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Research on the impact of Digital Economy Development on The Integration of The Two Industries

-- Empirical Analysis Based on Data from 30 provinces in China

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Abstract: Based on data from 2010 to 2021 in 30 provinces of China, comprehensive evaluation systems for digital economy development, manufacturing, and service industry integration were constructed. Using a two-way fixed effects model with individual and time dimensions, empirical analysis conducted the impact of digital economy development on the integration of the two industries in each province. Additionally, a panel threshold model was employed to analyze the nonlinear relationship between digital economy development and the integration of the industries. The research findings indicate a significant promoting effect of digital economy development on the integration of the two industries. Robustness tests confirm the stability of the empirical results. In terms of heterogeneity, digital economy development in various regions significantly promotes the integration of the two industries, with the promotion effect in the central and western regions surpassing that in the eastern regions, and the optimal effect in regions with a moderate level of industrialization. Nonlinear reveals the evident nonlinear characteristics of the impact of digital economy on the integration of the two industries, with different effects at different stages of digital economy development. Based on these findings, policy recommendations are proposed, emphasizing the vigorous promotion of digital economy support for the integration of the two industries and the cultivation of digital talent.

Keywords: Digital economy; integration of the two industries; nonlinear effects.

1. Introduction

The deep integration of manufacturing and services has become an unstoppable global trend. The United States, the United Kingdom, and Germany have each proposed initiatives like the Manufacturing Innovation Networks, Made in UK 2050, and Industry 4.0, respectively, competing for the future industrial development high ground[1]. For China, the integration of manufacturing and services is an inevitable path into the post-industrial era. This integration is driving industrial structural upgrades. With the widespread application of digital technology, manufacturing is gradually developing towards intelligence and efficiency, while services are more closely integrated into chains and value chains. This helps improve the overall industrial level and promotes China's economy from traditional manufacturing to a knowledge-based economy. At the same time the integration of the two industries accelerates the integration of innovation and technology. The combination of manufacturing and services has given rise to new business models, such as industrial internet and smart manufacturing. These innovations not only enhance the competitiveness of enterprises but also drive the penetration of technological innovation throughout the entire industry chain, providing opportunities for the improvement of China's technological strength.However, the integration of the two industries also brings a series of challenges, such as talent shortages, intellectual property protection, and industrial security. In the process of promoting the integration of manufacturing and services, there is a need for the free flow and effective allocation of factors such as capital, information, and digital elements[2]. Compared with developed countries, China's level of integration of manufacturing and services is relatively low, and the international competitiveness of its services industry is also weak. Therefore, it is imperative to enhance the level of integration between manufacturing and services.

The digital economy possesses advantages such as high efficiency, digitization, and precision, enhancing information spillover effects and reducing financing costs in industrial development. It has positive significance for improving the industrial and activating the integration of the two industries. Firstly, the widespread adoption of digital technology in the manufacturing sector, by providing more flexible and efficient digital tools, enables enterprises to better cope with external pressures, accelerating the production process, improving efficiency, and helping manufacturing companies adapt to market demand changes. Secondly, the application of the digital economy in the service industry provides various industries with more convenient payment and settlement methods, accelerating fund flow. This not only enhances the transaction efficiency of the service industry but also reduces transaction costs, creating a more beneficial market environment for industrial integration and development[3]. In addition, the development of the digital economy promotes the integration of information in manufacturing and service industries. Through technologies such as big data analysis and artificial intelligence, businesses can comprehensively understand market trends, enhance the accuracy of production planning, and optimize the service experience. Therefore, a thorough analysis of how the development of the digital economy affects the integration of the two industries and exploring its underlying impact mechanisms is a topic worthy of in-depth research in the current economic development context in China.

2. Literature Review

The research on the integration of two industries mainly focuses on aspects such as the path to integration, dividend release, and structural dimensions[4]. Scholars have proposed

