Digital Deployment and Innovation Technology

Journal Homepage: https://journal.ddit.hk/

Digital Capital and Urban-Rural Integration Development: Based on the perspective of high-quality development of higher education

***Hao Deng*[1], *Sanglin Zhao*[2*]**

[1] *Faculty of Humanities and Social Sciences, Macau Polytechnic University, Macao SAR, China*
[2] *School of Business, Macau University of Science and Technology, Macao SAR, China*

ARTICLE INFO

Keywords:
High-quality development of higher education
Digital capital
Urban and rural integration development
Digital policy
Intermediary model

*Correspondence:
Sanglin Zhao
sanglin.zhao@cityu-dg.edu.cn

ABSTRACT

One of the key tasks of China's economic and social development is to promote new urbanization and overall rural revitalization in order to promote the integrated development of urban and rural areas. This paper selects the provincial panel data of China from 2011 to 2023 (excluding Tibet, Hong Kong, Macao and Taiwan) as the research sample and based on the perspective of high-quality development of higher education, tests the influence of digital capital on urban-rural integration and its related mechanism through empirical analysis. This paper measures the level of digital capital and the level of urban-rural integration development by word frequency analysis and entropy method and verifies that digital capital has a significant positive impact on urban-rural integration development and promotes urban-rural integration development by improving the high-quality development level of higher education. This paper enriches the application theory of digital capital in urban-rural integration development and provides reference and enlightenment for other developing countries.

1. Introduction

1.1. Research background

With the rapid development of digital economy, digital capital has become the core element to reshape the regional economic structure. Digital capital covers not only physical forms such as ICT infrastructure and data resources, but also intangible assets such as digital skills and platform economy (Tapscott, 1996). Its particularity lies in its wealth accumulation attribute and production innovation function: it can not only directly improve production efficiency through ICT hardware investment, but also promote new formats through data flow and knowledge sharing (Xu Aiting, 2023). At present, the global digital economy has accounted for more than 40% of GDP, and the growth rate of digital economy in China has remained above 15% for many years (National Bureau of Statistics, 2023), and the driving role of digital capital in regional development has become increasingly prominent.

The existing research shows that digital capital has a far-reaching impact on the development of urban-rural integration by reconstructing the flow mode of factors and optimizing the efficiency of resource allocation, but its mechanism has significant spatial heterogeneity and institutional dependence. Tapscott (1996) creatively put forward the concept of digital capital, emphasizing its characteristics of value creation through information network and digital technology, while Xu Aiting (2023) further distinguished its dual attributes of wealth accumulation and production innovation, providing a theoretical framework for understanding the economic function of digital capital. The development of digital economy in China presents a gradient decreasing pattern of "East-Central-West-Northeast", and the urban agglomerations of Beijing-Tianjin-Hebei, Yangtze River Delta and Pearl River Delta form the core growth poles. This spatial differentiation and the mismatch between urban and rural factors form a superposition effect: in 2022, the proportion of digital economy in GDP in the eastern region will reach 54.01% (Beijing) and 50% (Shanghai), while the coverage rate of digital infrastructure in rural areas in the central and western regions will be less than 40%, resulting in a gap in the utilization efficiency of urban and rural resources. Camacho et al. (2024)' s empirical research reveals that the social stratification effect of digital capital intensifies the differentiation between urban and rural groups, and the structural contradiction of "strong east and weak west" in higher education resources (62% in eastern universities and only 21% in western

ISSN Pending / DOI will be assigned upon official publication
Received 10 July 2026; Received in revised form 13 July 2026; Accepted 14 July 2026; Available online 15 July 2026
© 2026 The Authors. Published by Ywain Limited. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0)

universities) further enlarges this gap, forming a vicious circle of "digital gap-education gap". In this context, the role of digital capital in correcting the mismatch between urban and rural factors is twofold: on the one hand, technologies such as 5G and blockchain promote the two-way flow of urban and rural talents and data elements, such as Henan county's remote office platform to achieve technical talents to the countryside, and digital financial tools to improve rural financing efficiency by 37%; On the other hand, the imbalance of regional digital infrastructure leads to the "digital siphon effect". In 2022, the number of 5G base stations in Guangdong was 2.8 times that in Sichuan, which aggravated the outflow of rural factors in the west. As a key regulating variable, the high-quality development of higher education reshapes the digital capital empowerment mechanism through three major paths: first, the transformation of technology research and development, such as the smart agricultural system developed by Huazhong Agricultural University, which improves the planting efficiency in rural areas of Hubei by 28%; The second is the training of digital talents. The e-commerce training program in henan university of economics and law has increased the penetration rate of rural e-commerce by 19 percentage points; The third is the digital allocation of educational resources. The platform of educational resources in Henan Province has increased the access rate of high-quality courses for rural students from 32% to 67%. However, there are still theoretical blind spots and methodological limitations in the existing research: in theory, we pay too much attention to the economic dimension and ignore the institutional and cultural factors, such as the lag of data property rights system, which leads to 38% rural data resources being idle; In terms of methods, static cross-sectional data analysis is difficult to capture the dynamic synergy effect between digital capital and urban-rural integration. Zhao Zhiqiang (2023) pointed out that the lack of panel data and spatial econometric model restricts the policy accuracy; On the practical level, the collaborative innovation mechanism of universities, enterprises and governments has not yet formed a system. The patent conversion rate of digital technology in eastern universities is only 21%, far lower than 68% in the United States. Future research needs to break through the single economic paradigm, integrate the theory of "digital exclusion" in sociology and the framework of "capacity poverty" in education, and build a three-dimensional analysis model of "technology-system-human capital". In particular, it needs to pay attention to the subversive influence of emerging technologies such as meta-universe and quantum computing on the spatial relationship between urban and rural areas in the Web3.0 era, as well as the restraining effect of digital ethical regulation on the flow of factors, so as to provide a more explanatory theoretical tool for solving the dilemma of "Hu Huanyong Line".

In this context, urban-rural integration development, as a strategic starting point to break the long-term constraints of Hu Huanyong Line and achieve common prosperity, urgently needs to break through the traditional one-way flow mode of elements. The research shows that the mismatch rate of urban and rural factors in China is 37% (Liu Minghui et al., 2022), which leads to the utilization rate of rural resources being less than 40% and the urban agglomeration effect being excessively concentrated (Cai Yuezhou, 2015). Although policies continue to be overweight (such as "rural revitalization strategy" and "digital China" construction), how to turn digital capital into the endogenous driving force for coordinated development of urban and rural areas is still an urgent theoretical and practical proposition. As the hub of knowledge production and talent cultivation, higher education bears a unique mission in the digital transformation. First, universities can directly promote agricultural digitalization (such as smart agriculture), industrial intelligence (such as industrial internet) and service industry innovation (such as digital finance) through technology research and development; Second, the realization of educational equity depends on the cross-regional flow of high-quality educational resources (Pan Xingxia, 2022). It is worth noting that China's higher education resources show a gradient distribution of "strong in the east and weak in the west", with the number of universities in the eastern region accounting for 62% of the country, while only 21% in the west (Ministry of Education, 2022). This structural contradiction intensifies the gap between urban and rural human capital-the number of college students per 10,000 people in cities is 4.3 times that in rural areas (National Bureau of Statistics, 2023). Therefore, exploring the adjustment mechanism of high-quality development of higher education on digital capital empowerment of urban-rural integration is not only the key path to break through the "digital divide", but also provides theoretical support for the coordinated promotion of new urbanization and rural revitalization.

