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Enhancing Industry Evolution: The Role of Digital Inclusive Finance in Optimizing and Upgrading the Industrial Structure

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Abstract

The upgrading of digital inclusive finance has markedly enhanced the financing and operational milieu for small and micro enterprises (SMEs), exerting a pivotal influence on the optimization of the national industrial structure. This paper leverages panel data spanning from 2011 to 2020 across 30 provincial-level administrative regions within China to scrutinize the ramifications of digital inclusive finance on the amelioration and elevation of the industrial framework. It endeavors to assimilate the construct of digital inclusive finance into the analytical paradigm concerning the evolution of industrial structures, embarking on a dual-faceted investigation from both theoretical constructs and empirical evidences to elucidate the dynamics between digital inclusive finance and the upgrading of China's industrial structure. The empirical outcomes underscore that digital inclusive finance substantially fosters the refinement of the industrial architecture, particularly accentuating its positive leverage on the rationalization of industrial structure. Subsequent explorations reveal a regional heterogeneity in the facilitative effects of digital inclusive finance on industrial structure optimization and upgrading, with more pronounced significances identified within the central and western regions of China. Moreover, it is discerned that divergent domains of digital inclusive finance impart differential impacts on the optimization efficacy of the industrial structure. This discourse not only augments the scholarly dialogue on digital finance and industrial progression but also proffers empirical insights for policy formulations aimed at harnessing digital inclusive finance as a strategic instrument for economic augmentation and industrial sophistication.

Keywords: digital inclusive finance, industrial structure, advancement of industrial structure, rationalization of industrial structure

1. Introduction and Literature Review

The Nineteenth Central Committee of the Communist Party of China's Fourth Plenary Session marked the first inclusion of data into the factor distribution system, signifying China's entrance into a new phase of massive unleashing of digital economy benefits. Against this backdrop, inclusive finance, as a vital driver of China's socio-economic development, plays a critical role in its deeper upgrading. Over the past decade, China has vigorously promoted the development of inclusive finance, aiming to

foster inclusive growth of the socio-economic system through the universalization and deepening of financial services. However, inclusive finance still confronts numerous challenges in practice, with information asymmetry being particularly prominent. This asymmetry complicates financial institutions' customer information gathering and risk control, adversely affecting the robust operation and sustainable development of inclusive finance business, and hindering further resolution of financial exclusion, thus affecting the universality and fairness of financial services. In this context, the emergence of digital inclusive finance significantly broadens the depth and breadth of inclusive finance application. Digital inclusive finance, a product deeply integrated with digital finance and cutting-edge technologies like big data mining and cloud computing, leverages powerful online platforms and a vast user base of mobile terminal (Fu, Qiuzi & Huang, Yiping, 2018), achieving precise financial service coverage for all social strata at an extremely low cost. This innovative model of "digitalization + inclusive finance" not only tremendously lowers the financial service entry threshold but also enhances the effective operation of pricing mechanisms and efficient information flow, effectively breaking financial service end barriers and pushing financial services towards sustainable development with high coverage and low costs (Bei, Duoguang, & Li, Yan, 2017). With its unique features such as individual payments, account coverage, insurance funds, and micro-credits, digital inclusive finance displays a significant poverty alleviation effect, effectively easing income disparity issues and liquidity constraints caused by financial exclusion (Huang, Qian, Li, Zheng, & Xiong, Deping, 2019), and broadly stimulating consumer spending, especially among middle- and low-income and indebted groups (Yi, Xingjian, & Zhou, Li, 2018).

