

The Impact of the Digital Economy on the Integration and Development of Manufacturing and Logistics Industries

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Abstract: Industrial integration is an effective way to promote economic growth in the era of digital economy and an important part of the high-quality development of the manufacturing industry. In the context of the vigorous development of the digital economy, this paper uses the principal component analysis method to construct the digital economy development index system and the coupled coordination degree model to measure the integration level of the manufacturing industry and logistics industry, and empirically analyzes the impact of the digital economy on the integration and development of the manufacturing industry and logistics industry by using the panel data of 30 provinces (municipalities and districts) in China from 2013 to 2020. It is found that the digital economy significantly promotes the integration level of manufacturing and logistics. The digital economy can promote the integrated development of manufacturing and logistics through both enterprise technology innovation and a digital platform. Heterogeneity analysis shows that the digital economy has a significant promotion effect on the eastern region and western region, with the western region > the eastern region.

Keywords: Digital economy, Technological innovation, Digital platforms.

1. Introduction

The integrated development of the manufacturing and logistics industries is an important guarantee for the construction of a new development pattern of double-cycle and the building of a modernized industrial chain and supply chain. The experience of developed countries shows that promoting the integrated development of manufacturing and logistics is a necessary measure to realize the high-quality development of manufacturing. In recent years, with the rapid development of digital technology and digital economy, the integration level of China's manufacturing and logistics industries has been improving, and the integration degree has increased from 0.4934 in 2009 to 0.7598 in 2020, which is on the verge of being dislocated and gradually developing into intermediate coordination[1]. However, the depth and breadth of the integration of China's manufacturing industry and logistics industry is still insufficient, especially with the insufficient sharing of information resources, standards and norms convergence is not in place, and other issues are more prominent, resulting in the manufacturing supply chain elasticity being insufficient and the industry chain synergies being low[2]. Digital economy as a new economic form of rapid development, has gradually become the driving force of China's industrial structure upgrading, high-quality development of the economy in the traditional industries to achieve resource integration, optimize the allocation of factors, and give new energy at the same time, which can break the traditional inter-industrial barriers. For this reason, the report of the 20th Party Congress proposed to build a digital China, accelerate the development of the digital economy, and promote the deep integration of the digital economy with the real economy.

Digital economy is a series of economic activities with data resources as the key production factors, modern information network as the important carrier, and effective use of information and communication technology as the important

driving force for efficiency improvement and optimization of economic structure, which can not only promote the digital transformation of the manufacturing and logistics industries, form a large market of data resources, and derive new modes and new business models closely related to the data, but also promote effective connection and in-depth integration of the manufacturing and logistics industries[3]. The effective connection and deep integration of the logistics industry. To this end, academics have conducted numerous theoretical and empirical studies on a series of issues, such as how the digital economy digitally transforms traditional industries such as manufacturing and logistics, the size of the promotion effect of the development of the digital economy on traditional industries, and the integration and development of the digital economy on traditional industries. For example, some scholars research on how the digital economy transforms traditional industries finds that the digital transformation of the manufacturing industry and the logistics industry is the process of industrial upgrading to form a new model, and it is necessary to deepen the application and penetration of digital technology in the traditional industries of R&D and innovation, production and processing, etc., and constantly improve the foundation of traditional industry informatization and digitization to support the transformation and upgrading of traditional industries, so as to promote their high-quality development[4]. Some scholars used an econometric model to measure the size of the role of the digital economy in influencing traditional industries such as manufacturing and logistics, respectively, and found that for every 1% increase in the level of development of the digital economy, the upgrading of China's manufacturing industry was increased by 0.935%, and the level of high-quality development of the logistics industry was increased by 1.448%[7]; some scholars conducted a study on industrial integration and found that the digital economy has a facilitating effect on industrial integration, and further found that: industrial digitization and digital industrialization are the basic paths of the digital

economy's role in industrial integration, with technological innovation, general-purpose assets, and spatial distance as the influencing mechanisms[9]. At present, the use and development of digital technology have accelerated the process of industrial integration, with industrial subjects relying on technological innovation to obtain new advantages and then seeking new development power and a new competitive track, ultimately leading to the birth of new forms, new models, new products, and new services, so that the industrial integration of the current economic development is effective.