diverse viewpoints on the implementation path of the integration of two industries. For instance, some studies[5] suggest that the practice path of deep integration involves inspiring creative innovation to promote product integration, integrating resource elements to promote industrial integration, optimizing development environment to promote integration, and utilizing modern technology to promote technological integration. Other studies argue that in the process of the two industries' integration, it is essential to handle the relationship between industry and enterprises as well as consumers, following the periodic laws of development. Some researchers believe that the nature of the integration of two industries determines that it is necessary to achieve resource integration through the extraction, reconstruction, and integration of cross-cutting elements between manufacturing and services. In terms of releasing the dividends of the integration of two industries, some scholars have put forward new perspectives. For example, research indicates that the integration of two industries boost the high-quality development of the economy. Scholars propose that the integration of two industries can enhance industrial potential, resilience, and completeness, thereby improving the well-being of the national material life by promoting industrial and economic development. Furthermore, some scholars[6] believe that the integration of two industries can broaden the perspective of industrial development, and expanding the functions of the integration of two industries can activate both the existing and incremental market, forming new formats and models. Some scholars have provided their insights into the structural aspects of the integration of two industries. For instance, they emphasize that the characteristics and development trends of deep integration involve a shift from interaction to symbiosis, specifically reflected in five dimensions: products, formats, elements, markets, and values. These dimensions mutually promote each other, forming an integrated ecosystem the outside in.

Research on the empowerment of the integration of the two industries by the development of the digital economy is mainly analyzed from two perspectives: theory and empirical evidence. From the perspective of theoretical analysis, some studies have pointed out that under the background of the digital economy, the innovative development of the integration of manufacturing and service industries can promote high-quality economic development. Some studies have found that in the integration of the two industries in China, there are various constraints such as insufficient integration, digital generalization, legal vacuum, and in development demands and attributes[7]. Only by overcoming these factors can a new pattern of integration and development of the two industries be constructed. Other studies have indicated that the development of industrial integration in China still faces various challenges such as strengthening top-level design, promoting precise matching of supply and, and improving the quality of content construction. From the empirical perspective, some studies have conducted in-depth research using various models. For example, some studies have used direct effect models, moderation effect models, threshold models, and employed dynamic panel estimation methods to study the positive promotion of information and communication technology on the mutual integration of manufacturing and service industries[8]. Other studies have conducted empirical research using fixed effect models and moderation effect models, finding that the development of the digital economy can promote the integration of the two industries through channels such as organization, technology, and product innovation. Some studies have used mediation effect models to explore the mechanism path of the development of the digital economy driving the integration of the two industries, believing that the development of the digital economy can promote the integration of the two industries by expanding market potential, strengthening urban innovation capabilities, and improving capital allocation efficiency[9].

Research on the integration of the two industries and the empowerment of the digital economy is relatively abundant. However, the research mainly focuses on the direct impact of digital economic development on the integration of the two industries. There is less emphasis on the nonlinear relationship between digital economic development and the integration of the two industries, and there is little research that empirically analyzes the relationship between them by constructing a comprehensive evaluation index system for the integration of the two industries. Therefore, based on panel data 31 provinces in China from 2010 to 2021, this study constructs a comprehensive evaluation index system for the development of the digital economy and the integration of the two industries at the level. Using a time-individual two-way fixed-effects model for baseline regression analysis and using the level of digital economic development as a threshold variable, the study analyzes the nonlinear relationship between digital economic development and the integration of the two industries using a panel threshold model, providing reference for empowering the development of the integration of the two industries with the development of the digital economy.

3. Theoretical Hypothesis

3.1. The development of the digital economy affects the linear effect of the integration of the two industries

Manufacturing and service integration is a complex process of manufacturing becoming more service-oriented and services becoming more manufacturing-oriented. It requires the free flow and effective allocation of capital, information, digital elements, and the support of high-end industrial chains and a well-develop integrated development system[10]. As China's economy and financial market continue to expand, the phenomenon of imbalance between the supply and demand of financial resources is becoming increasingly prominent. The efficiency loss in this area has the potential to greatly impact the incremental economic benefits. Against this background, the development the digital economy can empower the integration of the two industries in multiple aspects.

First, in terms of the participating entities in the integration of the two industries, various types of manufacturing and service entities involved in the industrial integration process need to bear certain integration costs. The development of digital economy reduces the cost of capital, which becomes a key factor in enhancing the level of industrial integration. Second, in terms of the important means of integrating the two industries, whether it is exploring new forms of industries or deepening social services in the service industry and innov manufacturing production technologies, the development of the digital economy plays an important role, and high-quality and efficient digital services have become its core driving force[11]. Third, looking at the main industrial entities in the

current stage of the development of the integration of the two industries, the development and growth of high-tech enterprises and advanced service-oriented enterprises rely on digital innovation. The quality and efficiency of the development of the digital economy directly determine the development speed and sustainability of these industries.

Based on the above analysis, this paper proposes the first hypothesis: H1: The development of the digital economy has a positive promoting effect on enhancing level of integration between the two industries.