The upgrading of industrial structure, as a core driving force of modern economic evolution (Kuznets, S., 1966), characterized by industrial transfer, upgrading of sectoral and industry structures, and internal industrial evolution, is key to enhancing the quality of economic growth and achieving sustainable development (Wu, Fenghua, & Liu, Ruiming, 2013). Amid profound transformations in the global economic landscape and increasingly intense industrial competition, especially under the dual strategic drive of "re-industrialization" and "digital transformation," promoting the optimization of the industrial structure has become a crucial engine for enhancing China's overall economic competitiveness. Financial services, acting as a catalyst for the efficient allocation of resources and upgrading of economic structures (Rin, M. D., & Hellmann, T., 2002), through their efficient operation, reasonable scale, and structural optimization, are narrowing the technological gap between regions and promoting the optimization and upgrading of industrial structures (Aghion, P., Howitt, P., & Mayer, F. D., 2005). Digital inclusive finance, with its low service threshold and cost advantages, is emerging as a new force in promoting industrial structure upgrading. As financial service digitization progresses, the efficiency of credit resource allocation and the industrial financing environment have been significantly optimized, which will have a more profound and widespread impact on industrial structure upgrading (Sheng, Dan, & Wang, Yongjin, 2013). However, at the critical stage of China's economic growth model transformation and industrial structure optimization and upgrading, how to fully leverage the unique advantages of digital inclusive finance to promote the overall optimization and upgrading of the industrial structure, and thereby achieve the coordinated development of regional industries, remains to be further explored.

In view of this, this paper utilizes the China Digital Inclusive Finance Index to assess the impact of digital inclusive finance on the optimization and upgrading of China's industrial structure. The marginal contributions of this paper are twofold: firstly, it utilizes the China Digital Inclusive Finance Index combined with relevant provincial panel data to explore the intrinsic connection between digital inclusive finance and industrial structure optimization; secondly, it investigates the impact differences of digital inclusive finance on the optimization of industrial structures across different regions of China, as well as the structural heterogeneity of the effects of digital inclusive finance across different dimensions, hoping to enrich the literature on the factors influencing industrial structure optimization and upgrading from the perspective of digital inclusive finance to some extent.

2. Theoretical Analysis and Research Hypotheses

The upgrading of industrial structure, driven by

continuous upgrading in technology and the level of production socialization, refers to the process of deep transformation where the industrial structure achieves constant improvements in efficiency and level. This process involves the optimization of the internal structure within industrial sectors and the improvement of inter-industry relational modes, aiming to adapt to the new characteristics of economic development stages and changes in market demand.

At the current stage of China's economic development, the upgrading of industrial structure shows a significant trend of integration between new technologies and real industries. Frontline technologies such as the internet, big data, artificial intelligence, and the sharing economy demonstrate enormous potential in promoting the transformation and upgrading of traditional industries, enhancing production efficiency, and optimizing resource allocation. The deep application of these technologies not only gives rise to emerging industries, new business forms, and models but also provides a robust impetus for the innovation and upgrading of traditional industries, further promoting a steady increase in the proportion of the new economy.

Existing research indicates that financial development can facilitate the growth of emerging industries, guide the exit of declining industries from the market, and is a crucial factor influencing industrial structure upgrading (Beck, T., & Levine, R., 2002). As an organic combination of digital technology and traditional finance, digital finance has emerged as a new business form, significantly driving the inclusive development of the financial industry and achieving precise docking of financial capital with real economy industry capital. From the supply-side perspective, the development of digital finance is inseparable from the effective support of digital infrastructure, which in turn fosters the flourishing development of the information service industry. The widespread use of mediums such as the internet, mobile communication, and data platforms has had a profound impact on the manufacturing sector's production and distribution links. This process of informatization compels manufacturing enterprises to adopt internet thinking and utilize digital technology to optimize management modes, enhance the degree of production automation and efficiency, thereby providing solid support for the upgrading of industrial structure.

From the demand-side perspective, digital finance, by optimizing payment settlement tools and perfecting the payment settlement system, greatly enhances payment convenience. This enhancement not only stimulates consumers' desire to consume but also enriches their intertemporal consumption choices, effectively releasing new consumption demands and potential consumption intentions. These diversified consumption demands, as the most effective and fundamental driving force for industrial structure upgrading, inject new vitality into the optimization and upgrading of industrial structure from the demand end.

Based on the above analysis, this paper proposes the following research hypothesis:

H1: Digital inclusive finance is conducive to the upgrading of the industrial structure.

