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Research on the Impact of Digital Transformation on Industrial Structure Upgrading: An Empirical Analysis based on Panel Data of 31 Provinces in China

Qian Huang *, Jing Jiang

School of Chengdu University of Technology, Chengdu, China

*Corresponding Author

Abstract

As the digital economy grows by leaps and bounds, digital transformation has become key motivation for promoting economic transition and upgrading as well as innovative development. In this paper, an empirical model of digital transformation index and degree index of industrial structure upgrading is built for the relationship between digital transformation and industrial structure upgrading in China, based on panel data of 31 provinces in the China's mainland from 2011 to 2022, and the fixed effects model is used for empirical analysis. The results suggest that digital transformation has a significant positive impact on industrial structure upgrading, namely, the higher the degree of digital transformation, the more significant industrial structure upgrading. Research indicates that digital transformation provides sufficient talents, funds, and technological support for innovation in various industries by optimizing business processes and promoting the resource allocation efficiency. Based on this, the government is recommended to introduce supportive policies such as fiscal and tax policies, and is encouraged to increase investment in digital technology and talent development; furthermore, all industrial entities should actively build open and coordinated digital innovative platforms and ecosystems, and promote the deep integration of digital resources and industrial structure transformation. The research in this paper enriches the empirical research on digital transformation and industrial structure, providing theoretical basis and empirical reference for relevant policymaking.

Keywords

Digital Degree; Industrial Structure Transformation; Empirical Analysis.

1. Introduction

The arrival of the digital economy era has injected new momentum into upgrading and innovative development of traditional industries. The Third Plenary Session of the 20th Central Committee of the Communist Party of China set out to improve the system that promotes the deep integration of real economy and digital economy, requiring continuously deepening of the reform of digital economy system, driving the development of new quality productive forces, promoting the optimization and upgrading of industrial structure, and further building a modern industrial system that meets the high-quality development needs of China's economy. [1] China is in a crucial period of economic structure adjustment and industrial upgrading at present; digital technology and digital economy have become important motivation for industrial upgrading. The government is accelerating the construction of digital infrastructure, encouraging the use of technologies such as cloud computing, big data, and artificial intelligence to transform the traditional industrial structure. However, throughout the digital transformation, there are still bottlenecks such as insufficient technological investment and lack of talents, as a result, the innovative potential of digital resources has not been fully

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unleashed. Therefore, exploring how the digital transformation of enterprises affects industrial structure upgrading has important theoretical and practical significance.

1.1. Research Background

In the context of globalization and informatization, the digital economy, as important motivation for global economic development, is profoundly changing all aspects of economic activities, and digital transformation has become the core engine driving the upgrading of global industrial structure. Especially in the context of the digital economy being elevated to a national strategy, its material impact is continuously deepening. In recent years, China has continuously strengthened policy support system through the systematic layout of digital industrialization, industrial digitization, digital governance, and data value. The rapid development and innovative features of the digital economy have broken through geographical and administrative boundaries, promoting the flow and sharing of key elements such as information, technology, and capital among different regions; this open and sharing feature make digital transformation become a key force in promoting industrial structure upgrading. Therefore, exploring the influence mechanism of digital transformation on industrial structure upgrading is not only the key for resolving factor allocation imbalance and regional development differentiation, but also an important theory and practical call for building a modern industrial system.

1.2. Research Significance

This research combines significant theoretical and practical significance. On the level of theory, this paper enriches the research perspective on the relationship between the digital economy and industrial upgrading. Although studies have focused on the impact of the digital economy on industrial upgrading, most of them have concentrated on micro-level perspective or single-path analysis, still lacking in-depth discussion from comprehensive perspective. Therefore, based on provincial panel data and empirical analysis, this paper systematically illustrates the influence mechanism of digital transformation on industrial structure upgrading, expanding related theoretical research. At the practical level, the research results can provide references for the government to adopt differentiated digital economy policies. For instance, accelerating the construction of digital infrastructure and optimizing the allocation of factor market can help release the digital dividend and promote the optimization of industrial structure. Additionally, the test of regional heterogeneity effect can guide different regions to adopt industrial digital policies in line with local conditions, promoting common development. In summary, making clear the inner link between digital transformation and industrial upgrading will provide theoretical support and policy references for China's high-quality development.