For the digital economy to promote the integration of manufacturing and logistics development issues, there are many scholars in the academic community to carry out research, but more qualitative analysis is needed, such as: with the development of information technology, the logistics industry must introduce a variety of innovative elements and concepts to achieve effective management of the supply chain, while logistics outsourcing providers are committed to the advancement of logistics technology, which will help the manufacturing industry to have a knowledge and technology spillover effect. The development of the Internet of Things and the popularization and application of logistics information technology have strengthened the linkage between logistics and manufacturing industries. Regarding the impact of IoT on the integration of the two industries, some scholars pointed out that the use of IoT technology promotes the informatization of China's manufacturing and logistics industries[11]. Some scholars have suggested that the application of IoT information technology accelerates the business integration of manufacturing and logistics[12]. At the level of logistics information technology, some scholars argue that the use of logistics information technology has become the main way for manufacturing enterprises in developed countries to improve logistics efficiency, respond to customer demand in a timely manner, and enhance corporate service capabilities and product competitiveness[13]. Some scholars both point out that the digital economy has a driving effect on the integration of manufacturing and logistics, and further find that the integration of the two industries contributes to the improvement of integration performance and the reduction of manufacturing logistics[14].

The above literature on how the digital economy affects the integration of manufacturing and logistics industries has carried out extensive research, which provides a reference for the deep integration of manufacturing and logistics industries, but there are still places for further deepening. First, regarding the measurement of the size of the role of the digital economy in promoting the level of integration and development of the manufacturing and logistics industries, the existing literature is only based on qualitative judgments and less empirical research and fails to accurately measure the size of the role of the digital economy in the integration of the two industries. Secondly, regarding the mechanism of the digital economy to promote the development of the integration of the two industries, the existing studies often only determine that the digital economy has a facilitating effect on the integration of the two industries without a thematic study of the mechanism by which the digital economy acts on the integration of the manufacturing industry and the logistics industry, resulting in the inability to systematically assess the relationship between the digital economy and industrial integration. Thirdly, regarding the regional differences in the impact of the digital

economy on the integration of the two industries, the existing research is more focused on examining the regional heterogeneity of the level of integration of the manufacturing and logistics industries and has not explored the impact from the perspective of the digital economy. Based on this, this paper combines the characteristics of the development process of the digital economy, builds a theoretical analysis framework from the perspective of the integration of the manufacturing and logistics industries, measures the level of digital economy development and the level of integration of the manufacturing and logistics industries in 30 provinces (municipalities and districts) across the country in the period from 2013 to 2020, empirically examines the impact of the digital economy on the integration of the development of the two industries by using the econometric model, and further researches the impact mechanism and the effect of the impact. The study will further investigate the mechanism and effect of the influence.

Compared with existing articles, the marginal contributions of this paper are mainly reflected in the following points: First, the impact of the digital economy on the integration and development of manufacturing and logistics is systematically explored from the theoretical and empirical aspects, respectively, and the mechanism of the digital economy's impact on the integration and development of the two industries is explored from the perspectives of both corporate technological innovations and digitization platforms. Second, a more systematic measurement of the digital economy and the integration of the two industries is carried out at the provincial level, and the role and size of the digital economy in promoting the integration of the two industries are assessed. Third, it examines the differences in the impact of the digital economy on the integrated development of manufacturing and logistics in three major regions. This enriches the research content on the integrated development of manufacturing and logistics and provides policy insights for the digitalization of industries and the high-quality development of manufacturing.