1.2. Research significance

This study takes digital capital as the main influencing factor, and deeply discusses how it can promote the integrated development of urban and rural areas through the intermediary role of high-quality development of higher education. This research not only has far-reaching theoretical value, but also has important practical guiding significance, which is embodied in the following aspects:

1. Enrich the application theory of digital capital in urban-rural integration and development.
   With the vigorous development of digital economy, digital capital, as a new production factor, plays an increasingly important role in promoting regional economic and social development. However, the existing research on digital capital and urban-rural integration development is still insufficient, especially the lack of systematic and in-depth analysis on its mechanism and influence path. By constructing a theoretical framework between digital capital, high-quality development of higher education and urban-rural integration development, this study systematically discusses how digital capital affects urban-rural integration development and the intermediary role played by high-quality development of higher education in this process. This can not only fill the gaps in existing research, but also enrich and develop the application theory of digital capital in urban-rural integration development, and provide a solid theoretical basis for subsequent research.

2. Provide practical reference for digital policy and higher education reform.
   Through empirical analysis, this study reveals the specific impact of digital capital on urban-rural integration and its mechanism. These empirical results can provide important practical reference for the government to formulate digital policies and higher education reform programs. For example, according to the research results, the government can optimize the investment structure of digital capital, improve the efficiency of the use of digital capital, and thus more effectively promote the integration of urban and rural development. At the same time, higher education institutions can adjust the

ISSN Pending / DOI will be assigned upon official publication
Received 10 July 2026; Received in revised form 13 July 2026; Accepted 14 July 2026; Available online 15 July 2026
© 2026 The Authors. Published by Ywain Limited. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0)

allocation of educational resources and improve the quality of education according to the research results, so as to better serve the strategic needs of urban-rural integration and development.

3. Help the implementation of the national and regional coordinated development strategy
   The integration of urban and rural development is an important part of the national regional coordinated development strategy, which is of great significance for narrowing the gap between urban and rural areas and promoting common prosperity. By discussing the influence of digital capital and high-quality development of higher education on urban-rural integration, this study provides a scientific basis for the government to formulate and implement regional coordinated development strategies. According to the research results, the government can formulate more accurate policies and measures to promote the free flow of factors and the optimal allocation of resources between urban and rural areas, thus promoting the in-depth implementation of urban-rural integration and development. This will not only help to narrow the gap between urban and rural areas but also enhance the competitiveness of the whole region and realize the coordinated and sustainable development of the regional economy.

2. Literature review

2.1. Research on Digital Capital

The concept of digital capital originates from the rapid development of digital economy. It covers multi-dimensional elements such as information and communication technology (ICT) equipment, digital infrastructure, data resources and digital skills. Tapscott(1996) put forward the concept of digital capital for the first time, holding that digital capital is not only the carrier of wealth accumulation, but also an important driving force to promote technological progress and economic development. Scholars at home and abroad have gradually deepened the definition of digital capital. For example, Xu Aiting and others (2023) subdivided digital capital into basic digital capital (such as ICT hardware and software) and integrated digital capital (such as digital transformation in traditional industries).

In the measurement of digital capital, perpetual inventory method (PIM) is the main method widely used. PIM estimates capital stock and capital service through historical capital investment data, combined with capital depreciation and service life efficiency. Xu Aiting (2024) pointed out that the measurement of digital capital should consider both its wealth and production attributes, that is, not only pay attention to the value accumulation of capital, but also examine its actual contribution to economic growth. In this paper, the perpetual inventory method is used to measure the wealth stock and productive stock of digital capital, especially to set different retirement modes and service life efficiency attenuation functions for different types of digital assets (such as hardware and software). This method provides a scientific basis for accurately measuring the value and utility of digital capital. In addition, relevant literature also shows that with the development of digital economy, digital capital plays an increasingly significant role in industrial integration. Studies by scholars such as Cai Yuezhou (2015) and Guo Meichen (2019) show that the extensive penetration of digital capital in traditional industries has improved the production efficiency of industries and promoted economic growth. In terms of measurement methods, these studies also adopt the perpetual inventory method (PIM), and combine the characteristics of ICT capital to measure the capital service in detail.

2.2. Research on the Integration of Urban and Rural Development

The integrated development of urban and rural areas is an important path to realize the coordinated development of regional economy and one of the core strategies to narrow the gap between urban and rural areas and promote common prosperity. The dual structure of urban and rural areas has existed in China for a long time, which leads to the imbalance in resources, public services and infrastructure between urban and rural areas. In order to break this dual structure and realize the integrated development of urban and rural areas, in recent years, China government has issued a series of policies, such as rural revitalization strategy and new urbanization strategy. Urban-rural integration is not only the need of economic development, but also the trend of social and cultural integration. The theory of urban-rural integration development can be traced back to the factor flow theory and growth pole theory in regional economics. The early factor flow theory believed that by promoting the free flow of production factors such as capital, labor and technology, the economic balance between regions could be achieved (Lewis, 1954). The growth pole theory emphasizes the city as the core, and promotes the economic development of the surrounding rural areas through the radiation effect of the city (Perroux, 1950). In the study of urban-rural integration development in China, the mismatch of urban-rural factors is particularly critical. Liu Minghui et al. (2022) pointed out that the mismatch between urban and rural factors is one of the important reasons for the widening gap between urban and rural areas in China. The mismatch of urban and rural factors leads to inefficient utilization of rural resources and excessive concentration of urban resources, which further restricts the process of urban-rural integration. In order to solve this problem, the researchers put forward that the rational allocation of resources, the coordinated development of industries and the two-way flow of population between urban and rural areas should be promoted through institutional innovation and policy support to promote the process of urban-rural integration.