1.3. Literature Review

In recent years, scholars both at home and abroad have pursued extensive research on the relationship among digital transformation, the digital economy, and industrial structure upgrading. Overall, most empirical research supports the significant promoting effect of digital transformation on industrial upgrading, but there are differences in the action paths, intensities, and heterogeneity features. In domestic research, Li Qingqing, based on panel data of 30 provinces from 2014 to 2022, confirmed that the construction of digital infrastructure, digital industrialization, and industrial digitalization all significantly drive industrial structure upgrading [2]; Xia Jiechang et al., by analyzing 281 prefecture-level cities, pointed out that although the digital economy effectively promotes the rationalization of the industrial structure, its effect on the industrial structure supererogation is not yet significant, and the core mechanism lies in accelerating the market-based allocation of production factors [3]; Zhang Jingkai and Chen Jun's provincial panel research further found that the promotion effect of digital economy on the upgrading of the manufacturing industry is particularly acute in the

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central region, which is mainly achieved through stimulating enterprise innovation [4]; the comparative study of Liu Hedong et al. emphasized that although both digital industrialization and industrial digitalization can promote upgrading, the former has a stronger promotion effect [5].

International cutting-edge studies further verify this trend: Acemoglu & Restrepo, by building "task model," pointed out that technologies such as artificial intelligence drive the industrial chain to leap towards intelligence and flexibility by reconstructing production organization processes and innovative coordinated paradigms [5]; Farboodi & Veldkamp, based on the marginal cost analysis of data elements, empirically revealed that while data mobility optimizes the efficiency of resource allocation across the entire domain, it also intensifies regional development differentiation due to the "gradient difference of digital infrastructure" [6]; Forman et al. deepened the General Purpose Technology (GPT) theory through diffusion research on cloud technology at the county level in the United States, indicating that the priority efficiency increase mechanism of digital technology in developed regions stems from the coupling effect of human capital and the innovative ecosystem [7]. These studies together reveal that digital transformation reshapes the global industrial pattern through a three-dimensional mechanism of technological restructuring, factor flow, and regional differentiation.

To sum up, existing literature has basically developed consensus: digital transformation positively impacts industrial structure upgrading through paths such as developing innovative ability (e.g. enterprise technology iteration), optimizing resource allocation (e.g. cross-regional factor flow), and expanding market boundaries (e.g. platform economy radiation). Furthermore, research has generally identified significant phased and regional heterogeneity feature, for instance, efficiency increase in developed regions and the eastern coastal areas is more obvious. However, there are still three limitations in existing research: first, the analysis units mostly focus on micro enterprises or single industries, lacking systematic verification of provincial panel data; second, there is insufficient exploration of the overall impact mechanism of digital transformation (such as technology-organization-institution synergy); third, cross-national comparison and adaptability research under new policy backgrounds are weak. Therefore, this research integrates provincial panel data from 2011 to 2022, builds a multi-dimensional mechanism model from the systematic perspective of digital transformation, and deepens heterogeneity analysis in combination with regional coordinated development strategy in the new era to fill the vacuum of comprehensive mechanism research.

2. Theoretical Basis and Research Hypotheses

2.1. Relevant Theoretical Basis

The theoretical basis of industrial structure upgrading integrates the core viewpoints of New Structural Economics, Diffusion of Technological Innovations Theory, and New Growth Theory.

