

Research on the Impact of Digital Inclusive Finance on the Upgrading of China's Industrial System

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ABSTRACT: Finance drives the upgrading of industrial structure and promotes the rational allocation of modern economic resources. Digital inclusive finance is a product of digital information technology and the financial industry. It is a new development model that organically combines digital technology and inclusive finance, making the combination of innovative capabilities and service efficiency of financial services a reality. Developing digital inclusive finance and improving the financial accessibility of various groups can not only promote the overall structural reform of the monetary supply side and high-quality development of the financial industry but also further promote the deep integration of digital finance and the real economy by improving product quality, stimulating domestic demand, and promoting high-quality and healthy economic development, technological innovation, and industrial structure upgrading.

This article combines the development background of digital inclusive finance in China, analyzes the current situation of digital inclusive finance and industrial structure development, and then analyzes how digital inclusive finance affects industrial structure upgrading. Based on this, and based on relevant data from 31 provinces in China from 2016 to 2020, the digital inclusive finance index is used to conduct empirical analysis using fixed effect models and intermediary effect models. The results indicate that digital inclusive finance will positively impact the upgrading of industrial structure, and consumer demand and technological innovation play a mediating role in the impact of digital inclusive finance on upgrading industrial systems.

KEYWORDS: Digital inclusive finance; Upgrading of industrial system; Mediating effect

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I. INTRODUCTION

Digital inclusive finance is a new type of development supported by digital technology. Through the organic combination of digital technology and inclusive finance, it can break through the limitations of time and space, improve the quality of financial services, expand the scope of financial services, and improve the coverage and availability of financial services. It is essential to solve information asymmetry between financial supply and demand, prevent and resolve financial risks, and reduce transaction costs. Developing digital inclusive finance and optimizing allocating more financial resources to critical areas and weak links is an essential means to solve the problem of imbalanced and insufficient development, promote shared prosperity, and accelerate the construction of a modern country with shared prosperity and inclusive sharing. The upgrading of China's future industrial structure will be significantly affected by digital inclusive finance. The development of digital inclusive finance can promote upgrading the country's industrial structure and better serve a country's economic growth.

China is currently in a critical period of transformation and development, and how to promote the optimization and upgrading of industrial structure is a significant and complex challenge for current economic growth. The further development of the economy must rely on high-added value and high-tech, and only independent innovation can achieve industrial transformation and upgrading. The result of digital inclusive finance is bound to support small and medium-sized enterprises in obtaining financing, improving innovation mechanisms, promoting the coverage of financial services, and thereby promoting technological progress and upgrading industrial structure.

This study is based on theoretical and empirical analysis of how digital inclusive finance affects industrial structure upgrading. The research perspective is set in the context of the digital inclusive finance era, exploring how industries achieve structural upgrading in this context, providing a valuable basis for exploring the path of industrial structure upgrading in the future.

II. LITERATURE REVIEW

The role of digital inclusive finance in upgrading industrial structure is very prominent (Zhou Luyao,2022). Much literature research tends to recognize the positive relationship between the development of digital inclusive finance and the upgrading of industrial design. Chen Yufei (2021) empirically explores the development of different regions and dimensions based on models such as system GMM and fixed effects. The test results indicate that digital inclusive finance has significantly promoted the optimization and upgrading of China's industrial structure, and the role of digital inclusive finance in the central and western regions is more significant than that in the eastern areas. Wang Wenyu (2021) empirically analyzed the impact of digital inclusive finance on industrial structure upgrading through county-level panel data from 2014 to 2018. The positive promotion of digital HP finance significantly influences upgrading the industrial system in China's central and eastern regions. Based on panel data from China from 2011 to 2018, Zhang Guangyuan and Wang Min (2022) analyzed the impact of digital inclusive finance on the rationalization and upgrading of industrial structure from three dimensions: coverage breadth, depth of use, and degree of digitization, using panel threshold models from a national and regional perspective. Digital inclusive finance has a significant nonlinear relationship with upgrading industrial structure. The coverage of national digital inclusive finance has a particularly negative impact on the rationalization of industrial construction. Tang Wenjin (2019) used the threshold model to propose a significant nonlinear relationship between digital finance and industrial structure upgrading. He found that digital inclusive finance has a particular inhibitory effect on boosting industrial facilities in China's eastern, central, and western regions. The excessive development of digital finance does not promote industrial structure upgrading and causes phenomena such as resource hollowing out and slow economic growth.