2. Theoretical Analysis and Research Assumptions

Relying on a new generation of information technology and massive data resources, the digital economy promotes the improvement of industrial efficiency and cross-border integration, and its versatility and high permeability have completely changed the production mode of traditional industries, integrating upstream and downstream resources of the industrial chain, further reducing operating costs, and improving the productivity, operational efficiency and management efficiency of enterprises. The digital transformation of production, transportation, warehousing and consumption by digital technology promotes the deep participation of manufacturing enterprises and logistics enterprises in each other's design, operation and control processes and the joint pursuit of intensive development and overall optimization of operation and management of the synergy model. By combing the research in the fields of digital economy and industrial integration, the following theoretical framework is constructed to analyze the impact mechanisms of the digital economy on the integration and development of the manufacturing and logistics industries.

2.1. Digital economy, technological innovation and integration of the two industries

On the one hand, the digital economy promotes the technological innovation of manufacturing enterprises and logistics enterprises. As a knowledge- and technology-intensive economic form, the rapid development of digital economy is very important to promote technological innovation. The development of the digital economy promotes the continuous gathering of high-end talents and R&D capital, which is a kind of innovation element, and relies on the most cutting-edge information technology such as the Internet of Things, artificial intelligence, 5G and other cutting-edge information technology iterative formation of new technologies, the depth of the penetration of advanced technology to manufacturing enterprises and logistics enterprises to reshape the technological route of traditional industries[16], and through the overflow of intra-enterprise learning, the competitive overflow between enterprises and the overflow of different industries, which will then more effectively promote the diffusion and overflow of digital technology.

On the other hand, technological innovation by enterprises can promote the integration of manufacturing and logistics. Firstly, manufacturing enterprises through technological innovation brought about by new technologies and new processes applied to manufacturing, marketing and other links, so that it has digital intelligent technology production elements, the formation of new technologies emerging endlessly, continuous outpouring, superimposed on the convergence of the situation, reconfigure the main body of supply and demand, the industrial chain, the supply chain and the value chain, and give birth to the manufacturing industry's digitalization of the new business model; Secondly, the logistics enterprises will be intelligent logistics technology is widely used in transportation[17], warehousing, loading and unloading handling and other links, and thus more effectively promote the integration of manufacturing and logistics industry. Secondly, logistics enterprises widely apply intelligent logistics technology in transportation, warehousing, loading and unloading, and other links to continuously adapt to the new needs of customers and the new external environment. As an intermediate input element, logistics services are integrated into various links in manufacturing enterprises to maintain the continuity and coordination of production and operation. In the manufacturing enterprise supply chain, the logistics enterprise designs, implements and controls the information from the procurement of raw materials from the manufacturing enterprise, the flow of the internal processing link of the enterprise, and the transportation and warehousing of the terminal into the market. On this basis, intelligent logistics technology and manufacturing production of new technologies to integrate will realize the manufacturing industry's and the logistics industry's standards and norms of integration, convergence, and sharing of information resources. The consistency of the standard specification of the two industries strengthens the connection between manufacturing enterprises and logistics enterprises in each link and reduces the input and waste of redundant elements; under the fusion and sharing of information resources, it reduces the risk of information asymmetry and incompleteness, improves the operational efficiency of the supply chain and the speed of response to information, and

forms a long-term cooperative relationship of risk-sharing and benefit-sharing, which realizes the deep-seated fusion of two industrial enterprises. In addition, the technology integration platform of the manufacturing and logistics industries built on the basis of digital technology effectively promotes the matching efficiency of the new technology of logistics enterprises and the manufacturing supply chain, strengthens the correlation and interchangeability of the technology between enterprises, realizes the technological penetration between enterprises of different industries, and promotes the in-depth integration of the manufacturing industry and the logistics industry[18]. Based on this, this paper puts forward the following hypotheses:

Hypothesis 1: The digital economy helps manufacturing enterprises and logistics enterprises through technological innovation and thus promotes the integration of the two industries.