H2: Digital inclusive finance is conducive to the rationalization of the industrial structure.

3. Research Design

3.1 Variable Selection

3.1.1 Explained Variables

Current research on the optimization and upgrading of industrial structure mainly focuses on dimensions such as the rationalization of industrial structure, the upgrading of industrial structure, and the internal evolution of industrial structure. Considering the issue of data availability, this paper establishes indicators for the optimization and upgrading of China's industrial structure from the following two perspectives:

(1) Advancement of Industrial Structure (adv): The advancement of industrial structure holds significant importance for driving sustained economic growth, enhancing national competitiveness, promoting social progress, and improving the standard of living of the people in China. In this paper, the proportion of the tertiary sector in GDP (%) is used as a measure of advancement.

(2) Rationalization of Industrial Structure (rat): The rationalization of industrial structure (rat) is an important indicator measuring the rationality of resource allocation and the distribution of industrial structure, as well as development coordination. This paper uses the reciprocal of the Theil index of each region as the measure of

industrial structure rationalization. The higher the index value, the more rational the industrial structure is.

3.1.2 Explanatory Variables

Digital Inclusive Finance (index): The Digital Inclusive Finance Index by Peking University (2011-2020) constructs a comprehensive indicator system including three dimensions and a total of 33 indicators, representing the most authoritative and objective data on digital inclusive finance to date. This study measures the impact on the rationalization of industrial structure using the logarithm of the digital inclusive finance index in each region.

Breadth of Digital Finance (breadth): This dimension focuses on the coverage capability of digital financial services for different populations, especially those not reached by traditional financial services. It examines the popularization of digital financial services across different regions and socio-economic groups, and their ability to provide basic financial services to a broader population, primarily reflected through the number of electronic accounts.

Depth of Use of Digital Finance (depth): This dimension concentrates on the frequency and extent of users' engagement with digital financial services. It assesses not only whether people have digital financial accounts but, more importantly, whether they actively use these services for transactions, payments, savings, loans, and other financial activities, reflecting the actual use, design domain, and business capability of the services provided by digital finance.

Digitalization Level of Digital Finance (dig): This dimension pays attention to the digitalization level of financial services, including the upgrading of technology, digital characteristics of financial products and services, and the application degree of digital technology in financial services. This is manifested in the proliferation of mobile payments, development of online lending platforms, and emergence of innovative financial tools like digital currencies, measured by their convenience and cost-effectiveness.

3.1.3 Control Variables

As a complex development concept, the optimization and upgrading of industrial structure are influenced not only by the aforementioned explanatory variables but also by many other aspects. Based on previous research on digital inclusive finance and industrial structure upgrading, this paper selects seven aspects as control variables: the level of economic development, government intervention, labor costs, openness to the outside world, fixed asset investment level, urbanization rate, and level of technological innovation.

Level of Economic Development (econ): The level of economic development reflects the scale, speed, and standard of a country's economic development, an important sign of the state and potential of economic development. Since the reform and opening up, China's economy has grown rapidly, making the level of economic development increasingly significant. This paper measures the level of economic development using the logarithm of per capita GDP (in billions of yuan) for each province.

Degree of Government Intervention (gov): Government fiscal expenditure intervention plays a resource-guiding effect, significantly influencing the advanced and rationalized industrial structure, thereby affecting the optimization and upgrading of industrial structure. This paper measures the degree of government intervention using the proportion of provincial fiscal expenditure in regional GDP.

Labor Costs (labor): Labor costs, to some extent, reveal the quality and structural situation of the population factor between and within industries, affecting the upgrading of industrial structure. This study measures labor costs using the logarithm of the average wage of workers in factories in each province.

Level of Openness (open): With the impact of economic globalization, the degree of openness of a country's economy can affect capital flow, technology transfer, adjust employment structure, thereby influencing the optimization and upgrading of industrial structure. This paper measures the level of openness using the logarithm of the total amount of imports and exports (in billion USD) for each province.