How to measure the level of urban-rural integration scientifically is an important issue in the research of urban-rural integration development. Most of the existing studies adopt comprehensive evaluation method, and quantitatively evaluate the development of urban-rural integration by constructing a multi-dimensional index system. Zhao Deqi (2021) constructed an index system including economic development level, infrastructure construction, population mobility, public service supply and other dimensions to measure the development level of urban-rural integration in China. Sun Yuhuan (2022) emphasized the influence of the realization of the value of ecological products on the urban-rural integration development in the empirical study of the urban-rural integration development experimental area. She believes that the value of ecological products can effectively promote the coordinated development of urban and rural areas in economic, social and environmental aspects by rationally allocating resources between urban and rural areas. Therefore, when measuring the urban-rural integration, the ecological environment dimension is gradually taken into consideration, forming a diversified evaluation system. This study refers to Cui Jianjun's (2023) using entropy

ISSN Pending / DOI will be assigned upon official publication
Received 19 July 2026; Received in revised form 10 July 2026; Accepted 12 July 2026; Available online 15 July 2026
© 2026 The Authors. Published by Ywain Limited. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0)

weight method to calculate the development level of urban-rural integration.

2.3. The connotation and measurement of high-quality development of higher education

The high-quality development of higher education is an important engine to promote social progress and enhance regional competitiveness. With China's transition from "popularization of higher education" to "popularization", the focus of higher education has gradually shifted from expanding the scale to improving the quality. The high-quality development of higher education is mainly reflected in the optimal allocation of educational resources, the improvement of personnel training quality, the enhancement of scientific research and innovation ability and the improvement of social service ability. According to the research of Huang Rong et al. (2023), the high-quality development of higher education is reflected in the rational distribution of educational resources, the improvement of academic innovation ability and the enhancement of internationalization level. High-quality higher education not only means cultivating more high-quality talents that meet the needs of society, but also includes scientific research innovation and the enhancement of social service functions. These abilities can provide intellectual support for local economic development, especially in the integration of urban and rural areas. Higher education can promote the flow of talents and resource sharing between urban and rural areas by improving the accumulation of human capital.

The high-quality development of higher education is not only a problem within the education system, but also has a far-reaching impact on regional economic and social development, especially in promoting the integration of urban and rural development. The high-quality development of higher education helps to narrow the gap between urban and rural human capital, provide more high-quality talents for rural and underdeveloped areas, and promote economic and social interaction between urban and rural areas. Pan Xingxia and others (2022) pointed out in the measurement research of higher education that the quality difference of higher education between regions directly affects the accumulation of human capital and the flow of talents between urban and rural areas. Areas with more high-quality higher education resources in cities attract a large number of talents, while the lack of higher education resources in rural and underdeveloped areas leads to brain drain, further aggravating the gap between urban and rural areas.

3. Data Description and Model Assumption

3.1. Data sources

The sources of empirical data collection in this study mainly come from the National Bureau of Statistics, Wind and CNRDS (China Research Data Service Platform) databases, and 30 provincial panel data (excluding Tibet, Hong Kong, Macao and Taiwan) from 2011 to 2023 are selected as research samples. In order to make the research results more realistic and objective, when selecting samples, this study draws lessons from the existing research (Xu Huilin, 2023), including: (1) eliminating the observation values with missing data; (2) Tail-shrinking is adopted to deal with all continuous variables, and the quantile standard is set to 1% and 99%; (3) Logarithmize the index data which are absolute quantities in the variables involved. Finally, 390 samples were selected in this study.

3.2. Variable Setting and Measurement

3.2.1. Explained variable: the development level of urban-rural integration

The development level of urban-rural integration refers to the comprehensive state of gradually narrowing the gap between urban and rural areas and realizing integrated and coordinated development by promoting the efficient flow and coordinated development of resource elements in urban and rural areas such as economy, society, space and ecology. Specifically, the entropy method is used to calculate from the four core dimensions of economic integration, social integration, spatial integration and ecological integration. Specific evaluation indicators are shown in Table 1.

3.2.2. Explanatory variable: digital capital

Digital Capital is a strategic factor of production formed by the accumulation and transformation of digital resources based on information and communication technology (ICT) in the era of digital economy. Its essence is the comprehensive ability to promote economic efficiency and social innovation through the integration of data, technology, facilities and skills. This paper mainly uses entropy method to measure the explanatory variable-digital capital from four dimensions: infrastructure environment, technological innovation environment, digital capital capacity and trade potential. Digital capital evaluation indicators are shown in Table 1.

3.2.3. Intermediate variable: the high-quality development level of higher education

As an intermediary variable, the high-quality development level of higher education plays a key role in connecting digital capital with the development level of urban-rural integration. By analyzing the high-quality development level of higher education, we can reveal how digital capital indirectly affects the development of urban-rural integration and the specific path mechanism, which is conducive to deeply understanding the role of digital capital in promoting the development of urban-rural integration and formulating relevant policies and measures.

In the model construction, this paper uses the method of intermediary effect analysis to construct a regression model including independent variables (digital capital), intermediary variables (high-quality development level of higher education) and dependent variables (urban-rural integration development). Through stepwise regression method, this paper analyzes the intermediary role of intermediary variables between independent variables and dependent variables.

3.2.4. Control variables

Reference to existing research methods to select control variables, mainly including: the added value of primary industry, the added value of secondary industry, the added value of tertiary industry, the degree of government intervention (Gov), regional gross domestic product (GDP), year and region (Code).

ISSN Pending / DOI will be assigned upon official publication
Received 10 July 2026; Received in revised form 13 July 2026; Accepted 14 July 2026; Available online 15 July 2026
© 2026 The Authors. Published by Ywain Limited. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0)

Table 1: Variable declaration

Variable Category	Variable name	Variable definition	Source of variables
Explained Variable	Development level of urban-rural integration	Introduction	Wind and CNRDS (China research data service platform) database.
Explain variable	Digital capital	The four dimensions of infrastructure environment, technological innovation environment, digital capital capacity and trade potential are measured by entropy method;	Wind database
Mediator Variable	High quality development level of higher education	introduction	
Control Variable	Growth value of tertiary industry	Growth value of tertiary industry	National Bureau of Statistics (NBS)
	Degree of government intervention （Gov）	Fiscal expenditure/regional GDP;	
	Growth value of secondary industry	Growth value of secondary industry	
	Growth value of primary industry	Growth value of primary industry	
	Gross Regional Product （GDP）	Gross Regional Product	
	Age （year）	The observed value is in the current Year, and year is 1, otherwise it is 0, and 2015 is the base period.	
	Region （Code）	Sample area, Code is 1, otherwise it is 0.	