New Structural Economics emphasizes that "the dynamic transfer of resources from low-efficiency sectors to high-efficiency sectors is the key path to release the potential for economic growth" [8], and digital transformation give new connotation to this process: "data, as a core production factor, significantly optimizes the allocative efficiency of factor by enhancing information transparency and reducing transaction costs" [9]. Diffusion of Technological Innovations Theory further explains the penetration mechanism of digital technologies - reshaping the industrial organizational form through "creative destruction" and promoting systematic changes in production methods. For instance, "technologies such as artificial intelligence and big data not only directly enhance the total factor productivity of traditional industries" [10], but also generate emerging business forms like intelligent manufacturing and platform economy through cross-industry convergence, forming a multi-dimensional upgrading path of "high-end, rationalization, and convergence" [9].

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"New Growth Theory" reveals the digital endogenous driving mechanism from a micro-dynamic perspective: digital capital investment (e.g. ICT infrastructure), human capital accumulation (e.g. high-tech talents), and construction of innovative environment (e.g. digital business environment) jointly constitute the core engine of technological innovation, promoting the transformation of industries towards tech-intensive and service-oriented types. Empirical studies suggest that these elements have significant space spillover effect: under the feature of economic distance, digital transformation promotes the coordinated upgrading of industries inside and outside the region through technology spillover and knowledge diffusion [9], especially generating "positive space spillover" for the optimization of circulation industry structure [11]; under the feature of geographical distance, "shadow effect" may be formed due to factor siphon. It indicates that industrial upgrading not only relies on local digital capabilities but also requires the optimization of resource allocation through regional coordinated policies, ultimately achieving a systematic leap of industrial structure towards the high end of the global value chain, providing new impetus for high-quality development.

2.2. Mechanism of Action and Research Hypotheses

The mechanism of action by which digital transformation drives industrial structure upgrading mainly has three dimensions: first, the technological innovation effect, digital transformation enhances production efficiency by accelerating technological innovation and knowledge diffusion. Enterprises apply technologies such as intelligent manufacturing and digital management to optimize production processes, reduce unit costs and increase added value of products, thereby promoting the evolution of industries towards high-end. Second, the supply chain synergy, from the perspective of the industrial chain, the digitalization of downstream enterprises drives productivity gains of upstream enterprises by optimizing supply-demand matching, stabilizing supply relationships, enhancing the innovative capabilities of suppliers, strengthening the resilience of the entire chain and generating backward spillover effects. Third, the factor reallocation effect, digital platforms, and big data analysis tools effectively reduce information asymmetry, promote efficient flow of production factors such as capital and talent across departments and regions, and continuously optimize the rationalization level of industrial structure. Based on the above mechanisms, this research makes the following hypotheses:

H0: Digital transformation has a significant positive promotion effect on industrial structure upgrading;

H1: This effect has regional and industry heterogeneity - the promotion effect is stronger in developed regions and regions with digital infrastructure advantages, while it is relatively weaker in underdeveloped regions.

Based on the panel data of 31 provinces in China, the above hypotheses will be tested in the subsequent empirical analysis.

3. Empirical Analysis

3.1. Model Specification

This paper selects panel data of 31 provinces in China from 2011 to 2022 for empirical analysis, uses the fixed effects model analyze the impact of digital degree on industrial structure upgrading, refers to the research of scholar Hou Shangfa, [1] the econometric model is built as follows:

$$lnISA_{it}=\alpha_0+\alpha_1 lnDL_{it}+\alpha_2 GOV_{it}+\alpha_3 DO_{it}+\alpha_4 PGDP_{it}+\delta_i+\varepsilon_{it} \tag{1}$$

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$lnISA_{it}$ represents the high-end degree of industrial structure in Province i during period t, $lnDL_{it}$_it represents the degree of digital transformation in Province i during period t, GOV_{it} represents the degree of government interference in Province i during period t, DO_{it} represents the degree of opening up in Province i during period t. $PGDP_{it}$ represents the economic development level of province i in period t. α_0 is a constant term, δ_i represents the regional fixed effect, and ε_{it} random error term.