Digital inclusive finance can promote upgrading industrial structure through different mechanisms of action. James R. Brown (2012) found that in promoting industrial facility upgrading, financial development first affects the allocation of infrastructure construction projects, constraining the mechanism of capital flow in the capital market, thereby positively impacting the external financing environment of enterprises. With the support of funds, technology can innovate, and regional infrastructure industry development can be promoted, leading to changes in industrial structure. Yang Hong and Wang Qiaoran (2021) pointed out that in terms of the transmission mechanism of effects, digital inclusive finance promotes the upgrading of regional industrial structure through technological innovation effects, entrepreneurial effects, and human capital effects. Zhang Qi and Wang Xiaorun (2022) analyzed the mechanism of action. They concluded that digital inclusive finance has achieved the goal of promoting industrial structure upgrading by expanding funding sources, promoting technological innovation, and promoting consumption.

Reviewing existing literature has found that the research on the relationship between digital inclusive finance and industrial structure upgrading in the academic community is divided into two aspects. Some scholars believe a positive correlation exists between digital inclusive finance and industrial system upgrading. The development of digital inclusive finance can promote upgrading China's industrial structure. In contrast, others believe a nonlinear relationship exists between digital inclusive finance and industrial system upgrading. Digital inclusive finance has a particular inhibitory effect on boosting China's industrial structure. At the same time, research on the mechanism of digital inclusive finance on industrial structure upgrading has found that, based on the views of scholars, this article will analyze how digital inclusive finance affects industrial structure upgrading through two mechanisms: stimulating consumer demand and promoting technological innovation.

III. EMPIRICAL ANALYSIS

3.1 Model variables selection

According to the Petty Clark theorem, with the continuous deepening of economic development, labor will shift from the primary to the secondary and tertiary industries, promoting upgrading industrial structure. Therefore, upgrading the industrial system is not static and should include dynamic transfer characteristics.

This article uses panel data from 31 provinces and cities in China from 2016 to 2020 as the research sample. The digital inclusive finance index is sourced from the Digital Finance Research Center of Peking University, the consumer demand index is sourced from the Wind database, and the remaining data is sourced from the statistical yearbooks of each province. The variables in this article are shown in the following Table.

Table 1: Variable Description

Variable	Indicator	Symbol	Explanation
Explanatory variable	Digital Inclusive Finance Index	Index	Indicating the development level of digital inclusive finance in various regions
	Coverage breadth	Index1	The depth of digital inclusive finance coverage in various regions
Dependent variable	Industrial Structure Upgrade Index	USI	Numerical increase indicates upgrading of industrial structure

	Use depth	Index2	The depth of digital inclusive finance usage in various regions
	Digitization level	Index3	The degree of digitalization of digital inclusive finance in various regions
Control variables	Urbanization rate	X1	The proportion of urban population to total population at the end of the year
	Government intervention	X2	The proportion of local fiscal expenditure to GDP
	Extent of openness to the outside world	X3	The proportion of total exports to total imports and exports
Mediating variable	Consumer demand	Z1	The proportion of total social retail consumption to GDP
	Technological innovation	Z2	The proportion of internal R&D expenditure to GDP

3.2 Model Establishment

To study the impact of digital inclusive finance on industrial structure upgrading, we construct the following model:

$$USI_{i,t} = \partial_0 + \partial_1 Index_{i,t} + \sum \phi_i x_{i,t} + \eta_i + \varepsilon_{i,t} \quad (1)$$

Among them, the dependent variable $USI_{i,t}$ is the industrial structure upgrading Index of province i in year t ; Explanatory variable $Index_{i,t}$ represents the digital inclusive finance index of province i in year t , which incorporates information from three dimensions: coverage breadth (Index1), depth of use (Index2), and degree of digital support services (Index3). To further investigate the impact of these sub-dimensions on industrial upgrading, this article also selects these three indices as further explanatory variables; $X_{i,t}$ are control variables, including urbanization rate (X1), government intervention (X2), and degree of openness to the outside world (X3); η_i represents the fixed effect of provinces; $\varepsilon_{i,t}$ represents the error term.

The specific model is as follows:

(1) Consumer Demand ($Z1_{i,t}$) :

$$USI_{i,t} = \partial_0 + \partial_1 Index_{i,t} + \sum \phi_i x_{i,t} + \eta_i + \varepsilon_{i,t} \quad (2)$$

$$Z1_{i,t} = \beta_{01} + \beta_{11} Index_{i,t} + \sum \phi_{i1} x_{i,t} + \eta_{i1} + \varepsilon_{i1,t} \quad (3)$$

$$USI_{i,t} = \gamma_0 + \gamma_{11} Index_{i,t} + \gamma_{12} Z1_{i,t} + \sum \phi_{i1} x_{i,t} + \eta_i + \varepsilon_{i1,t} \quad (4)$$

(2) Technological Innovation ($Z2_{i,t}$) :

$$USI_{i,t} = \partial_0 + \partial_1 Index_{i,t} + \sum \phi_i x_{i,t} + \eta_i + \varepsilon_{i,t} \quad (5)$$

$$Z2_{i,t} = \beta_{02} + \beta_{12} Index_{i,t} + \sum \phi_{i2} x_{i,t} + \eta_{i2} + \varepsilon_{i2,t} \quad (6)$$

$$USI_{i,t} = \gamma_0 + \gamma_{21} Index_{i,t} + \gamma_{22} Z2_{i,t} + \sum \phi_{i2} x_{i,t} + \eta_i + \varepsilon_{i2,t} \quad (7)$$

The primary descriptive statistical results of each variable are shown in Table 2.