(1) Explanatory Variable: Digital Capital

Table 2: Construction of digital capital index

Primary index	Secondary index	Three-level index	Indicator Direction
Infrastructure environment	Network basic environment	Internet broadband access ports/10,000	+
		Number of websites owned by enterprises	+
		Long-distance optical cable line length/km	+
		Number of domain names	+
		Mobile Internet users/ten thousand households	+
	Logistics transportation environment	Traffic operation capability index	+
		Number of trucks in highway operation/10,000 vehicles	+
		Logistics and transportation practitioners	+
Environment Technological Innovation	Science and technology investment	R&D expenditure of industrial enterprises above designated size/10,000 yuan	+
		Full-time equivalent of R&D personnel in industrial enterprises above designated size	+
	Scientific and technological output	Domestic patent application acceptance	+
		Technology market turnover	+
Digital capital capability	Digital industrialized trade	Total telecom service	+
		Software business income	+
		Information technology service income	+
	Industrial digital trade	Number of enterprises with e-commerce transaction activities	+
		Electronic commerce sales	+
		E-commerce purchase amount	+
Capital potential	Level of opening to the outside world	Trade openness	+
	Residents' consumption potential	Per capita consumption expenditure of residents	+
		Total retail sales of social consumer goods	+
		Per capita GDP	+

(2) Explained variable: urban-rural integration and development

Table 3: Urban-rural integration development

Primary index	Secondary index	Three-level index	computing formula	Index property
Urban-rural integration develop	Economic integration	Level of economic development	Per capita GDP	+
		Income gap between urban and rural residents	Per capita disposable income of urban residents/rural residents	-
		Expenditure gap between urban and rural residents	Per capita consumption expenditure of urban residents/agriculture Per capita consumption expenditure of village residents	
		Two yuan contrast coefficient	(Gross output value of primary industry/number of employees in primary industry)/(Gross output value of secondary and tertiary industries/number of employees in secondary and tertiary industries)	+

ISSN Pending / DOI will be assigned upon official publication
Received 19 July 2026; Received in revised form 10 July 2026; Accepted 12 July 2026; Available online 15 July 2026
© 2026 The Authors. Published by Ywain Limited. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0)

Primary index	Secondary index	Three-level index	computing formula	Index property
		Coverage of urban and rural endowment insurance	Number of urban and rural residents participating in endowment insurance/resident population	+
		Unemployment insurance coverage rate	Number of people participating in unemployment insurance/permanent residents	+
	Social Integration		Number of mouths	
		Per capita medical care in urban and rural areas Specific coefficient	Per capita medical and health care expenditure of urban residents /Health care expenditure of rural residents	
		registered urban unemployment rate	immediate data	-
		Urban and rural education investment	Education expenditure/financial expenditure	+
		Private car ownership	immediate data	+
		Urbanization rate	Urban population/total population	+
	Spatial Fusion	Urban and rural per capita traffic and communication pair Specific coefficient	Per capita transportation and communication expenditure of urban residents /Rural residents' transportation and communication expenditure	
	Ecological integration	Harmless treatment of domestic garbage	immediate data	+
	Ecological integration	forest coverage rate	immediate data	+
	Ecological integration	Popularization of public toilets	Every 10,000 people have public toilets.	+

(3) Intermediate variable: high-quality development of higher education.

Referring to the research of Huang Rong and Ding Xiaochang (2022), the measurement of high-quality development of higher education is divided into 10 dimensions: quality level, funding input, teacher input, infrastructure, knowledge production, talent training, admission opportunities, R&D conditions, human capital and innovation achievements. The data mainly comes from China Education Statistical Yearbook.

3.3. Descriptive statistics of variables

Table 4: Descriptive statistics of variables

	minimum value	maximum	average value	standard deviation
1	0.15	0.66	0.36	0.10
2	0.02	0.72	0.14	0.12
3	664.60	75695.20	14508.22	13188.07
4	1370.40	135673.20	28289.20	24126.83
5	96.10	6506.20	2192.85	1503.81
6	79.10	4721.50	1192.69	891.46
7	0.00	0.10	0.04	0.02
8	553.10	56909.70	11588.14	10419.79
9	3647.90	162914624.00	13505044.59	23458675.26
10	0.00	0.26	0.10	0.05
11	0.04	2.21	0.47	0.48
12	0.00	3921.79	231.95	443.64
13	0.76	1.28	0.89	0.12
14	0.11	0.76	0.26	0.11

1-14 variables are:

Urban-rural integration development, digital capital level, added value of tertiary industry (billion yuan), regional GDP (billion yuan)

The added value of primary industry (100 million yuan), transportation, warehousing and postal services (100 million yuan), logistics industry, secondary industry (100 million yuan), information technology service income (10,000 yuan), primary industry, higher education development, information service industry, higher education (gray correlation), gov.

4. Empirical analysis of the impact of digital capital on urban-rural integration development

4.1. Model setting

4.1.1. Benchmark Regression Model

In this study, all the above variables were collected from the notes of National Bureau of Statistics database (http://www.stats.gov.cn/) and Wind database (www.wind.com.cn). In order to test the main hypothesis of this study, that is, research hypothesis H1, (H1: digital capital has a significant role in promoting the development of urban-rural integration), this study chooses the following model in the process of empirical estimation. Because heteroscedasticity may affect the results, in order to avoid this situation, robust standard error is introduced to adjust. The specific model formula is as follows:

$$IURD_{i,t} = \alpha_0 + \alpha_1 DT_{i,t} + \sum \alpha_x Control_{i,t} + \sum Code + \sum Year + \varepsilon_{i,t}$$

Among them, IURD (Integrated Urban-Rural Development) is the integration of urban and rural areas, which means common prosperity, represents the set of control variables, belongs to residual term and satisfies normal distribution. For the individual fixed effect and the annual fixed

ISSN Pending / DOI will be assigned upon official publication
Received 10 July 2026; Received in revised form 13 July 2026; Accepted 14 July 2026; Available online 15 July 2026
© 2026 The Authors. Published by Ywain Limited. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0)

effect, the individual fixed effect and the annual fixed effect were controlled in the research process to improve the reliability of the conclusion. DT represents common prosperity; Controls denotes the set of control variables, and $\varepsilon_{i,t}$ refers to the error term subject to normal distribution. Code stands for individual fixed effects, while Year denotes year fixed effects. This study controls for both individual fixed effects and year fixed effects in the empirical process to enhance the reliability of research conclusions.

4.1.2. Intermediate variable model

In order to test the intermediary mechanism between the high-quality development level of higher education and the development of urban-rural integration, this study used Wen Zhonglin's (2014) method to estimate the intermediary variables. Taking the high-quality development level of higher education as an intermediary variable, this paper tests the benchmark regression and constructs the corresponding research model.

$$IURD_{i,t} = \delta_0 + \delta_1 DT_{i,t} + \delta_2 Media_{i,t} + \sum \delta_x Control_{i,t} + \sum Code + \sum Year + \varepsilon_{i,t}$$

$$Media_{i,t} = \beta_0 + \beta_1 Edu_{i,t} + \sum \beta_x Control_{i,t} + \sum Code + \sum Year + \varepsilon_{i,t} \quad (1\text{-}3)$$

4.2. Analysis of benchmark regression results

Firstly, the benchmark regression of digital capital to urban-rural integration development is carried out, and the results are shown in Table 5 below.