3.1.1. Response Variables

High end of Industrial structure $lnISA_{it}$. This paper refers to scholars such as Xu Yingzhi and Zhou Guofu [12][13], collects the added value of the secondary industry and the tertiary industry of 31 inland provinces across the country from 2011 to 2023 from the National Bureau of Statistics and the China Statistical Yearbook, use the ratio of the added value of the tertiary industry and the increase of the secondary industry represent the high end of industrial structure. The larger the index, the higher the high-end degree of industrial structure.

3.1.2. Explanatory Variables

Degree of digital transformation $lnDL_{it}$. Digital transformation can drive economic resources to flow and gather from low-efficiency and low-value-added traditional industrial links to high-efficiency and high-value-added emerging industrial links by profoundly changing production methods, innovative models, industrial boundaries, value creation logic and factor structure. This paper refers to the research of scholars Guo Feng and Wang Jingyi [14], uses the digital transformation indexes of 31 provinces in the China's mainland from 2011 to 2023 from Institute of Digital Finance, Peking University, the larger the digital transformation index, the higher the degree of digital transformation.

3.1.3. Control Variables

To more accurately reflect the impact of the degree of digital transformation on industrial structure upgrading, referring to the research of scholars such as Cheng Sainan and Feng Zhen [15], the following variables are selected as control variables:

(1) Degree of government interference (GOV_{it}): it is represented as the proportion of local general budget revenue to regional GDP.

(2) Degree of opening up (DO_{it}): it is represented as by the proportion of total import and export volume to GDP.

(3) Economic development level ($PGDP_{it}$): it is represented as per capita gross national product.

3.2. Data Sources and Explanation

The data of various indexes comes from statistical data of 31 provinces in China from 2011 to 2023, The specific data sources and explanation are shown in the table below.

Table 1. data sources and explanation

variable type	variable name	variable symbol	data source
response variable	industrial structure upgrading	ISA	National Bureau of Statistics, China Statistical Yearbook
explanatory variable	digital transformation	DL	Institute of Digital Finance, Peking University
control variable	degree of government interference	GOV	National Bureau of Statistics,
	degree of opening up	DO	China Statistical Yearbook
	economic development level	$PGDP$	National Bureau of Statistics

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3.3. Descriptive Statistics of Variables

Stata16 is used for descriptive statistics on the selected response and explanatory variables in this paper, as shown in Table 2.

Table 2. descriptive statistics

variable	sample size	average value	standard value	minimum	maximum
lnisa	372	0.224	0.381	-0.64	1.657
lndl	372	5.598	0.667	2.026	6.147
gov	372	0.113	0.032	0.058	0.245
pgdp	372	5.807	3.045	1.602	19.031
do	372	0.266	0.279	0.008	1.464

Data source: produced by Stata.

According to the analysis of explanatory variables and response variables of this model, it can be seen that the average value of the response variable, industrial structure upgrading degree (lnisa), is 0.224, the minimum is -0.64, and the maximum is 1.657. The average value of explanatory variable, the degree of digital transformation (lndl), is 5.598, the minimum is 2.026, and the maximum is 6.147. From the descriptive statistical analysis table, it can be seen that the sample data of the core explanatory variable and the response variable has certain discreteness and volatility, indicating that there are differences among regions and the research has value.

3.4. Correlation Analysis

After performing descriptive analysis, the next step is to perform correlation analysis on the variables, only when there is a correlation between explanatory variables and response variables, the research result makes sense. Therefore, the correlation of variables is tested (Table 3).

Table 3. correlation analysis

variable	lnisa	lndl	gov	pgdp	do
lnisa	1.000				
lndl	0.320*	1.000			
	(0.000)				
gov	0.431*	-0.087	1.000		
	(0.000)	(0.093)			
pgdp	0.521*	0.340*	0.248*	1.000	
	(0.000)	(0.000)	(0.000)		
do	0.404*	-0.150*	0.507*	0.647*	1.000
	(0.000)	(0.004)	(0.000)	(0.000)	
**** p<0.01, ** p<0.05, * p<0.1*					

Note: The values in parentheses are p-values, and * represent significant at the 10% level

Data source: produced by Stata16

According to the correlation analysis table, it can be seen that there is correlation between selected explanatory variables and response variables, explanatory variable (lndl) has a significantly positive correlation with response variable (lnisa), moreover, the control variables all have significantly positive correlations with response variables, which conforms to the research expectation.