Level of Fixed Asset Investment (fixed): Effective fixed asset investment can promote the optimization and upgrading of industrial structure, promoting regional economic development. This paper measures the level of fixed asset investment using the proportion of total fixed asset investment to GDP for the year in each province.

Level of Urbanization (urban): The level of urbanization involves many aspects of a

country's spatial structure, population distribution, and economic development. Therefore, the impact of the urbanization rate on the optimization and upgrading of a country's industrial structure cannot be ignored. This paper measures the level of urbanization using the proportion of urban population to the total permanent population at the end of each year for each province.

Level of Technological Innovation (tech): Through technological innovation, the combination of production factors is optimized, thereby promoting the optimization and upgrading of industrial structure. This paper measures the level of technological innovation using the logarithm of the number of patent applications by domestic applicants.

3.2 Model Construction

Based on the selection of research variables for this study, the following panel data model is constructed as the basic regression model for the research, as shown below:

$$ISU_{it} = \beta_0 + \beta_1 Fin_{it} + Controls + \delta_i + \delta_t + \varepsilon_{it}$$

Where i represents the province, t represents time, ISU_{it} denotes the upgrading of industrial structure which is measured by two indicators: Advancement of Industrial Structure (adv) and Rationalization of Industrial Structure (rat), Fin_{it} represents digital inclusive finance (index), δ_i represents individual fixed effects for provinces, δ_t represents time fixed effects, and ε_{it} represents the error term; β_0 is the constant term coefficient, and β_1 represents the coefficients of various explanatory variables, with $1 \le i \le 30$, $1 \le t \le 10$. In addition, the Digital Inclusive Finance Index is further verified from three sub-domains: the breadth of digital inclusive finance (breadth), the depth of use of digital inclusive finance (depth), and the digitalization level of digital inclusive finance (dig).

3.3 Data Source and Descriptive Analysis

This paper utilizes provincial panel data from 30 provinces in China (excluding the Tibet Autonomous Region) over ten years from 2011 to 2020, totalling 300 sample observations, to empirically test the impact and effectiveness of digital inclusive finance on the optimization and upgrading of the industrial structure. The data on digital inclusive finance is sourced from the Digital Finance Index by Peking University (2011-2020), while the remaining data for measuring the optimization and upgrading of industrial structure are selected from the "China Statistical Yearbook", National Bureau of Statistics, or Wind database. Missing data for certain provinces are supplemented using interpolation methods.

The statistical descriptive analysis of the variables is shown in Table 1.

Table 1. Statistical description of each variable

Variable	Observations	Mean	Std. Dev.	Min	Max
adv	300	47.147	9.762	29.700	83.900
rat	300	34.519	60.082	0.816	339.179
index	300	217.246	96.968	18.330	431.928
econ	300	10.841	0.436	9.706	12.013
gov	300	0.264	0.115	0.119	0.758
labor	300	11.048	0.336	10.375	12.128
open	300	6.170	1.567	1.202	9.298
fixed	300	0.831	0.444	0.210	3.193
urban	300	0.602	0.118	0.363	0.896
tech	300	10.713	1.403	6.596	13.782

4. Empirical Results

4.1 Benchmark Regression Results

Before conducting the multivariate regression analysis, the Hausman test indicates that using a fixed effects model estimation aligns more closely with the characteristics of this paper's sample.

Table 2. Benchmark regression results

VARIABLES	(1)	(2)	(3)	(4)
	adv		rat	
index	0.0522***	0.0412***	0.0250***	0.1767***
	(33.009)	(5.415)	(5.359)	(7.491)
econ		-12.3269***		-2.4135
		(-7.505)		(-0.474)
gov		6.0231		28.3778
		(0.972)		(1.476)
labor		7.7378**		-53.4701***
		(2.577)		(-5.738)
open		-0.5203		-4.2629**
		(-0.843)		(-2.225)
fixed		-0.4273		10.4827***
		(-0.461)		(3.644)
urban		-54.8480***		6.6365
		(-5.864)		(0.229)
tech		-1.2683**		0.9970
		(-2.011)		(0.509)
Constant	35.8018***	134.9463***	10.2419***	589.6176***
	(95.660)	(3.628)	(9.271)	(5.108)
R-squared	0.802	0.862	0.096	0.302

The results in brackets are t-statistics; ***, **, and * indicate that the test result is significant at 1%, 5% and 10% significant levels, respectively.