3.2. The development of the digital economy has nonlinear effects on the integration of the two industries

The development of the digital economy has nonlinear effects on the integration of the two industries.In the early stages of digital economic development, there may be shortcomings such as information leakage risks, low penetration rates into other industries, limited application scenarios[12], shallow usage, and low digitalization levels. The advantages of high efficiency, precision, andization may not be well demonstrated, which could lead to the digital economy's development having an insignificant effect on promoting the integration of the two industries. With the development of the digital economy, digital technologies gradually mature, and industrial integration gives birth to more diverse application scenarios, meeting multi-faceted market demands and improving production efficiency[13]. The integration of the two industries utilizes the characteristics of the digital economy to innovate the industrial chain cooperation of products. By using data, algorithms, and other production factors, as well as organizational models of digital platforms, consumers of manufacturing and service products are also involved in the production process, promoting further development of industrial integration. At the same time, as the level of digital technology deepens and the coverage of the digital economy expands, digital economic services can actively connect with regions and enterprises in need of services, thereby mitigating the negative effects of the early stages of development[14]. At this point, the promoting effect of economic development on the integration of the two industries becomes more significant.

Based on the above analysis, the following hypothesis is proposed in this paper: H2: The development of the digital economy has nonlinear effects on the integration of the two industries.

4. Data Source and Research Design

4.1. Sample and Data Source

The text you provided translates to:"This article selects relevant data from 31 provinces in China from 2010 to 2021 for empirical analysis. The data sources include the annual "China Statistical Yearbook," "China Third Industry Statistical Yearbook," "China Urban Statistical Yearbook," and the Wind database."

4.2. Variable Description

The degree of integration between the two industries (T) refers to the phenomenon and process in which the production factors of the manufacturing industry and the service industry permeate[15], intersect, and recombine with each other, gradually optimizing resource allocation efficiency and breaking through the boundaries of the original industries. Existing studies have constructed an index system for the integration of the two industries based on relevant metrics of the manufacturing and service industries.

The level of development of the digital economy (FI). Depending on the different definitions of the scope of the digital economy, the definition of the digital economy can be divided into three categories: core definition, narrow definition, and broad definition. Among them, the broad definition considers the digital economy to be the economic brought about by industrial upgrading driven by digitization, that is, digital industrialization and industrial digitization. This definition is widely accepted by scholars and governments of various countries. Referring to relevant studies on the measurement of the digital economy development index, five secondary indicators, including the level of Internet penetration, Internet-related output, and the development of digital finance, are adopted and the digital economy development index is calculated through the entropy weight method[16]. At the same time, a comprehensive evaluation system is constructed using three sub-indicators: digital finance, industrial digitization, and digital industrialization.

Consideration of some variables that may affect the objectivity of empirical research in reality[17], this article selects the following indicators as control variables to be included in the model: (1) Per capita GDP, economic development is an important driving force for the integration of the two industries, and the natural logarithm of per capita GDP is to measure the level of economic development. (2) Level of traditional financial development, the ratio of the balance of loans of financial institutions to regional GDP is used to measure the level of traditional financial development. (3) Industrial structure, the ratio of the output value of the secondary industry to the total output value of the region is used. (4) Level of informatization, the ratio of the total value of postal and telecommunications business income to regional GDP is used. (5) Foreign, the ratio of actual use of foreign direct investment to regional GDP is used. (6) Degree of openness, the ratio of total import and export value of goods to regional GDP is used.

4.3. Model setting

Considering that the effect of digital economic development on the integration of the two industries may be affected by provincial and temporal factors, this paper adopts a two-way fixed-effects model for time and individual analysis, constructing the following model.

$$T_{it} = \alpha_0 + \beta FI_{it} + \gamma X_{it} + \mu_i + \sigma_t + \varepsilon_{it} \quad (1)$$

Where T represents the degree of integration between manufacturing and service industries; FI represents the index of digital economic development; X represents a series of control variables. i represents provinces, t represents years. α denotes time fixed effects, μ denotes individual effects, and ε represents the random error term, likewise.

Using a panel threshold model to analyze the nonlinear effects of digital economic development on the integration of the two industries. Following Hanse's approach, constructing the threshold model as follows.

$$T_{it} = \alpha_0 + \beta_1 FI_{it} I(\text{threshold} \le \delta) + \beta_2 FI_{it} I(\text{threshold} > \delta)$$

$$+\gamma X_{it} + \mu_i + \sigma_t + \varepsilon_{it} \quad (2)$$

threshold represents the threshold variable, I represents the indicates function.