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3.5. Multicollinearity

To prevent the model from being disturbed by the correlation among variables, this paper performs multicollinearity analysis with the variance inflation factor (VIF) before the benchmark regression. As shown in Table 4, the variance inflation factors (VIF) of all variables are less than 10, indicating that there is no collinearity among the variables.

Table 4. multicollinearity test

	VIF	1/VIF
do	2.908	0.344
pgdp	2.638	0.379
lndl	1.547	0.646
gov	1.372	0.729
Mean VIF	2.116	

Data source: produced by Stata16

3.6. F-test and Hausman Test

Table 5. results of Hausman test

	Coef.
Chi-square test value	24.985
P-value	0

Data source: produced by Stata16

F-test was carried out on the model to determine whether to adopt fixed effects model or mixed effects model, the test results are $F(4, 367) = 65.52$, $Prob>F = 0.0000$, F-test was significant, thus eliminating the mixed effects model. Subsequently, Hausman test was performed to decide to choose between random effects model and fixed effects model for the model, the results of Hausman test are shown in Table 3-5, from the table, it can be seen that p=0.0000, p-value is less than 0.1, therefore, the fixed effects model was chosen, it suggests that there are no errors in the model built above, and regression analysis can continue.

3.7. Benchmark Regression Analysis

Table 6. model regression results

	fixed effect	random effect	mixed effect
	lnisa	lnisa	lnisa
lndl	0,136***	0,149***	0,149***
	(9,035)	(5,248)	(5,248)
gov	-1,096*	4,087***	4,087***
	(-1,941)	(7,287)	(7,287)
pgdp	0,029***	0,037***	0,037***
	(3,857)	(4,598)	(4,598)
do	0,013	0,107	0,107
	(0,118)	(1,148)	(1,148)
_cons	-0,586***	-1,315***	-1,315***
	(-5,392)	(-8,538)	(-8,538)
N	372	372	372
R2	0.524	0.417	0.417
Adj. R2	0.476	0.410	0.410
F	92.888	65.522	65.522

*** p<0.01", "** p<0.05", "* p<0.1

Note: The values in parentheses are z-values, and ***, **, * represent significance at the 1%, 5%, and 10% levels, respectively.

Data source: produced by 16.

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The impact of explanatory variables lndl) and control variables (gov, pgdp, do) on the dependent variable (lnisa) is analyzed.

$$lnISA_{it}=\alpha_0+\alpha_1 lnDL_{it}+\alpha_2 GOV_{it}+\alpha_3 DO_{it}+\alpha_4 PGDP_{it}+\delta_i+\varepsilon_{it} \quad (2)$$

The model regression results are shown in Table 6, the influence of the explanatory variable (lndl) on the response variable (lnisa) under fixed effects, random effects, and mixed effects models is displayed, respectively. In terms of the regression results, under the fixed effects model, the coefficient of the digital transformation degree (lndl) is significantly positive. According to the empirical results, a 1% increase in digital transformation the degree (lnDL) will significantly promote the high-end degree of the industrial structure by 0.136%, it indicates that digital transformation has a positive driving effect on industrial structure upgrading. This result also confirms that digital transformation can drive the flow and concentration of economic resources from low-efficiency, low-value-added traditional industrial sectors to high-efficiency, high-value-added emerging industrial sectors by profoundly changing production methods, innovative modes, industrial boundaries, value creation logic, and factor composition.