Table 2: Primary descriptive statistical results of variables

Variables	Observations	Mean	Standard deviation	Minimum	Median	Maximum
Usi	155	2.426	0.111	2.243	2.404	2.836
Index	155	2.928	0.494	1.903	2.935	4.319
Index1	155	2.74	0.507	1.672	2.758	3.97
Index2	155	2.914	0.595	1.727	2.909	4.887
Index3	155	3.639	0.413	2.288	3.692	4.622
Z1	155	8.992	1.039	6.13	9.14	10.668
Z1	155	5.67	1.522	0.797	6.114	8.155
X1	155	0.614	0.116	0.316	0.599	0.893
X2	155	8.561	1.011	5.527	8.628	11.726
X3	155	0.546	0.166	0.168	0.591	0.896

Data source: Stata test, 2022.

3.3 Correlation analysis and multicollinearity test

Table 3 shows the correlation coefficients of each variable. It can be found that the correlation coefficients between the explanatory variables Index, Index1, Index2, Index3, and the dependent variable USI are 0.569, 0.560, 0.554, and 0.355, respectively, and are all significant at the 1% significance level. This indicates a

positive correlation between digital inclusive finance and industrial structure upgrading, but the correlation of variables cannot represent causal relationships. Therefore, further hypothesis testing is still necessary through regression analysis in the following text. In addition, the absolute values of most of the correlation coefficients between the explanatory variables Index, Index1, Index2, Index3, and the control variables are below 0.5, which can preliminarily verify that there is no multicollinearity problem between the variables.

Table 3. Correlation Analysis Results

	Usi	Index	Index1	Index2	Index3
Usi	1				
Index	0.569***	1			
Index1	0.560***	0.961***	1		
Index2	0.554***	0.904***	0.835***	1	
Index3	0.355***	0.794***	0.783***	0.578***	1
Z1	0.217***	0.383***	0.311***	0.419***	0.319***
Z2	0.081	0.031	0.028	0.058	-0.023
X1	0.761***	0.553***	0.549***	0.537***	0.322***
X2	0.195**	0.318***	0.294***	0.383***	0.253***
X3	-0.037	-0.06	-0.025	-0.086	-0.066
	Z1	Z2	X1	X2	X3
Usi					
Index					
Index1					
Index2					
Index3					
Z1	1				
Z2	0.088	1			
X1	0.397***	0.027	1		
X2	0.876***	0.033	0.376***	1	
X3	-0.148*	-0.135*	-0.034	-0.075	1

Data source: Stata test, 2022.

To further confirm that there is no multicollinearity problem between variables, variance inflation factor (VIF) is used for testing to ensure modeling appropriateness and multiple regression's reliability. The larger the VIF value, the more pronounced the multicollinearity effect between variables. Severe multicollinearity is generally when the VIF is greater than 10.

Table 4. VIF inspection results

Variable	VIF	VIF	VIF	VIF
Index	1.52			
Index1		1.42		
Index2			1.52	
Index3				1.18
Z1	4.72	4.59	4.65	4.73
Z2	4.43	1.03	4.40	1.03
X1	1.54	1.56	1.49	1.26
X2	1.52	4.40	4.39	4.43
X3	1.05	1.05	1.04	1.05
Mean VIF	2.38	2.35	8.08	2.28

Data source: Stata test, 2022.

The results are shown in Table 4, and the mean VIF between the four explanatory and control variables is within 10. Therefore, there is no severe multicollinearity problem between the variables selected in this article, and the model establishment is relatively appropriate, which can be used for the next step of multiple linear regression analysis of each variable.

3.4 Regression results

Table 5 presents the regression results of model (1), with columns 1 to 4 showing the regression results of the financial inclusion index (Index), coverage breadth (Index1), depth of use (Index2), and degree of digital support services (Index3) on industrial structure upgrading, respectively.