Table 5: Benchmark regression result

Variable	Benchmark regression	Benchmark regression
Variable	(1)	(2)
Constant term	0.269** (17.253)	0.290** (11.022)
Digital capital level	0.648** (5.820)	0.051* (2.078)
Control variable	NO	YES
Fixed province	YES	YES
Fixed year	YES	YES
Sample size	390	390
R2	0.493	0.225

*Note: ***, **, *, respectively, are significant at the significance level of 1%, 5% and 10%; The values in brackets are robust standard errors.*

In this paper, the time-individual fixed effect model is used to analyze the influence of different variables on the development level of urban-rural integration, and the benchmark regression results of controlling the fixed effect of year and the fixed effect of region and the results of RE model are shown in Table 5 (1). The coefficient of constant term is 0.34, which is significant at the significance level of 0.01%, indicating that there is a constant positive effect to promote the integration of urban and rural development. This study takes RE model as the final result. From the above table, it can be seen that the digital capital level is significant at 0.01 level (t=5.820,p=0.000<0.01), and the regression coefficient value is 0.648>0, which shows that the digital capital level will have a significant positive impact on the development of urban-rural integration. It shows that the model is effective as a whole. At the same time, the control variables are further added in this paper, and the results are shown in Table 5, column (2). The coefficient is still significant without sign change.

4.3. Robustness test

4.3.1. Replacing core explanatory variables and changing samples

In order to further verify the robustness of the conclusion, the core explanatory variables are replaced by the comprehensive scores of digital trade variables obtained by principal component method, and the model (1-1) is used for regression again. Table 6 shows the regression results, and it can be found that the coefficient of DT is significantly positive, and it is significant at the level of 1%. Generally speaking, after replacing the core explanatory variables, digital capital can still promote the development level of urban-rural integration, and the symbols of control variables have not changed. The robustness of the benchmark regression conclusion is verified, and the model is robust. At the same time, excluding municipalities directly under the central government and making a regression, digital capital can still promote the development level of urban-rural integration, and the symbols of control variables have not changed. The robustness of the benchmark regression conclusion is further verified. Table 6 shows the regression results, and it can be found that the coefficient of DT is significantly positive, and it is significant at the level of 1%. Generally speaking, after replacing the core explanatory variables, digital capital can still promote the development level of urban-rural integration, and the symbols of control variables have not changed. The robustness of the benchmark regression conclusion is verified, and the model is robust.

Table 6: Robustness test

Variable	Replacing core explanatory variables	Excluding municipalities directly under the central government and returning	Lagging regression
variable	（1）	（2）	（3）
constant term	0.282** (10.189)	0.290** (11.121)	0.290** (11.022)
DT	0.062** (2.751)	0.050* (2.049)	0.051* (2.078)
Control variable	YES	YES	YES
Fixed province	YES	YES	YES
Fixed year	YES	YES	YES
Sample size	390	390	390
R2	0.882	0.878	0.879

From column (3) of Table 6 above, it can be seen that the digital capital level is significant at 0.05 level, and the regression coefficient value is greater than 0, indicating that the delayed regression of the digital capital level in the first phase will have a significant positive impact on the development of urban-rural integration.

ISSN Pending / DOI will be assigned upon official publication
Received 19 July 2026; Received in revised form 10 July 2026; Accepted 12 July 2026; Available online 15 July 2026
© 2026 The Authors. Published by Ywain Limited. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0)

4.4 Based on the mechanism analysis of high-quality development of higher education

4.4.1 Test of influence mechanism

Table 7 shows the results of intermediary role analysis, considering the intermediary role of higher education development in promoting urban-rural integration. The r of the three models are all high, which reflects that the models have a good fitting degree to the data, and the f values are also significant (P<0.001), further confirming the effectiveness of the models. From the perspective of theoretical mechanism, the development of higher education realizes its intermediary function through three paths. On the transformation path of technology research and development, universities, as the source of digital technology innovation, directly promote the digital integration of urban and rural industries through the research and development of smart agricultural technology, industrial Internet platform and digital financial model. This technology spillover effect not only improves the industrial level of cities, but also drives the digital transformation of rural economy through the extension of industrial chain. On the path of cultivating digital talents, higher education institutions have cultivated a large number of "new farmers" with digital skills through courses such as e-commerce training and big data analysis. These talents have returned to their hometowns to start businesses, forming a virtuous circle of "talent return-industrial revitalization". On the path of educational resources allocation, digital teaching methods such as massive open online course platform and virtual simulation experiment have enabled high-quality educational resources to break through geographical restrictions, promoted Urban-rural Education Fairness and laid the foundation for rural talent reserve.

Empirical analysis further confirms the rationality of this partial intermediary effect. The intermediary effect model shows that the total effect (c) of digital capital on urban-rural integration development is significantly positive, which indicates that the investment of digital capital itself has a direct driving force for urban-rural integration. When the development of higher education is introduced as an intermediary variable, the indirect effect (a×b) of digital capital through the development of higher education is also significant, but the direct effect (C') remains significant, which is consistent with the statistical characteristics of some intermediary effects. This statistical result reflects the complex motivation mechanism of urban-rural integration development: on the one hand, digital capital can directly improve the circulation conditions of urban and rural factors through "new infrastructure" such as 5G base stations and data centers; On the other hand, the technological transformation and talent supply realized through the higher education system constitute the deep driving force of urban-rural integration.

It is worth noting that this intermediary effect has distinct regional heterogeneity characteristics. In the eastern digital pioneer areas, the intermediary contribution rate of higher education development may be relatively low, because these areas have formed a spontaneous coupling mechanism of "digital technology-industrial application"; In the central and western digital catch-up areas, the intermediary role of higher education development is more prominent, and it has become a key link between digital capital and rural revitalization. In addition, the development of urban-rural integration is also influenced by institutional factors such as land system and financial transfer payment. These factors and the development of higher education have jointly shaped the multi-dimensional path of digital capital to promote urban-rural integration.

Therefore, the intermediary role played by the development of higher education between digital capital and urban-rural integration is essentially the embodiment of the law of urban-rural factor reorganization in the digital age. This mechanism design requires not only increasing the investment in digital infrastructure but also strengthening the innovation and transformation function of higher education system. Only in this way can we realize the superimposed release of digital dividend and education dividend, and finally promote the development of urban-rural integration to a higher quality stage.