In addition, in the control variables, every 1-unit change in government interference degree (gov) will cause industrial structure upgrading to decrease by 1.906%, this result suggests that scaling up government intervention may lead to reduction in the speed of industrial structure upgrading by distorting resource allocation and inhibiting market activity. Every 1-unit change in the economic development level (pgdp) will cause the industrial structure upgrading to increase by 0.029%, economic growth has a fundamental supporting role in industrial structure upgrading, and it mainly drives industrial transformation through the demand upgrading and slow accumulation of technology brought about by the increase in per capita income. Every 1-unit change in the degree of opening-up (do) will cause industrial structure upgrading to increase by 0.013%, opening up may promote industrial upgrading through mechanisms such as technology spillover, international competition pressure, and participation in global value chains.

3.8. Robustness Test

3.8.1. Exclusion of Special Years

To make sure the analysis results are not affected by major external shocks, considering the significant impact of the outbreak of COVID-19 pandemic in 2019 on the industrial structure, the data of 2020 was excluded to avoid abnormal fluctuations caused by special years, ensure the robustness and reliability of the research conclusions, the analysis results are shown in the following table. According to the report in the table, it can be concluded that after excluding unusual year, the significance of explanatory variables and the sign of regression coefficients have changed compared to the original model, confirming the stability of the model.

3.8.2. Substitution of Explanatory Variables

To further verify the robustness of model, here the core explanatory variable of digital transformation is replaced with digital financial inclusion, and the regression analysis is performed again. The results suggest that the regression coefficients of explanatory variables are significantly positive, which is consistent with the regression results of the original model, indicating that the benchmark regression results are robust and reliable.

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Table 7. robustness test

	original model	excluded years	substitution variable
	lnisa	lnisa	lnisa
Lndl/lnde	0,136***	0,136***	0,276***
	(9,035)	(9,035)	(13,604)
gov	-1,096*	-1,096*	0,178
	(-1,941)	(-1,941)	(0,368)
pgdp	0,029***	0,029***	-0,001
	(3,857)	(3,857)	(-0,140)
do	0,013	0,013	-0,122
	(0,118)	(0,118)	(-1,265)
_cons	-0,586***	-0,586***	0,891***
	(-5,392)	(-5,392)	(7,329)
N	372	372	372
R2	0.524	0.524	0.619
Adj. R2	0.476	0.476	0.580
F	92.888	92.888	136.657
*** p<0.01", "** p<0.05", "* p<0.1			

3.9. Heterogeneity Test

Table 8. heterogeneity regression

	eastern region	central and western regions	population regression
	lnisa	lnisa	lnisa
lndl	0,129***	0,079***	0,168***
	(8,658)	(4,336)	(7,649)
gov	-0,288	1,114*	-1,951**
	(-0,565)	(1,785)	(-2,508)
pgdp	0,039***	0,046***	0,011
	(6,044)	(6,931)	(0,903)
do	0,135	-0,000	-0,101
	(1,507)	(-0,002)	(-0,412)
_cons	-0,728***	-0,574***	-0,633***
	(-6,782)	(-2,981)	(-4,771)
N	403	130	273
Adj. R2	0.413	0.567	0.357
F	314.248	179.125	171.766

*** p<0.01", "** p<0.05", "* p<0.1

Note: The values in parentheses are t-values, * * *, * *, * * represent significance at the 1%, 5%, and 10% levels, respectively

Data source: produced by Stata16

The degree of digital transformation, as the core motivation for promoting the high-end of industrial structure, plays an extremely crucial role in enhancing the high-end level of the industrial structure. However, in China the regional non-equilibrium feature of digital transformation development is significant, the eastern region may form unique advantages through first-mover technological accumulation and talent aggregation, while the western region faces constraints from the spillover effects of digital transformation due to technological backwardness, resource endowment and differences in institutional environment. To deeply

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explore the regulating effect of regional heterogeneity on industrial structure transformation, this paper further divides the samples into the eastern and western regions based on the benchmark regression, and perform system analysis on the differentiated impact of the degree of digital transformation on industrial structure upgrading in different regions through group regression. The empirical results are shown in Table 8.