Table5. Regression Results of Digital Inclusive Finance on Industrial Structure Upgrading

Variable	(1) m1 Usi	(2) m2 Usi	(3) m3 Usi	(4) m4 Usi
Index	0.031** (0.012)			
Index1		0.046*** (0.009)		
Index2			0.016** (0.007)	
Index3				0.024*** (0.006)
X1	0.430 (0.325)	0.033 (0.273)	0.762*** (0.224)	0.682*** (0.202)
X2	0.009* (0.005)	0.007 (0.005)	0.009* (0.005)	0.008* (0.004)
X3	0.031** (0.012)	0.031** (0.012)	0.030** (0.013)	0.031** (0.012)
Constant	1.973*** (0.156)	2.199*** (0.125)	1.822*** (0.107)	1.832*** (0.092)
Observations	155	155	155	155
R-Squared	0.465	0.482	0.449	0.468
Number Of Pro	31	31	31	31

Note: ***, **, * respectively represent significant levels at 1%, 5%, and 10% significance levels; The values in parentheses represent the clustering standard error at the provincial level.

Data source: Stata test, 2022.

It can be found that the core explanatory variables that this article focuses on are the coefficients of Index, Index1, Index2, and Index3, which are 0.031, 0.046, 0.016, and 0.024, respectively, and are all significant at the 1% significance level. This indicates that financial inclusion has a significant positive promoting effect on industrial structure upgrading. In terms of the regression coefficients of coverage breadth (Index1), depth of use (Index2), and degree of digital support services (Index3), coverage breadth has the most significant positive promoting effect on industrial structure upgrading, followed by the depth of use, and degree of digital support services. In addition, the control variables selected in this article are also significantly positive, indicating the necessity of controlling these variables.

Table 6 shows the three-step regression results of the mediation effect test of consumer demand, with columns 1 to 3 indicating the regression results of models (2) - (4), respectively.

Table 6. Regression results of the mediating effect of consumer demand

Variable	(1) m1 Usi	(2) m2 Z1	(3) m3 Usi
Index	0.031*** (0.011)	0.058*** (0.0100)	0.029*** (0.011)
Z1			0.044*** (0.014)
X1	0.430* (0.242)	2.545 (1.545)	0.318 (0.236)

X2	0.009* (0.005)	0.076** (0.031)	0.006 (0.005)
X3	0.031** (0.014)	-0.057 (0.089)	0.034** (0.013)
Constant	1.973*** (0.123)	6.638*** (0.782)	1.680*** (0.150)
Observations	155	155	155
R-Squared	0.465	0.228	0.508
Number Of Pro	31	31	31

Data source: Stata test, 2022.

The coefficient of the Index in column 2 is 0.058, which is significant at the 1% significance level, indicating that digital inclusive finance has a positive promoting effect on consumer demand, indicating a significant mediating impact. The coefficient of the Index in column 3 has decreased from 0.031 in column 1 to 0.029, indicating a partial mediating effect of consumer demand in digital inclusive finance and industrial structure upgrading. This means that the increase in digital inclusive finance will drive an increase in consumer demand, further driving the upgrading of the industrial system.

Table 7. shows the three-step regression results of the mediating effect test of technological innovation, with columns 1 to 3 indicating the regression results of models (5) - (7), respectively. The coefficient of the Index in column 2 is 1.353, which is significant at the 5% significance level, indicating that digital inclusive finance has a positive promoting effect on technological innovation, indicating a significant mediating impact. The coefficient of the Index in column 3 decreased from 0.031 in column 1 to 0.026, meaning that technological innovation has a partial mediating effect in digital inclusive finance and industrial structure upgrading. That is to say, the increase in digital inclusive finance will drive the development of technological innovation, further driving the upgrading of industrial systems.

Table 7. Regression results of the mediating effect of technological innovation

Variable	(1)	(2)	(3)
	m1	m2	m3
	Usi	Z2	Usi
Index	0.031*** (0.011)	1.353** (0.637)	0.026** (0.011)
Z2			0.004*** (0.002)
X1	0.430* (0.242)	-30.755** (14.084)	0.558** (0.241)
X2	0.009* (0.005)	-0.130 (0.280)	0.010** (0.005)
X3	0.031** (0.014)	-0.770 (0.810)	0.034** (0.014)
Constant	1.973*** (0.123)	22.124*** (7.131)	1.881*** (0.124)
Observations	155	155	155
R-Squared	0.465	0.054	0.496
Number Of Pro	31	31	31

Data source: Stata test, 2022.

IV. CONCLUSION

- 1) There is a positive relationship between developing digital inclusive finance and upgrading industrial structure. That is, developing digital inclusive finance can promote upgrading the industrial system.
- 2) The positive promotion effect of digital inclusive finance on industrial upgrading can be confirmed in terms of coverage, depth of use, and degree of digitization, with range having the most significant impact on industrial upgrading.
- 3) Consumer demand and technological innovation mediate the process of digital inclusive finance affecting industrial structure upgrading. Digital inclusive finance can directly promote industrial structure adjustment and optimization and indirectly promote industrial system boosting by increasing consumer demand and promoting technological innovation.

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