2.2. Digital economy, digital platform and the integration of the two industries

On the one hand, the development of the digital economy has accelerated the construction and use of digital platforms. Relying on digital technology, industry innovation and consumption upgrading, numerous digital platforms have been rapidly developing and expanding[20], becoming the main organizational form of the digital economy and greatly enhancing the efficiency of economic operation by penetrating different industry sectors[21]. As a network carrier, the digital platform processes the huge amount of data gathered, screens, connects and integrates the multi-link source data of different industries, and generates the value-added effect of data fusion[22].

On the other hand, the digital platform can promote the integration of manufacturing and logistics. Relying on cloud computing, big data, 5G and other technologies to build intelligent logistics service platforms, industrial Internet and supply chain platforms, etc., is based on the "common value" of the "value ecosystem", serving the collection, transmission, integration, management and analysis of data and effectively promoting the relationship between supply and demand in the manufacturing and logistics industries. It serves data collection, transmission, integration, management and analysis; effectively promotes the efficient matching of supply and demand between the manufacturing industry and the logistics industry; and realizes the intelligentization of logistics decision-making and the flexibilization of production and manufacturing. The digital platform aggregates massive unstructured data and, after artificial intelligence algorithm simulation, data simulation and other stages, transforms it into high-value structured forms that can be used in business models and transforms information flow into a data value chain. The service-centered platform ecosystem puts different subjects of interest in the same open and complex value creation network, relying on structured data to build up a multi-industry, multi-subject and multifactor space, realizing the multi-link synergy between manufacturing enterprises and logistics enterprises in the production, transportation, warehousing and distribution of products, and generating the economies of scale based on transportation, warehousing and distribution, thus reducing transaction costs. In addition, the digital platform relies on the function of "interconnection of all things" to promote cross-border flow of data in an all-round way, break the information barriers between production factors and production links

between different industries, strengthen the information interoperability of management systems, supply chain links and production systems, and help manufacturing enterprises and logistics enterprises explore effective information in depth, reduce the cost of information, and promote the formation of vertical interconnection between manufacturing and logistics industries. Manufacturing and logistics industries to form a vertically connected and horizontally interconnected integration and development system. Logistics enterprises through the data connection, integration and analysis, improve the logistics link operation efficiency and then provide safe and efficient, real-time monitoring, personalized, customized logistics services for the manufacturing industry. They also improve the manufacturing enterprises flexible and agile manufacturing capabilities and help them achieve the goal of improving output efficiency and reducing costs. Based on this, this paper puts forward the following assumptions:

Hypothesis 2: The digital economy reduces costs through the digital platform, thereby promoting the integration of the two industries.

3. Research Design

3.1. Model Setting

In order to test the impact of digital economy on the integration of manufacturing and logistics, this paper constructs the basic econometric model:

$$D_{it} = \beta_0 + \beta_1 dig_{it} + \beta_2 X_{it} + \mu_i + \omega_t + \varepsilon_{it} \quad (1)$$

Where i denotes province and t denotes year, D_{it} denotes the level of integration of manufacturing and logistics in province i in year t , dig_{it} denotes the degree of development of digital economy in province i in year t , X_{it} denotes the province-level control variable, μ_i denotes province fixed effect, ω_t denotes time fixed effect, ε_{it} is a random perturbation term.

3.2. Variable selection

Explained Variables: the integration level of manufacturing and logistics industry (D). Constructing the indicator system to measure the integration development level of manufacturing and logistics industry, the construction process should take into account the scientific and operability, therefore, this paper through combing the relevant literature selected indicators[14].

This paper calculates the weights of indicators based on the entropy weight method and applies the coupled coordination model to measure the level of integrated development of manufacturing and logistics in 30 provinces (cities and districts) across the country, and the calculation steps are as follows:

In the first step, normalization of raw data:

$$\text{positive indicator: } X_{ij} = (x_{ij} - x_{jmin}) / (x_{jmax} - x_{jmin}) \quad (2)$$

$$\text{negative indicator: } X_{ij} = (x_{jmax} - x_{ij}) / (x_{jmax} - x_{jmin}) \quad (3)$$

Where, x_{ij} represents the original value of the j th indicator of the i th individual in the cross-section data, and x_{jmax} 、 x_{jmin} are the maximum and minimum values of the j th indicator in the year of the cross-section data. i denotes the

individual of the cross-section data, $i=1,2,\dots, m$; j denotes the number of indicators, $j=1,2,\dots, n$.