Table 2 reports the benchmark regression results of the impact of digital inclusive finance on the optimization and upgrading of industrial structure. The empirical results show that the core explanatory variable, the digital inclusive finance index, has a significantly positive impact on both the rationalization and upgrading of the industrial structure. Specifically, columns (2) indicate that holding other control variables constant, a 1% increase in the digital inclusive finance index corresponds to a 0.0412 increase in the levels of industrial upgrading: H1: Digital inclusive finance is conducive to the upgrading of the industrial structure is thus proven. Column (4) indicate that holding other control variables constant, a 1% increase in the digital inclusive finance index corresponds to a 0.1767 increase in the levels of industrial upgrading: H2: Digital inclusive finance is conducive to the rationalization of the industrial structure is thus proven. This thoroughly demonstrates that the development of digital finance is an important driving force behind the rationalization and upgrading of industrial structure.

Regarding control variables, the regression coefficients of the control variables are broadly in line with those of the digital inclusive finance index. Among them, labor costs have a significantly positive effect on the upgrading of industrial structure but a reverse effect on its rationalization. A possible reason is that labor, as a basis of economic development, is conducive to accelerating the speed and degree of industrial structure upgrading, thereby speeding up the process. Due to the heterogeneity of the three major sectors, which have different demands for the quality of their laborers, higher quality laborers are more beneficial to the development of the tertiary sector. Therefore, an increase in labor costs is beneficial to the upgrading of industrial structure. However, the increase in labor costs may also affect the relocation of labor-intensive industries, which could negatively

impact the rationalization of industrial structure. An improvement in the level of economic development has a significant negative effect on the upgrading of industrial structure, possibly because the income disparity brought by economic development affects the demand for high-end products and services, and industries with low technical content may expand rapidly in the short term. Additionally, urbanization also has a significant negative impact on the upgrading of industrial structure, possibly due to the excessive concentration of population it brings, leading to resource allocation imbalances, increased infrastructure pressure, and excessive business agglomeration affecting the upgrading of industrial structure.

Overall, the development of digital inclusive finance has a greater promotive effect on the rationalization of industrial structure than on its upgrading. This may be because the development of the tertiary sector and the expansion of high-tech industries have long-term and complex processes that require support from technological reforms and other aspects. Merely the high-tech nature of the financial industry is not sufficient to influence the upgrading of industrial structure significantly.

4.2 Robustness Test

To ensure the robustness of the empirical results, this study employs the following methods for testing:

Endogeneity Discussion: To alleviate the endogeneity issues caused by sample selection bias, propensity score matching method with the radius caliper matching technique was employed. The matching variables were the existing control variables, and the matching ratio was set to one-to-one. Subsequently, a re-examination was conducted using the matched samples to ensure the robustness and reliability of our research findings. The results are shown in Table 3.

Table 3. Propensity score matching results

VARIABLES	(1)	(2)
	adv	rat
index	0.054*	0.039**
	(1.667)	(2.273)
Controls	Yes	Yes
Constant	251.703***	-471.709***
	(5.452)	(-3.376)
Province	Yes	Yes
year	Yes	Yes
Number of id	234	214
R-squared	0.956	0.997

The results in brackets are t-statistics; ***, **, and * indicate that the test result is significant at 1%, 5% and 10% significant levels, respectively.

1) Change the model and regression was conducted using a random-effects model. The results are shown in Table 4.