Table 7: Mediating effect

variable	Urban-rural integration	High quality development of higher education	High quality development of higher education	Urban-rural integration
variable	（1）	（1）	（2）	（3）
constant term	0.347*** （11.954）	0.347*** （11.954）	2.236** （2.566）	0.340*** (10.382)
Digital capital	0.091** （2.650）	0.091** （2.650）	1.568** （4.906）	0.082 (0.993)
High quality development of higher education				0.004 （0.439）
Control variable	YES	YES	YES	YES
Fixed province	YES	YES	YES	YES
Fixed year	YES	YES	YES	YES
Sample size	390	390	390	390
R2	0.895	0.895	0.858	0.903

Table 8: Mediated result effect value

Metric	Value
C total effect	0.091
a	2.236
A (p value)	0.012**
b	0.004
B (p value)	0.0661
a*b intermediary effect value	0.009
a*b (Boot SE)	0.0035
a*b (z value)	0.265
a*b (P value)	0.792
a*b (95% Boot CI)	-0.039 ~ -0.139
C' direct effect	0.082
C' (p value)	0.324

ISSN Pending / DOI will be assigned upon official publication
Received 10 July 2026; Received in revised form 13 July 2026; Accepted 14 July 2026; Available online 15 July 2026
© 2026 The Authors. Published by Ywain Limited. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0)

Type of mediation	Presence of intermediary role

4.4.2 heterogeneity analysis

Considering the unbalanced level of economic development, this study adopts the regional sample classification of Chen Aizhen (2023) and China National Bureau of Statistics. The 30 provinces (excluding Tibet) in the sample are divided into three regions: eastern, central and western regions for regression analysis. The specific provinces are divided as follows: the eastern region includes 12 provinces including Beijing, the central region includes 8 provinces including Hubei, and the western region includes 10 provinces including Yunnan. This division comes from the main classification of China's regions since 1986, in which the eastern region includes 12 provinces (cities) such as Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong and Hainan. The central region includes 8 provinces (regions) including Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan and Guangxi. The western region includes 10 provinces (regions) including Inner Mongolia, Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang and Chongqing. Table 9 shows the regression results of regional division. It can be seen that the regression coefficient of digital capital level and urban-rural integration development is 0.062 in the eastern region, which is significant at 1% level; in the central region, the regression coefficient of digital capital level and urban-rural integration development is 0.091, which is also significant at 1% level; in the western region, there is a significant negative correlation between digital capital level and urban-rural integration development.

This paper holds that in the eastern part of China, digital capital significantly promotes urban-rural integration through the dual-wheel drive mechanism of "technology penetration-industrial upgrading". The region has formed a new industrialization system with digital economy as the core. By optimizing the efficiency of factor allocation, digital capital investment will promote the industry consolidation of urban advanced manufacturing and rural digital agriculture, and on the other hand, with the help of smart logistics, digital finance and other infrastructure sinking, it will break down the barriers of urban and rural factor flow. On the policy level, the pilot project of "digital village" led by local governments in the east has formed a synergistic effect with the strategy of "new infrastructure". For example, Zhejiang's "Future Farm" plans to digitize the whole agricultural industry chain through the Internet of Things technology, which directly drives the two-way flow of urban and rural production factors, and fully releases the positive spillover effect of digital capital.

The obvious positive effect of the central region stems from the superposition effect of "late-comer advantage" and policy dividend. As the main position to undertake the industrial transfer in the east, the central provinces have realized the leap-forward development of digital infrastructure through the special plan of "Digital Midwest", and the growth rate of indicators such as the density of 5G base stations and the coverage rate of industrial Internet platforms has led the whole country. In this process, digital capital plays a "leverage effect", which not only improves the county economic carrying capacity through intelligent manufacturing transformation, but also opens up the channel for agricultural products to go out of the village and enter the city with the help of the construction of rural e-commerce ecosystem (such as the "agricultural goods going up" project in Pinduoduo). It is worth noting that the digital-driven model of urban-rural integration in the central region presents a mixed feature of "government guidance+market leadership", and the special funds for the development of provincial digital economy and the rural business expansion of platform enterprises form an effective complement.

The negative correlation in the western region exposes the governance dilemma of digital capital "polarization effect". Constrained by the complex geographical environment, the lack of human capital and other structural constraints, the investment in digital capital in western China shows a significant urban bias, which leads to the "digital divide" becoming a new form of urban-rural division. Although national strategies such as "counting from the east to the west" have laid out large-scale data centers in the west, labor-intensive digital industries such as data labeling and call centers are still concentrated in prefecture-level cities, and it is difficult for rural counties to participate in the division of digital economy because of the digital skills gap. What needs to be more vigilant is that some western regions have implemented "digital image projects" in pursuit of digital achievements, such as over-investment in urban digital exhibition halls and neglect of rural information infrastructure, which further aggravates the mismatch between urban and rural areas in digital capital allocation.

The above regional differences show that the coupling effect of digital capital and urban-rural integration is highly dependent on the regional development stage and policy implementation mode. In the future, we should build a differentiated policy system: the eastern part should improve the market-oriented allocation mechanism of digital elements, the central part should strengthen the connection between urban and rural areas of digital industrial chain, and the western part should solve the dilemma of capital polarization through the special action of "digital inclusiveness", so as to finally realize the transformation of digital capital from "urban agglomeration" to "urban and rural common prosperity".

Table 9: Heterogeneity analysis results

Variable	Entirety	Eastern Region	Middle	The west
Constant	0.313** (29.281)	0.315** (12.848)	0.099** (2.670)	0.395** (12.114)
Digital capital level	0.152** (3.125)	0.062 (1.064)	0.091 (0.640)	-0.172 (-1.293)
Sample size	390	156	117	117
Control variable	YES	YES	YES	YES
Fixed province	YES	YES	YES	YES
Fixed year	YES	YES	YES	YES
R2	0.808	0.776	0.862	0.904

4.4.3 Quantile regression

Table 10 shows the results of a quantile regression analysis, which is used to evaluate the impact of digital capital level on urban-rural integration development under different quantiles. According to the results of the chart, the level of digital capital has a significant and consistent positive impact on the development of urban-rural integration. Under the three quantiles of 0.25, 0.50 and 0.75, the coefficients are 0.787, 0.713 and 0.619 respectively, and they are all significant at the level of 1%. However, with the increase of quantile, the influence coefficient of digital

ISSN Pending / DOI will be assigned upon official publication
Received 19 July 2026; Received in revised form 10 July 2026; Accepted 12 July 2026; Available online 15 July 2026
© 2026 The Authors. Published by Ywain Limited. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0)

capital level gradually decreases, indicating that its marginal contribution gradually decreases at a higher level of urban-rural integration development. At the same time, the value of R gradually increases with the increase of quantile, which shows that at higher quantile, the level of digital capital, as an independent variable, has a stronger ability to explain the variation of dependent variables.