The empirical results indicate that the regression results of the eastern region and the central and western regions are similar to those of the population sample, there is a significant positive correlation between the explanatory variables and the response variables, it indicates that both the eastern region and the central and western regions, the results all show significant positive correlation between the degree of digital transformation and industrial structure upgrading, it suggests that the driving effect of digital transformation is universal across regions. However, the coefficients of the explanatory variables in the eastern region are higher than those in the central and western regions, it indicates that the promotion effect of the degree of digital transformation on industrial structure upgrading is more prominent in the eastern region, this difference may come from the advantages of the eastern region in technological upgrading, information dissemination, industrial synergy, and policy environment, as a result, technology spillover is stronger, and rate of digital transformation is higher, the central and western regions are constrained by resource endowment, technological backwardness, and differences in institutional environments, which require making up for their shortcomings through regional coordinated digital platforms and distinctive development paths.

4. Research Conclusion and Policy Recommendations

In this paper, a panel data model is built to investigate the impact of digital transformation on industrial structure upgrading. Based on empirical analysis of panel data of 31 provinces in China from 2011 to 2022, it suggests that digital transformation has become a core driver for the high end of industrial structure by reconstructing the logic of production factors and industrial coordinated models. Specifically, digital technologies lower information barrier between upstream and downstream of industrial chain, accelerates technology spillover and knowledge sharing, promote the transformation of industries towards "intelligent +" and service-oriented, moreover, it unleashes emerging industries such as cloud computing and industrial internet, continuously increasing the proportion of added value in the tertiary industry. However, this effect varies regionally: the upgrading effect is more obvious in the eastern and economically developed regions. This is due to first-mover advantages of the eastern region in digital infrastructure, technical talent reserves, and industrial chain coordination, while the central and western regions are constrained by the blocked factor flow and weak innovation ecosystems, resulting in the incomplete release of digital dividend.

Based on the above conclusions, the following policy recommendations are made:

First, increasing investment in digital infrastructure and technological innovation. The government need to incorporate new digital infrastructure into strategic investment, focus on the layout of 5G networks, industrial internet platforms, and computing centers, and incentivize enterprises to increase research and development in core technologies such as AI and blockchain through fiscal and tax incentives. Drawing on the experience of the eastern region, building "industry-university-research-application" integrated transformation mechanism, promoting the targeted matching of scientific research achievements in universities with industry demands, and developing digital technology clusters. Moreover, setting up a national digital innovative fund, supporting small and medium-sized enterprises in carrying out intelligent transformation, and lowering the threshold for technology application.

Second, deepening the digital application of industries. Given key areas such as traditional manufacturing and agriculture, providing digital transformation road map, guiding enterprises

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to actively adopt technologies such as intelligent manufacturing, industrial internet, and big data analysis, and achieve innovation in production organization and business models. The market-based allocation mechanism of factors is improved. Deepening the reform of land, capital, and talent markets, reducing the entrepreneurship cost of the digital industry, improving intellectual property protection and data factor markets, and guiding high-quality resources to concentrate on the direction of digital transformation.

Third, improving the market-based allocation mechanism of factors. Deepening the reform of land, capital, and data factors: on the one hand, improving the system of confirmation of data rights and trading, establishing data exchanges, and stimulating the value of data assets; on the other hand, promoting the cross-regional flow of talents, supplying high-tech talents for the central and western regions, and promoting regional balance.

Fourth, promoting regional development in the light of local conditions. For regions with different digital levels, differentiated strategies should be adopted: the eastern region continues to maintain a high level of digital economic development, while the central and western regions need to increase investment in digital infrastructure and talent development, narrow the regional digital gap; economically backward regions should focus on improving digital quality and technology application levels, and form sustainable industrial development momentum. During the implementation, policy coordination should be strengthened to form a mutually reinforcing pattern of industrial development and digital economy.

Taken together, digital transformation is a key force in promoting industrial structure upgrading, relevant policies should balance and promote technological innovation, market-oriented reforms, and regional coordinated development, ensure the effective release of the dividend of digital economy and provide strong support for the high-quality development of China's industries.

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