Table 4. Random-effects regression results

VARIABLES	(1)	(2)	(3)	(4)
	adv		rat	
index	0.0525***	0.0145*	0.0560***	0.4221***
	(32.335)	(1.940)	(2.931)	(4.733)
econ		-8.7733***		21.4402

		(-5.322)		(1.092)
gov		3.8769		37.4057
		(0.666)		(0.539)
labor		22.1016***		-115.4479***
		(8.178)		(-3.584)
open		1.2657**		-7.2520
		(2.320)		(-1.116)
fixed		-1.8954**		1.0658
		(-2.094)		(0.099)
urban		16.5660***		266.5422***
		(2.903)		(3.912)
tech		-0.2851		4.4885
		(-0.521)		(0.688)
Constant	35.7510***	-119.2654***	22.3614**	811.2262***
	(30.766)	(-4.560)	(2.421)	(2.599)

The results in brackets are z-statistics; ***, **, and * indicate that the test result is significant at 1%, 5% and 10% significant levels, respectively.

The robustness test results are consistent with the benchmark regression results mentioned earlier, indicating that the research conclusions of this article are robust.

4.3 Regional Heterogeneity Test

Given the differences in economic development levels and industrial structure conditions across China's regions, this paper re-examines the impact of the core explanatory variable on the upgrading of industrial structure based on spatial heterogeneity. According to differences in economic development levels and geographical locations, combined with the official regional division of the National Bureau of Statistics, this paper selects the eastern, central, and western regions for separate testing.

Table 5. Regional heterogeneity test

VARIABLES	East		Middle		West	
	(1)	(2)	(3)	(4)	(5)	(6)
	adv	rat	adv	rat	adv	rat
index	0.0258***	0.2775***	0.0565***	0.1862***	0.0534***	0.1269***
	(2.997)	(5.998)	(3.205)	(3.862)	(18.401)	(3.226)
Controls	YES	YES	YES	YES	YES	YES
Constant	75.1660*	1,272.7253***	337.9525***	198.5841	95.5634	116.6001
	(1.677)	(5.275)	(3.535)	(0.760)	(1.414)	(0.674)
Observations	110	110	80	80	110	110
R-squared	0.932	0.389	0.891	0.468	0.877	0.355

The results in brackets are t-statistics; ***, **, and * indicate that the test result is significant at 1%, 5% and 10% significant levels, respectively.

Table 5 reports the regional heterogeneity test results of the impact of digital inclusive finance index on the optimization and upgrading of industrial structure in three regions. Column (1)

and column (2) report the regression of the digital inclusive finance index on the advancement of industrial structure and the rationalization of industrial structure in the eastern region, respectively, while the other models are tests for other regions. The test results show that in the eastern, central, and western regions, the digital inclusive finance index has a significant positive impact on the industrial structure, and the effect of the digital inclusive finance index on the rationalization of the industrial structure is greater than its impact on the upgrading of the industrial structure. In the eastern region, the regression coefficient of the digital inclusive finance index on the rationalization of industrial structure is 0.2775, which is higher than 0.0565 and 0.0534 for the central and western regions, respectively. In the central and western regions, the regression coefficients of the digital inclusive finance index on the upgrading of the industrial structure are 0.0565 and 0.0534, respectively, higher than the regression coefficient of 0.0258 for the eastern region. This indicates that the positive promotion effect of the digital inclusive finance index on the rationalization of the industrial structure in the eastern region and the upgrading of the industrial structure in the central and western regions is more pronounced. A possible explanation is that the eastern region, as China's forefront of opening up, has a higher level of economic and financial development, high prevalence of digital finance, high integration with local industries, and has already formed a certain scale, thus the promotion effect of digital inclusive finance on the rationalization of industrial structure in the eastern region is significant; its efficiency of industrial factor allocation has reached a higher level, and the agglomeration effect of high-tech industries is strong, leading to a smaller promotion effect of digital inclusive finance on the upgrading of industrial structure in the eastern region. Meanwhile, the economic development of the central and western regions started later, the financial infrastructure is not comprehensive, the construction of high-tech industries is backward, the support capacity for the development of digital finance is weak, and the overall corporate layout impact of digital inclusive finance on these two regions is limited, so its impact on the rationalization of industrial structure is smaller than its impact on the eastern region. At the same time, it is precisely because of the backwardness of such high-level industries that the development of digital finance will have a more obvious support effect on local high-tech industries, with a stronger potential for the upgrading of industrial structure compared to the eastern region. Especially the central region, as a link between the eastern and western regions, has unique advantages in upgrading industrial structure. In recent years, digital inclusive finance, with its low threshold and low cost, has fully played an inclusive advantage, effectively supporting the national strategy of the rise of the central region and the large-scale development of the western region. Therefore, compared to the eastern region, the impact of the digital inclusive finance index on the upgrading of industrial structure in the central and western regions is significantly positive, and the coefficients are relatively large.