In the second step, construct the normalization matrix Z_{ij} :

$$Z_{ij} = x_{ij} / \sum_{i=1}^m X_{ij} \quad (4)$$

In the third step, calculate the information entropy value e_j for each indicator:

$$e_j = -k \sum_{i=1}^m (Z_{ij} \times \ln Z_{ij}) \quad (5)$$

In the fourth step, calculate the weights of each indicator W_j :

$$W_j = c_j / \sum_{j=1}^n c_j \quad (6)$$

Where $c_i = 1 - e_j$ is the information entropy redundancy calculated based on the entropy value.

In the fifth step, the integrated development level of the subsystem is further calculated:

$$P_{ij} = W_j \times X_{ij} \quad (7)$$

$$U_1 = \sum_{j=1}^n P_{ij} \quad (8)$$

P_{ij} indicates the development of individual indicators of the cross-section. U_1 indicates the development level of the manufacturing subsystem, and the development level of the logistics subsystem is U_2 .

In the sixth step, the coupling degree C of the two systems is calculated:

$$C = 2 \times \sqrt{\frac{U_1 \times U_2}{(U_1 + U_2)^2}} \quad (9)$$

In the seventh step, calculate the degree of coordination of the two systems, the integrated coordination index:

$$D = \sqrt{C \times T} \quad (10)$$

$$T = aU_1 + bU_2 \quad (11)$$

Among them, D is the coupling coordination degree of manufacturing and logistics industry, $D \in (0,1)$, T is the comprehensive coordination index, a 、 b represents the proportion of the two systems in the coupled system, $a + b = 1$, through combing the existing literature to set $a=0.5, b=0.5$.

Core Explanatory Variables: The core explanatory variable in this paper is the level of digital economy development (dig). The digital economy can be divided into the core layer, the middle layer and the outermost layer according to the industrial chain links. Based on these three levels, the digital economy can be divided into three dimensions: digital infrastructure, digital industrialization and industrial digitization[23].

Control Variables: Referring to the existing literature in the digital economy and industrial integration research, this paper selects control variables from five aspects: foreign direct investment (fdi), infrastructure level (inf), financial development level (fin), marketization degree (mar), and industrial structure (ind). FDI is expressed as the share of actual utilized foreign capital in GDP in the year;

infrastructure level is expressed as the number of road line miles per square kilometer; financial development level is expressed as the share of deposit and loan balances of financial institutions in GDP; the degree of marketization is measured as the share of employees in non-state-owned enterprises; and industrial structure is expressed as the share of value added of secondary industry in the value added of tertiary industry.

4. Empirical Tests and Analysis of Results

4.1. Analysis of the results of the benchmark model estimation

In this paper, the fixed effect model is used in the estimation of the benchmark regression model to test the relationship between the digital economy and the level of

integration and development of the manufacturing and logistics industries, and the results are shown in Table 1. Table 1 reports the effect of digital economy on the level of integration of manufacturing and logistics industries. The results in column (1) show that the coefficient of digital economy (*dig*) is significantly positive at the 1% level, indicating that the digital economy promotes the integrated development of manufacturing and logistics, in order to eliminate the interference of other economic factors on the regression results at the provincial level as much as possible, the control variables are added in column (2), and the results show that the coefficient of digital economy (*dig*) is significantly positive and passes the test of the 1% level of significance, and the model estimation The results are more robust, only the size of the value fluctuates, indicating that after controlling other influencing factors, the digital economy still significantly promotes the level of integration of manufacturing and logistics development.

