirdly, the impact of digital inclusive finance on industrial structure upgrading differs in three different regions in the east, west and east China. Digital inclusive finance can promote industrial structure upgrading in all three regions, but the impact is most obvious in the central region, followed by the western region and finally the eastern region.

Based on the above research findings, this paper puts forward the following policy recommendations:

we should deepen the development of digital finance comprehensively, expand the coverage breadth of digital finance, promote digital construction, and improve its efficiency in serving the real economy. Firstly, we should broaden the digital financial financing connection, open up the restrictions of digital finance even further, and expand the scale and breadth of digital finance. At the same time, financial supervision should be strengthened to prevent vicious competition and disorderly development. In addition, while supporting the development of digital finance, the government should avoid interfering with the direction of digital finance investment, etc. It should build a market-oriented incentive mechanism according to the choice of the market, which can effectively avoid the crowding-out effect and inefficient or even ineffective investment, thus improving the efficiency of financial operation, promoting financial development, and thus promoting the upgrading of industrial structure.

There is a problem of "compatibility" between digital inclusive finance and the real economy, which can hinder the upgrading of industrial structure to a certain extent. The government departments and financial institutions should actively popularize the importance of digital inclusive financial development to reduce the negative impact brought by "mission drift".

The development of digital inclusive finance can promote the upgrading of the industrial structure in the backward regions, and increasing and enhancing the supply and digitization of digital inclusive financial services is a powerful means to promote the upgrading of the industrial structure in the backward regions. Government departments and financial institutions should vigorously build digital financial infrastructure, promote the informatization of financial

infrastructure, enhance the level of technology that supports mobile and other convenient payments, and promote the facilitation of payment and credit systems. At the same time, we should consider appropriate development strategies according to the actual situation of each region, develop industries with characteristics and advantages of factor endowment, and adjust the ratio of three industries and resource allocation according to the actual local situation to improve economic efficiency, and regulate the financial market to guide the transformation of industrial structure. In addition, we should encourage financial innovation, provide high-quality financial services, and actively use the benefits generated by digital finance to promote the upgrading of industrial structure.

References

- [1] Luo, Chao-Ping, Zhang, Ziyu & Wang, Zhi-Zhang. (2016). Financial development and industrial structure upgrading: Long-term equilibrium and short-term dynamic relationship. *China Soft Science* (05), 21-29.
- [2] Xie, J. Z., Wang, W. T., and Li, S. C.. "The industrial structure upgrading effect of inclusive financial development." *Contemporary Economic Research* No. 259.03 (2017): 74-83.
- [3] SASIDHARAN S, JIO LUKOSE P J, KOMERA S. Financing constraints and investments in R&D: evidence from Indian manufacturing firms. *the quarterly review of economics and finance*, 2015, 55: 28-39.
- [4] BRUHN M, LOVE I. The real impact of improved access to finance: evidence from Mexico. *journal of finance*, 2014, 69 (3): 1347-1376.
- [5] Chava, SA. Oettl, et al., 2013. "Banking Deregulation and Innovation. *Journal of Financial Economics*. 109 (3): 759-774.
- [6] Zhang, X. Y.. (2016). Inclusive financial development and industrial structure upgrading in China - based on the perspective of shared finance. *Rural Finance Research* (05), 19-25. doi: 10.16127/j.cnki.issn1003-1812.2016.05.004.
- [7] Zhao, R., Chen, G. & He, Q. J.. (2021). A study on the impact of China's digital finance development on industrial structure upgrading. *Contemporary Financial Studies* (Z5), 22-30.
- [8] GENNAIOLI N, SHLEIFER A, VISHNY R. Neglected risks, financial innovation.
- [9] Xie, R. Z., Yang, M. W. & Bai, F. C.. (2022). Digital inclusive finance, resident consumption and industrial structure upgrading - A dynamic analysis of PVAR based on prefecture-level panel data in Guangdong Province. *Survey World* (02), 59-70. doi: 10.13778/j.cnki.11-3705/c.2022.02.007.
- [10] Tang, W. J., Li, X. & Tao, Y. Q.. (2019). Digital Inclusive Financial Development and Industrial Structure Upgrade - Empirical Evidence from 283 Cities. *Journal of Guangdong University of Finance and Economics* (06), 35-49.
- [11] Xing Yan. (2015). The utility and realization of digital inclusive finance: a review and insights. *International Financial Studies* (11), 24-36.

- [12] Kongsamut, P., S. Rebelo and D. Xie, 2001. "Beyond Balanced Growth." *Review of Economic Studies*. 68: 869-882.
- [13] Cai, H. Y. & Xu, Y. Z.. (2017). Does trade opening affect the upgrading of China's industrial structure? *Research in Quantitative Economics and Technology Economics* (10), 3-22. Zhang Guangyuan & Wang Min. (2022). Digital Inclusive Finance and Industrial Structure Upgrading. *Investment and Entrepreneurship* (02), 62-65.
- [14] Yi, Xingjian & Zhou, Li. (2018). Does the Development of Digital Inclusive Finance Significantly Affect Resident Consumption - Micro Evidence from Chinese Households. *Financial Studies* (11), 47-67.
- [15] Liu, Xiangyun & Wu, Wenyang. (2018). Synergistic evolution mechanism of science and technology finance and high-tech industry and empirical test - from Guangdong practice. *Journal of Guangdong University of Finance and Economics* (03), 20-32.
- [16] Zhou, Yang, Wang, Weihao & Liu, Xuejin. (2018). Cognitive ability and financial exclusion of Chinese households-an empirical study based on CFPS data. *Economic Science* (01), 96-112.
- [17] Wen C-L, Zhang L, Hou J-T, Liu H-Y. Mediation effect test procedure and its application [J]. *Journal of Psychology*, 2004 (05): 614-620.
- [18] Xu M, Jiang Y. Can China's industrial structure upgrade narrow the urban-rural consumption gap? [J]. *Quantitative Economic and Technical Economics Research*, 2015, 32 (03): 3-21. DOI: 10.13653/j.cnki.jqte.2015.03.001.