5. Empirical Analysis

5.1. Benchmark regression results

Table 1 conducts empirical tests on the benchmark relationship between the digital economy and the convergence of the two industries. Column (1) of Table 1 does include control variables, and the estimated coefficient of the digital economy is significantly positive. After adding control variables, the estimated coefficient remains significantly positive in column (2 The empirical results indicate that the development of the digital economy has a positive significance for the improvement of the level of convergence between the two industries, confirming hypothesis H1. Further examination of the impact of the dimensions of digital economic development on the level of convergence between the two industries is shown in columns (3) to (5) of Table 1. Columns (3), (4), and (5) represent the effect of various sub-indicators of digital economic development on the convergence of cultural and tourism industries, among, industrial digitization, digital industrialization, and digital finance are all significant at the 1% level. In terms of the positive promotion effect, the order is industrial digitization > digital industrialization > digital finance.

Table 1. Benchmark regression

	(1)	(2)	(3)	(4)	(5)
FI	**0.572*** **	**0.335*** **			
	(0.012)	**(0.016)**			
DigF			**0.179*** **		
			(0.015)		
Inddig				**0.553*** **	
				(0.011)	
Digind					**0.371*** **
					(0.023)
X	**Uncontrol**	**Control**	**Control**	**Control**	**Control**
_cons	**0.156*** **	**0.151*** **	**0.237*** **	**0.764*** **	**0.265*** **
	(0.023)	**(0.025)**	**(0.014)**	**(0.112)**	**(0.046)**
Observations	**360**	**360**	**3360**	**360**	**360**
r2	**0.453**	**0.912**	**0.546**	**0.681**	**0.268**
Individual/Annual	**Control**	**Control**	**Control**	**Control**	**Control**

5.2. Benchmark regression results

Previous analysis examined the linear effects of the development of the digital economy on the integration of the two industries, suggesting that the development of the digital economy can promote integration. Considering that the impact of digital economic development may a non-linear relationship, a panel threshold model is adopted to analyze the non-linear relationship between digital economic development and the integration of the two industries. The study found that the single and double thresholds of the overall index of digital economic development, digital finance, industrial digitization, and digital industrialization are significant. This indicates that the impact of digital economic development on the level of integration of the two industries has a dual threshold effect, verifying the heter point of view proposed in the theoretical analysis of this paper that the development of the digital economy has differentiated effects on the integration of the two industries at different stages of development, confirming hypothesis H2.

From Table 2, column (1), it can be seen that when the overall index of digital economic development is below the first threshold value of 0.562, the estimated coefficient of digital finance development index is significant, at 0.032. When this index exceeds the first threshold value of 0.562 but is less than the second threshold value of 2.215, the estimated coefficient is 0.056 and significant. When the total index exceeds the second threshold value of 2.215, the marginal impact coefficient increases to 0.073 and is also significant. From the results, the negative impact of digital economic development on the integration of the two industries weakens as the level of digital economic development continues to rise and enters the second and third stages, and the positive impact increases, specifically manifested as an enhancement of the promotion of of the two industries. Overall, the promotion of digital economic development on the integration of the two industries is more significant in mature stage.

Digital finance sub-index. Column (2) of Table 2 shows that the improvement of digital finance is beneficial to the integration of manufacturing and service industries, and the effect varies from weak to strong, also showing stage heterogeneity characteristics. The improvement of digital financial services can narrow the gap in the use of digital information technology between different regions and groups, which is of positive significance for the improvement of the level of integration of the two industries.

Industrial digitization sub-index. Column (3) of Table 2 shows that when the industrial digitization index is below the first threshold value of 0.455, the estimated coefficient of the depth index of digital finance usage is significant, at 0.033. When this index exceeds the first threshold value of 0.455 but is less than the second threshold value of 2.176, the estimated coefficient is 0.045 and significant. When the industrial digitization index exceeds the second threshold value of 2.176, the estimated coefficient increases to 0.059 and is also significant. Compared with the overall index of digital economic development, its threshold value is lower. This also indicates that when the digital economy is, the promotion effect of digital economic development on the upgrading and integration of manufacturing and service industries is weaker, while as the digital economy develops, its promotion effect further manifests. These results also support research hypothesis H2.