Table 1. Benchmark Regression Results

variable	(1) D	(2) D
<i>dig</i>	0.154*** (0.033)	0.094*** (0.032)
_cons	-0.717*** (0.025)	-0.725*** (0.089)
control variable	no	yes
Fixed effect	yes	yes
N	240	240
R ²	0.494	0.634

Note: T values are shown in brackets, and *, ** and *** represent significance levels of 10%, 5% and 1%, respectively. The following tables are the same.

4.2. Heterogeneity analysis

Considering that there are huge differences in the digital economy and resource endowment of each region, the integration and development of manufacturing and logistics industry is affected by the local economy to a certain extent, therefore, by dividing China's 30 provinces (municipalities and districts) into eastern, central and western regions, we explore the impact of regional economic development differences on the digital economy to promote the integration of the manufacturing industry and logistics industry, and the regression results are shown in Table 2: The regression coefficients of the digital economy of the eastern and western regions on the integration of the manufacturing industry and logistics industry integration development regression coefficient passed the 1% significance level test, and the degree of influence of the digital economy on the two industries in the western region is greater than that in the eastern region, indicating that the degree of promotion of economically developed regions is smaller, while the promotion of economically backward regions is more significant, the cause of this result may be that the eastern region than the western region has more abundant resources, infrastructure, talent aggregation, and policy support, the digital economy on the integration of manufacturing and logistics industry. The impact of the digital economy on the integration of manufacturing and logistics, development dividends and early release. But the resource-poor areas of manufacturing and logistics industry at this time are in the rapid development stage, and the digital economy, by the economic development of the constraints are smaller while

enjoying the national preferential policies and tax breaks, so the development of the digital economy is just to stimulate the latecomer advantage of the western region and therefore promote the role of significant. The regression coefficient of the digital economy on the integration level of manufacturing and logistics in the central region does not pass the 10% level test, which may be due to the fact that compared with the western region, the central region is subject to the siphoning effect of the eastern region, while the development of the digital economy and the advantages of the regional resource endowment fail to integrate well, resulting in the lack of accumulation of human capital in the central region, the loss of capital, and the transfer of the outstanding industries, so that the development of the power of the central region is not enough to further inhibit the development. The central region is further inhibited.

4.3. Robustness test

4.3.1. Replace the explanatory variable digital economy

There are a variety of index system construction and calculation methods for the digital economy. In order to avoid the impact of the explanatory variables on the estimation results due to the differences in the selection of indicators and different measurement methods, this paper refers to the correlation research method to re-construct the index system and utilize the entropy weighting method to measure the comprehensive development index of the digital economy (*dig1*)[24]. The regression results are shown in Table 3, column (1), the impact of digital economy on the integrated development of the manufacturing and logistics industries is still significant. The impact of the digital economy on the

integrated development of the logistics industry remains significant.

Table 2. Heterogeneity Analysis

variable	(1) Eastern	(2) Central	(3) Western
dig	0.039*** (0.006)	-0.029 (0.037)	0.056*** (0.021)
_cons	0.675*** (0.129)	0.638 (0.076)	0.279*** (0.055)
control variable	yes	yes	yes
Fixed effect	yes	yes	yes
N	88	64	88
R ²	0.619	0.597	0.702

4.3.2. Systematic GMM Estimation

In order to further solve the estimation error brought by a single method, this paper lags one period of the explanatory variable manufacturing and logistics integration level (D) as an explanatory variable for the system GMM estimation, and

the estimation results are shown in column (2) of Table 3, which indicates that the digital economy still promotes the integrated development of manufacturing and logistics significantly.