4.4 Discussion on the Structural Heterogeneity of Digital Inclusive Finance

The multi-level and diversified characteristics of digital inclusive finance necessitate that while considering its dynamic development process and its impact on industrial structure, we also explore its horizontal, multidimensional effects on the optimization and upgrading of industrial structure. This approach enables a more targeted leveraging of the advantages of digital inclusive finance.

Table 6. Structural heterogeneity test

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	adv			rat		
breadth	0.0513***			0.1954***		
	(5.646)			(6.795)		
depth		0.0163***			0.0216	
		(3.114)			(1.251)	
dig			0.0074***			0.0601***

			(2.836)			(7.707)
econ	-11.7850***	-11.3723***	-11.7381***	0.3086	2.9003	-2.8200
	(-7.264)	(-6.746)	(-6.873)	(0.060)	(0.523)	(-0.556)
gov	7.0023	13.5819**	8.4889	35.7936*	61.1033***	19.3313
	(1.144)	(2.175)	(1.301)	(1.847)	(2.972)	(0.997)
labor	6.0376*	15.4176***	18.1264***	-53.5665***	-3.9234	-19.7497***
	(1.908)	(6.070)	(8.756)	(-5.344)	(-0.469)	(-3.210)
open	-0.5832	-0.0737	-0.0252	-4.1685**	-1.6090	-2.8932
	(-0.947)	(-0.117)	(-0.040)	(-2.137)	(-0.775)	(-1.542)
fixed	0.1725	0.0953	-0.6992	12.9484***	12.2815***	6.8746**
	(0.187)	(0.099)	(-0.709)	(4.439)	(3.892)	(2.344)
urban	-38.4474***	-51.9957***	-54.0613***	73.5559**	37.6065	-21.6735
	(-4.157)	(-5.339)	(-5.406)	(2.512)	(1.173)	(-0.729)
tech	-1.2152*	-1.0485	-1.1089*	1.3465	2.1946	1.1286
	(-1.938)	(-1.611)	(-1.695)	(0.678)	(1.024)	(0.580)
Constant	135.8290***	35.9708	14.9088	512.2219***	-39.5848	255.0070***
	(3.750)	(1.172)	(0.548)	(4.465)	(-0.392)	(3.153)
R-squared	0.863	0.852	0.851	0.279	0.157	0.309

The results in brackets are t-statistics; ***, **, and * indicate that the test result is significant at 1%, 5% and 10% significant levels, respectively.

Table 6 reports the structural heterogeneity test results of the impact of the three sub-domains of digital finance on the optimization and upgrading of industrial structure. Columns (1), (2), (3), and columns (4), (5), (6) correspond to the regressions of the three sub-domains of digital finance—breadth of coverage, depth of use, and degree of digitalization—on the upgrading and rationalization of industrial structure, respectively. It is observed that the breadth and digitalization of digital inclusive finance have a significantly positive impact on both the upgrading and rationalization of industrial structure, while the depth of use of digital inclusive finance, although not significantly, still has a positive coefficient for the rationalization of industrial structure. This indicates that expanding the usage scope, depth, and digitalization level of inclusive finance can positively affect the industrial structure. Moreover, digital inclusive finance exhibits structural heterogeneity in optimizing and upgrading the industrial structure, showing that the breadth of digital inclusive finance has the most substantial impact, followed by depth, and digitalization having the smallest impact. Regarding the rationalization of industrial structure, the impact of the breadth of digital inclusive finance remains significantly greater than that of digitalization. This might be because the development of digital inclusive finance significantly encourages entrepreneurship (Xie, Xuanli, Shen, Yan, Zhang, Haoxing, & Guo, Feng, 2018) and has a more apparent optimizing effect on the operational conditions of industries with a low urbanization rate and small-scale micro-enterprises (Huang, Yiping, & Huang, Zhuo, 2018), thereby effectively and sustainably driving the overall quality improvement of such late-developing regions and businesses. As the business model of China's digital finance is just beginning, the promotion of initial business models fully meets diversified demands, aiding in the rationalization of industrial structure (Huang, Yiping, & Huang, Zhuo, 2018). As the depth of use of digital inclusive finance deepens, its originally positive promotional effect gradually diminishes, hence its impact is less than that of the breadth of use of digital inclusive finance. The degree of digitalization depends on the related foundational infrastructure of digital finance and the knowledge reserves of participants, hence this dimension has a weaker impact on industrial structure layout. The non-