Digital industrialization sub-index. Column (4) of Table 2

shows that the improvement of digital industrialization is beneficial to the integration of manufacturing and service industries, and the effect is also weak to strong, with positive significance for the improvement of the level of integration of the two industries.

Table 2. Threshold model regression results

	(1) FI	(2) DigF	(3) Inddig	(3) Digind
threshold1	0.032***	0.015***	0.033***	0.025***
	(0.012)	(0.024)	(0.052)	(0.052)
threshold2	0.056***	0.042***	0.045***	0.047***
	(0.021)	(0.012)	(0.011)	(0.015)
threshold3	0.073***	0.063***	0.059***	0.062***
	(0.021)	(0.052)	(0.012)	(0.015)
X	Control	Control	Control	Control
_cons	0.061***	0.021***	0.035	0.038
	(0.026)	(0.023)	(0.031)	(0.032)
Observations	360	360	360	360
r2	0.315	0.297	0.126	0.462

5.3. Threshold model regression results Robustness test

Change the explanatory variables. The previous explanatory variables were calculated based on the system coupling model. Here, we change the calculation method to principal component analysis for calculating the new explanatory variables. The robustness test results are shown in Table 3, Column (1). Empirical results demonstrate that the impact of digital development on the integration of the two industries is significant at the 1% level, confirming the robustness of the previous regression.

Considering the possible correlation in the dataset, provinces are clustered, and standard error regression is conducted at the individual level. The empirical results are shown in Table 3, Column (2). The econometric regression results indicate that the impact of digital economic development on the integration of the two industries remains significant at the 1% level. Repeated random sampling.

Due to certain data missing during data collection, some provinces in China could not be included in the empirical analysis, which may lead to non-random sample selection and biased results. To mitigate the non-random sample selection issue, 200 samples are randomly drawn from the total sample, and this process is repeated 500 times to avoid bias. The empirical results are shown in Table 3, Column (3). The results of repeated random sampling indicate that the coefficient of the digital economy is significantly positive, proving the robustness of the empirical results.

Trimming. To eliminate the bias caused by extreme values on the empirical results, all variables trimmed at the 1% level. The regression results are shown in Table 3, Column (4), and the coefficients, variable significance, and direction of effect are similar to the baseline regression results.

Table 3. Robustness test

	(1)	(2)	(3)	(4)
FI	0.274***	0.317***	0.358**	0.462***
	(0.016)	(0.020)	(0.063)	(0.029)
X	Control	Control	Control	Control
_cons	0.048***	0.162*	0.075	0.115***
	(0.026)	(0.023)	(0.060)	(0.022)
Observations	360	360	360	360
r2	0.523	0.437	0.336	0.439
Individual/Annual	Control	Control	Control	Control

Table 4. Endogeneity testing

	(1) FI	(2) T	(3) FI	(4) T
FI		0.537***		0.668***
		(0.042)		(0.015)
L1.FI	1.126***			
	(0.012)			
L2.FI			1.460***	
			(0.021)	
X	Control	Control	Control	Control
_cons	-0.049***	0.153***	-0.234***	-0.072***
	(0.068)	(0.043)	(0.036)	(0.015)
Observations	330	330	330	330
Number	30	30	30	30

5.4. Endogeneity test

Considering the possible reverse causality between the development of the digital economy and the integration of the two industries, and the potential presence of omitted variable bias, it may lead to endogeneity issues. To mitigate the impact of endogeneity on empirical results, lagged one period and lagged two periods of digital economic development chosen

as instrumental variables, and the two-stage least squares (2SLS) method is employed for endogeneity testing. The regression results are shown in Table 4, where columns (1) and (3) demonstrate a significant positive relationship between the instrumental variables and the proxy variables for digital economic development, while columns (2) and (4) indicate that digital economic development enhances the level of integration between the two industries. The test results are consistent with the empirical findings in the previous section, confirming the hypothesis H1.

5.5. Heterogeneity analysis

5.5.1. Heterogeneity testing of industrialization level

Degree of industrialization is the foundation and significant influencing factor for the integration of the two industries. The impact of digital economic development on the integration of the two industries may exhibit significant heterogeneity among cities with different levels of industrialization. Therefore, distinguishing the industrialization levels among provinces is essential for analyzing the impact of digital economy on the integration of the two industries. The specific research process involves measuring the level of industrial development (DIP) by the ratio of the GDP of the secondary sector to the GDP of the tertiary sector in each province. A higher ratio indicates a higher level of industrialization. The provinces are then categorized into high DIP, medium DIP, and low DIP regions based on the numerical values. The regression results, as shown in columns (1), (2), and (3) of Table 5, indicate that digital economic development significantly promotes the integration of the two industries in all regions. However, in regions with moderate levels of industrialization, digital economic development has a more significant promoting effect on the integration of the two industries.