Table 3. Robustness Test

variable	(1) dig1	(2) system GMM
L.dig		0.209*** (0.039)
dig	0.305* (0.151)	0.0217*** (0.003)
_cons	0.447*** (0.077)	0.374*** (0.037)
control variable	yes	yes
fixed effect	yes	yes
N	240	180
R ²	0.595	-

5. Mechanism test

The previous regression results found that the digital economy has a facilitating effect on the manufacturing and logistics industries, and the theoretical analysis part found that the digital economy can act on the integration of the two industries in two ways through the technological upgrading of enterprises and digital platforms, and the mechanism of the effect is manifested in the technological upgrading of enterprises and the reduction of enterprise costs. In order to verify whether the influence mechanism exists, this paper designs the following econometric model for verification:

$$VAR_{it} = \beta_0 + \beta_1 dig_{it} + \beta_2 X_{it} + \mu_i + \omega_t + \varepsilon_{it} \quad (12)$$

Where, VAR_{it} it denotes the mechanism variables of digital economy affecting the integration of manufacturing and logistics in province i in year t , which are technological innovation (tec) and reducing enterprise cost (cos). In the econometric model, if it passes the significance test, it indicates that the digital economy affects the integration of the two industries in the above two ways. By analyzing the existing literature and combining the availability of data, this paper selects the relevant variables of the two mechanism variables as follows: (1) Technological innovation is

expressed by the number of patents granted in each province. (2) The reduction of enterprise costs is expressed by the ratio of total profit to main business income of industrial enterprises above large scale.

As shown in Table 4, the impact of the development of digital economy on technological upgrading is significantly positive at the 1% level regardless of whether control variables are added or not, indicating that the digital economy can expand the production boundaries of enterprises, make internal and external information exchange more convenient, and enable the acquisition, sharing and creation of new knowledge and information, which is conducive to promoting technological upgrading of enterprises. Technological innovation can promote the innovation and upgrading of each link of the industrial chain and then promote the integration of industries across the board, and technological progress is the continuous driving force of industrial integration.

The reduction of enterprise cost passes the test at the 5% level, indicating that the digital economy reduces the transaction cost, information exchange cost, search cost and fulfillment cost of enterprises through the digital platform, thus promoting the development of the deep integration of the manufacturing and logistics industries. Hypotheses 1 and 2 are verified.

Table 4. Mechanism Test

variable	(1)	(2)	(3)	(4)
	<i>tec</i>	<i>tec</i>	<i>cos</i>	<i>cos</i>
<i>dig</i>	0.908*** (0.164)	0.933*** (0.202)	0.006** (0.003)	0.007** (0.004)
_cons	-0.259 (0.164)	2.234*** (0.680)	0.0562*** (0.003)	0.0394 (0.047)
control variable	no	yes	no	yes
Fixed effect	yes	yes	yes	yes
N	240	240	240	240
R ²	0.779	0.809	0.015	0.029

6. Conclusion and Policy Recommendations

In the context of vigorously promoting the development of digital economy, this paper studies the impact and mechanism of digital economy on the integrated development of manufacturing and logistics based on the panel data of 30 provinces (cities and districts) across China. The results show that the digital economy, as a catalyst for industrial integration, can promote the integrated development of the manufacturing and logistics industries, and at the same time, it can also play a role in the integrated development of the two industries through the technological upgrading of enterprises and the digitalization platform in two ways. The results remain significant after a series of robustness tests. Heterogeneity analysis found that the digital economy has a significant impact on the level of integration of manufacturing and logistics in the eastern and western regions but fails to promote the central region.

Based on the findings of the study, this paper puts forward the following policy recommendations to improve the integration level of manufacturing and logistics:

First, the government should formulate differentiated digital economy development policy measures to promote the depth of integration between the two industries. In particular, western regions and non-technology-intensive regions should accelerate the construction of digital infrastructure, strengthen policy guidance and provide financial support, and cultivate talents adapted to the development of digital economy.

Second, enterprises should accelerate the process of digital transformation to activate the new impetus for the integration of the two industries. On the one hand, digital technologies such as 5G, artificial intelligence and the Internet of Things should be used as an innovation driver to improve enterprises' intelligent manufacturing and logistics management. On the other hand, enterprises should also give full play to the potential and multiplier benefits of data as a production factor to create new value chains and service models.

Third, in order to better realize the integration of the two industries, it is necessary to create a "value ecosystem" based on "common value" and build an integrated digital platform for manufacturing and logistics with real-time data collection and detection, intelligent analysis and control.

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