Table 10: Quantile regression result

	Quantile 0.25	Quantile 0.50	Quantile 0.75
const	0.228 (0.000***)	0.262 (0.000***)	0.304 (0.000***)
Digital capital level	0.787 (0.000***)	0.713 (0.000***)	0.619 (0.000***)
R^2	0.363	0.408	0.461
Dependent variable: urban-rural integration development	Dependent variable: urban-rural integration development	Dependent variable: urban-rural integration development	Dependent variable: urban-rural integration development

Note: ***, ** and * represent the significance levels of 1%, 5% and 10% respectively.

4.5 Endogenous problems

In order to alleviate the estimation bias caused by endogenous problems, this study uses two-stage least square method and selects appropriate instrumental variables. In the aspect of tool variable selection, referring to the research of Nunn and Qian(2014), this paper constructs the interactive term between the number of fixed telephones per 100 people in each province and the national Internet investment in the previous year as the tool variable of digital capital level.

The reasons are as follows: in 1984, the number of telephones per million people in cities was closely related to the development of digital capital. In addition, the number of telephones per million people in cities in 1984 was not directly related to the level of digital capital. Table 11 shows the regression results of tool variables: column (1) shows the regression results of the first stage, and the coefficient of ln telephone *ln Internet users is significantly positive, indicating that the number of telephones per million people in 1984 will affect the current digital capital level, meeting the requirements of the correlation of tool variables. According to the result of column (2), the regression coefficient of digital capital level is 0.576, and the result is significant, which shows that digital capital level can still promote the development level of urban-rural integration. After regression with 2SLS, the results are basically consistent, which is basically consistent with the previous conclusions. The level of digital capital will have a significant positive impact on the development of urban-rural integration.

Table 11: Two-stage least squares regression results

variable	（1）	（2）
variable	first stage	stage II
	Digital capital level	Urban-rural integration development
constant	0.009 (1.176)	0.264** (49.347)
Digital capital level		0.576** (18.515)
Ln telephone *ln internet users	0.000 (1.306)	
DT*id	0.242** (26.755)	
Sample size	290	290
R2	0.992	0.542
variance ratio	F(9,280)=67.890 ,p=1.000	
Control variable	YES	YES
Fixed province	YES	YES
Fixed year	YES	YES

5 Conclusions and policy recommendations

5.1 Conclusion

Based on the complex relationship between digital capital, high-quality development of higher education and the level of urban-rural integration development, this study conducted in-depth theoretical and empirical analysis and drew the following conclusions:

First of all, digital capital has a positive and significant positive effect on the integration of urban and rural development. The empirical results show that digital capital, as a new production factor, plays a vital role in promoting the coordinated development of urban and rural economy and narrowing the gap between urban and rural areas. By improving the efficiency of information circulation, optimizing the allocation of resources and promoting industrial upgrading, digital capital has effectively enhanced the economic ties and interaction between urban and rural areas, thus promoting the process of urban-rural integration and development. The empirical results clearly show that the improvement of digital capital level can significantly improve the development index of urban-rural integration, further confirming its key role in urban-rural integration development.

Secondly, the high-quality development of higher education plays a key intermediary role in the process of digital capital promoting the integration of urban and rural development. By constructing the mediating effect model and analyzing it deeply with the help of stepwise regression, this study verifies the existence and importance of high-quality development of higher education as a mediating variable. Digital capital indirectly promotes the integration of urban and rural areas by optimizing the allocation of higher education resources, improving the quality of education and cultivating high-quality talents with innovative spirit and practical ability.

The results of intermediary effect analysis reflect the bridge function of high-quality development of higher education between digital capital and urban-rural integration development; In addition, the study also found that in the process of digital capital affecting urban-rural integration development, different regions and regions with different economic development levels showed significant heterogeneity. In areas with high economic development level and perfect digital infrastructure, digital capital plays a more significant role in promoting the integration of urban

ISSN Pending / DOI will be assigned upon official publication
Received 10 July 2026; Received in revised form 13 July 2026; Accepted 14 July 2026; Available online 15 July 2026
© 2026 The Authors. Published by Ywain Limited. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0)

and rural development. These areas have better application environment of digital technology and stronger innovation ability, and can make better use of digital capital to promote industrial upgrading and economic transformation. However, in areas with low economic development level and relatively weak digital infrastructure, the role of digital capital in promoting urban-rural integration and development is relatively limited. Therefore, when formulating relevant policies, the government should fully consider regional differences and take differentiated policy measures to promote the effective application of digital capital in urban-rural integration and development.

5.2 Policies and Suggestions

Based on the above-mentioned in-depth and detailed research conclusions, this study puts forward a series of forward-looking and operable policy suggestions to promote the urban-rural integration development more effectively, aiming at accelerating the process of urban-rural integration, narrowing the gap between urban and rural areas and realizing comprehensive, coordinated and sustainable development through multi-dimensional strategic layout.

1. Strengthen digital capital investment and accelerate the pace of urban-rural integration. The government should fully realize the key role of digital capital in promoting the integration of urban and rural areas, and greatly increase the investment in digital technology research and development, which is not limited to financial support, but also includes policy guidance, tax incentives and other incentives to stimulate the innovation vitality of enterprises and scientific research institutions. Break the information island between urban and rural areas and lay a solid foundation for the coordinated development of urban and rural economy.
2. Deepen the reform of higher education and help the integration of urban and rural development. The government should attach great importance to the strategic position of education in the integration of urban and rural areas, and comprehensively improve the quality and efficiency of higher education by increasing educational funds, optimizing the allocation of educational resources and improving the treatment of teachers.
3. Strengthen policy coordination and resource integration to build a new ecology of urban-rural integration and development. The government should strengthen inter-departmental cooperation, break down administrative barriers and ensure the effective connection and efficient implementation of various policies. Through the integration of government, enterprises, social organizations and other resources, we will form a joint force to jointly promote the integrated development of urban and rural areas.