significant regression result of the depth of use of digital finance on the rationalization of industrial structure in column (9) could be because, in some cases, the depth of use does not fully align with the demand of the real economy it serves, focusing only on certain specific areas, hence having a limited impact on the overall rationalization of industrial structure.

5. Conclusions and Policy Recommendations

Using panel data from 30 provincial regions in China (excluding the Tibet Autonomous Region) from 2011 to 2020, this paper empirically tested the impact and effect of digital inclusive finance on the optimization and upgrading of industrial structure. The findings are as follows: First, digital inclusive finance not only accelerates the overall optimization and upgrading of corporate structures but also has a more pronounced positive promotional effect on the rationalization of industrial structure; second, all three sub-domains of digital inclusive finance positively promote the optimization and upgrading of industrial structure and exhibit structural heterogeneity, showing that the breadth of digital inclusive finance has the strongest impact, followed by depth, and digitalization having the smallest impact; third, there is significant regional heterogeneity in the impact of digital inclusive finance on the optimization and upgrading of industrial structure, with the promotional effect of the digital inclusive finance index on the upgrading of industrial structure being greater in central and western regions than in the eastern region, while the promotional effect on the rationalization of industrial structure is greater in the eastern region than in central and western regions; fourth, labor costs have a positive effect on the upgrading of industrial structure and a reverse effect on its rationalization; fifth, the level of economic development has a significant negative impact on the upgrading of industrial structure.

Based on the empirical results and considering China's economic reality, the following recommendations are proposed: First, the government should continue to promote the in-depth development of digital inclusive finance, deepen financial supply-side structural reforms, optimize the financial structure, to achieve the optimization and upgrading of industrial structure, injecting new developmental momentum into social development and internal vitality into high-quality economic growth. Second, through the analysis of the various sub-domains of digital inclusive finance, it is necessary to play the roles of the breadth of digital inclusive finance, the depth of its use, and the degree of digitalization in the optimization and upgrading of industrial structure differently and emphatically, to a greater extent leveraging the promotional effects of the various sub-domains of digital inclusive finance on industrial structure. Third, by analyzing the regional heterogeneity of the impact of digital inclusive finance on the optimization and upgrading of industrial structure, differentiated development policies should be formulated, adhering to the strategy of regional coordinated development, and vigorously promoting the rise of the central region and the development strategy of the western region with digital inclusive finance as the focus. Using the successful experience of digital inclusive finance development in the central and western regions as an opportunity, an effective regional collaboration and mutual aid mechanism should be established, promoting the complementary advantages and joint development of all regions in China; fourth, leverage the role of digital inclusive finance in the field of human capital, optimize the industrial structure layout, play the comparative advantages of various regions, promote the coordinated development of regional economies, and improve labor market flexibility to better match supply and demand of labor, serving the optimization and upgrading of industrial structure. Fifth, focus on the coordinated and synchronous improvement of the level of economic development and industrial structure, optimize capital allocation, achieve complementarity and coordination of production factors, guide production factors to transfer to areas with more potential and competitive advantages, and promote the optimization and upgrading of industrial structure.

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