The above results suggest that for provinces with lower levels of industrialization, where the tertiary sector has a higher proportion and the secondary sector has a lower proportion, the manufacturing industry is relatively weak. Due to the disparity in industrial scale, the foundation for the development of the integrated industries is weaker. In provinces with excessively high levels of industrialization, where the secondary sector has a disproportionately high proportion, there is an over-reliance on the manufacturing industry. Simultaneously, the proportion of the service sector is relatively small and the absence of high-quality services hinders the process of service-oriented transformation in the manufacturing industry, therebyeding the development of the integrated industries.

Table 5. Heterogeneity analysis based on the level of industrialization

	(1) Low DIP	(2) Medium DIP	(3) High DIP
FI	0.269***	0.367***	0.167*
	(0.021)	(0.026)	(0.011)
X	Control	Control	Control
_cons	-0.042	0.215***	-0.078
	(0.072)	(0.017)	(0.046)
N	120	120	120
r2	0.305	0.498	0.357
Individual/Annual	Control	Control	Control

5.5.2. Heterogeneity Test in Region

Due to variations in digital economic development, the integration of the two industries, geographical location, resource endowment, and degree of openness among provinces, the impact of digital economic development on the integration of the two industries may differ regionally. To the differences in the impact between different regions, the selected provinces are categorized into Eastern (East), Central (Mid), and Western (West) regions. The Eastern region includes: Beijing, Tianjin, Hebei, Shanghai, Jiangsu, Zhe, Fujian, Liaoning, Shandong, Guangdong, and Hainan. The Central region includes: Shanxi, Heilongjiang, Jilin, Anhui, Henan, Jiangxi, Hubei, and Hunan. The Western region includes: Inner Mongolia, Chongqing, Sichuan, Guizhou, Guangxi Yunnan, Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang.

For a detailed analysis of regional heterogeneity, refer to Table 6. Overall, the promoting effect of digital economic development on the integration of cultural and tourism industries is significant at the 1% level for all three regions. The promoting effect, ranked from largest to smallest, is as follows: Central region > Western region > Eastern region. This could be attributed to the early development of digital economy in the Eastern region, where the space for further dividend release is limited. In contrast, the Central and Western regions started their digital economic development relatively later, with significant potential for further dividend release.

Table 6. Heterogeneity Analysis in Region

	(1) EAST	(2) Mid	(3) West
FI	0.295***	0.485***	0.342***
	(0.011)	(0.015)	(0.021)
X	Control	Control	Control
_cons	-0.056	0.132***	-0.026
	(0.072)	(0.017)	(0.056)
N	132	96	132
r2	0.238	0.463	0.372
Individual/Annual	Control	Control	Control

6. Research Findings

The research is based on panel data of digital economic development and the integration of two industries in 30 provinces in China from 2010 to 2021. Utilizing a time-individual two-way fixed effects model, the study examines the effects of digital economic development on the integration of two industries. It analyzes the impact of various sub-indicators of digital economic development on the integration of two industries, explores the regional in the influence of digital economic development on the integration of two industries based on regions and industrialization levels.The conclusions drawn are as follows:

Digital economic development significantly promotes the integration of two industries. Various sub-indicators of digital economic development, namely industrial digitization, digital industrialization, and digital finance, all contribute positively to the integration of two industries. The degree of promotion follows the order: industrial digitization digital industrialization > digital finance.

Regionally, digital economic development in the eastern, central, and western regions of China promotes the integration two industries, with varying degrees. The promotion degree follows the order: central region > western region > eastern region.

In terms of industrialization levels, digital economic development has a more significant effect on the integration of two industries in regions with moderate industrialization levels.

The study introduces a panel threshold model, indicating that when the threshold value is below the first threshold, the coefficient for the promotion of integration in the cultural and tourism industry by digital economic development is .032. When the threshold value is between the first and second thresholds, the coefficient increases to 0.056. Crossing the second threshold the coefficient to 0.073, suggesting that the impact of digital economic development on the integration of the cultural and tourism industry strengthens when the research intensity of digital technology surpasses the threshold.

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