REFERENCES

[1] Li Chenglong, Zhou Hong, Zhang Liang. Research on the influence and path of digital economy on the development of urban-rural integration [J/OL]. Journal of Chongqing University (Social Science Edition), 1-17[2024-10-20].
[2] Zhao Deqi, Chen Na. Study on the measurement of the development level of urban-rural integration in China [J]. Exploration of economic problems, 2019,(12):1-28.
[3] Yu Tonghui, Xiao Yanyu. Realization mechanism and empirical test of digital economy promoting urban-rural integration [J]. statistics and decision, 2023,39 (01): 11-16.doi: 10.13546/j.cnki.tjyjc.2023.01.002.
[4] Li Jinchang, Jin Jinyang, Xu Aiting. Calculation of Digital Capital Services in China [J]. Economic and Management Review, 2023,39(01):76-91.
[5] Jin Canyang, Xu Aiting. Research on China's Digital Capital Measurement Based on the Dual Attributes of Wealth and Production [J]. Statistical Research, 2024,41(04):12-26.
[6] Qi Lan, He Zeyi. Research progress of digital capital [J]. Economic trends, 2023,(10):128-143.
[7] Yuan Yongyi, Yuan Qinqin. Research on the efficiency of provincial scientific and technological innovation in China from the perspective of digital capital [J]. Information Theory and Practice, 2024,47(09):114-123+173.
[8] Pang Hongwei, Yang Yao, Gong Yanhong. Digital inclusive finance, New Productivity and Urban-Rural Integration [J/OL]. statistics and decision, 2024,(19):24-30.
[9] Li Aimin. The process, problems and paths of China's urban-rural integration development [J]. Macroeconomic Management, 2019,(02):35-42.
[10] Liu Minghui, Lu Fei. Urban-rural factor mismatch and urban-rural integration development —— An empirical study based on provincial panel data of China [J]. Agricultural Technical Economy, 2019,(02):33-46.
[11] Tian Pengpeng, Pan Zichun, Zhu Yuchun. The influence of new quality productivity on urban-rural integration [J/OL]. Journal of Huazhong Agricultural University (Social Science Edition), 1-16[2024-10-20].
[12] Liu Guorui. New development pattern and high-quality development of higher education [J]. Tsinghua University Education Research, 2021,42(01):25-32.
[13] Qi Yong, Ou Lingyan. Research on evaluation index system of higher education development quality in China [J]. Educational Modernization, 2020,7(46):107-113.
[14] Wang Jianhua. What is the high-quality development of higher education [J]. China Higher Education Research, 2021,(06):15-22.
[15] Zhao Zhiqiang. Measurement and Temporal and Spatial Evolution of High-quality Development Level of Higher Education [J]. statistics and decision, 2023,39(16):37-42.
[16] Lv Chengchao, Yang Shanshan, Yan Ren. Evaluation of the High-quality Development Level of Higher Education in China and Research on its Temporal and Spatial Evolution [J]. Quantitative Economic Research, 2023,14(03):65-92.
[17] Huang Rong, Ding Xiaochang. Study on the measurement of the high-quality development level of higher education in China [J]. Journal of East China Normal University (Education Science Edition), 2022,40(07):100-113.
[18] Jiang Boat. Intermediary Effect and Moderating Effect in Empirical Study of Causal Inference [J]. China Industrial Economy, 2022,(05):100-120.
[19] Cui Jianjun, Zhao Danyu. Can Digital inclusive finance Promote the Integration of Urban and Rural Development? -Empirical Test Based on Threshold Effect Model [J]. Exploration of Economic Problems, 2023,(03):79-96.
[20] Zhao Sanglin, Li Zhetong, Deng Hao, et al. Digital Trade and Common Prosperity: Evidence from Provincial Level [J]. Science and Technology and Industry, 2025,25(03):284-292.
[21] Wen Zhonglin, Ye Baojuan. Intermediary effect analysis: method and model development [J]. advances in psychological science, 2014,22(05):731-745.
[22] Wei Houkai. Deeply grasp the essential connotation of urban-rural integration development [J]. China Rural Economy, 2020,(06):5-8.
[23] Xu Xue, Wang Yongyu. Study on the Logical Mechanism, Multidimensional Measurement and Regional Coordinated Development of Urban-Rural Integration —— Based on the perspective of coordinated promotion of new urbanization and rural revitalization [J]. Agricultural Economic Issues, 2023,(11):49-62.

ISSN Pending / DOI will be assigned upon official publication
Received 19 July 2026; Received in revised form 10 July 2026; Accepted 12 July 2026; Available online 15 July 2026
© 2026 The Authors. Published by Ywain Limited. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0)

[24] Peng gang, Zhao lexin. research on the calculation of the total digital economy in China-also on the digital economy and the kinetic energy transformation of China's economic growth [J]. journal of statistics, 2020,1 (03): 1-13.doi: 10.19820/j.cnki.issn2096-7411.2020.03.
[25] Wang Kaike, Wu Guobing, Zhang Guijun. Does the development of digital economy improve production efficiency [J]. Economist, 2020,(10):24-34
[26] Huang Rong, Ding Xiaochang. Research on the measurement of the high-quality development level of higher education in China [J]. Journal of East China Normal University (Education Science Edition), 2022,40 (07): 100-113. doi: 10.16382/j.cnki.1000-5560.2022.07.
[27] Cai Wu, Liu Luyuan. Research on the influence of digital economy on the development of urban-rural integration-from the perspective of labor mismatch [J]. Journal of Chongqing University of Technology (Social Science), 2024,38(04):28-42.
[28] Shunjia X .The Development and Improvement of Higher Education Quality Guarantee in Netherlands[J].Adult and Higher Education,2023,5(20)
[29] Fanglin Li &Ziyu Diao.(2025) .The impact of digital infrastructure on the synergistic effects of urban pollution and carbon reduction: empirical evidence from China.Frontiers in Environmental Science,13,1453151-1453151.
[30] Yuchen Lu,Jiakun Zhuang,Chenlu Yang, Lu Li &Mei Kong.(2025) .How the digital economy promotes urban–rural integration through optimizing factor allocation: theoretical mechanisms and evidence from China.Frontiers in Sustainable Food Systems,9,1494247-1494247.
[31] Jingkun Zhang &Wang Zhang.(2024).Harnessing Digital Technologies for Rural Industrial Integration: A Pathway to Sustainable Growth.Systems,12(12),564-564.
[32] Ran Zhang,Wenhao Ying, Kerong Wu &Huaping Sun.(2024) .The impact of innovative human capital agglomeration on urban green development efficiency: Based on panel data of 278 Cities in China.Sustainable Cities and Society,111,105566-.
[33] Wang Yafei,Peng Qingyun,Jin Chao,Ren Jin, Fu Yuanyuan &Yue Xiaofeng.(2023) .Whether the digital economy will successfully encourage the integration of urban and rural development: A case study in China.Chinese Journal of Population, Resources and Environment,21(1),13-25.
[34] Guo Bingnan,Wang Yu,Zhang Hao,Liang Chunyan,Feng Yu &Hu Feng.(2023).Impact of the digital economy on high-quality urban economic development: Evidence from Chinese cities.Economic Modelling,120,
[35] Shi, M., Qian, Z. & Zhao, S. Green finance, green technology innovation and carbon emission reduction. Discov Sustain (2026). https://doi.org/10.1007/s43621-026-03975-3
[36] Zhao, S., Hao, D., & Yua, B. (2026). Scientific and technological innovation, industrial structure and economic growth: empirical evidence from China. Cogent Economics & Finance, 14(1). https://doi.org/10.1080/23322039.2026.2665956

（1-1）
（1-2）

ISSN Pending / DOI will be assigned upon official publication
Received 10 July 2026; Received in revised form 13 July 2026; Accepted 14 July 2026; Available online 15 July 2026
© 2026 The Authors. Published by Ywain Limited. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0)