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Research on the Mechanism and Realization Path of Digital Technology Enabling High-quality Integration between Urban and Rural Areas

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Abstract

Urban and rural integration is the only way to solve the main social contradictions and achieve high-quality economic development. The booming digital technology, as the core of new quality productivity, provides new momentum for urban and rural integration. This paper takes the equalization of urban and rural basic services as a proxy variable for high-quality urban-rural integration, and empirically examines the enabling effect of digital technology on high-quality urban-rural integration based on the data of 282 prefecture-level cities nationwide from 2011 to 2021. The research shows that digital technology can effectively enable high-quality urban-rural integration; The development of digital technology promotes the high-quality integration of urban and rural areas by promoting industrial transformation and upgrading.

Keywords

Digital Technology; High-quality Urban and Rural Integration; Equalization of Basic Public Services in Urban and Rural Areas; Common Prosperity.

1. Introduction

With the transformation of China's economy from high-speed growth to high-quality development, unbalanced development between urban and rural areas and inadequate development in rural areas have gradually become one of the major contradictions in Chinese society. Eliminating the imbalance and uncoordinated development between urban and rural areas and achieving high-quality integrated development between urban and rural areas is an important part of achieving common prosperity for all Chinese people. The report of the Party's 20th National Congress also clearly pointed out that we should strive to promote the integrated development of urban and rural areas, smooth the flow of urban and rural factors, promote the comprehensive revitalization of rural areas, and promote the modernization of agriculture and rural areas. In the era of digital economy, the development and application of digital technology runs through all aspects of society, becoming an "accelerator" to promote the quality change, efficiency change and power change of economic development, and also provides new momentum and new vitality for breaking the urban-rural dual economic structure and achieving high-quality integrated development of urban and rural areas. In recent years, digital technologies, represented by big data, cloud computing, and artificial intelligence, have continued to emerge, promoting the transformation of production methods and social structures. Digital technology, with its high versatility, high permeability and high sharing, has rapidly penetrated into all aspects of the economy and society, effectively solved the problems of resource mismatch, time mismatch and space mismatch, and created new opportunities and provided new driving forces for promoting high-quality integrated development of urban and rural areas. During the "13th Five-Year Plan" period, the government invested in supporting the construction of 130,000 optical fiber access and 50,000 fourth-generation mobile information system (4G) base stations in administrative villages, and the proportion of optical

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fiber access and 4G access in administrative villages across the country exceeded 99%. Although the popularization of urban and rural Internet and the application of digital technologies such as e-commerce platforms have greatly stimulated the economic vitality of rural areas, how to use the power of digital technology to bridge the gap between urban and rural development and promote the deep integration of urban and rural development in the new era is still a realistic problem that China must face.

2. Literature Review

(1) Research on the integration of digital technology and high-quality urban and rural areas

At present, most scholars only select some perspectives to explore the realization path of digital technology for urban-rural integration, and there are few studies on the mechanism and realization path of digital technology for high-quality urban-rural integrated development. Just as Su Hongjian (2022) believes that the existing research on digital urban-rural construction is the same as the practice of digital urban-rural development. Overall, it is in the state of "segmentation" in various fields of urban and rural areas, and there are few comprehensive digital urban and rural studies.

In terms of the equality of basic rights and interests of urban and rural residents, Xie Lu et al. (2022) said that in order to realize the integrated development of urban and rural areas, it is necessary to cancel the restrictions of the urban-rural dual household registration system, realize the simultaneous citizenship of urban and rural farmers, grant farmers and citizens the same rights, and realize the co-construction and sharing of education, medical care and social security resources with the help of digital technology. In terms of the integration of urban and rural industrial development, Chen Tan (2021) believes that from the vertical point of view, digital technological change has broken the clear boundaries between various industries and weakened the significant differences between various industries. Modern organic agricultural industries such as leisure agriculture, tourism agriculture, manufacturing agriculture and creative agriculture with characteristic agriculture as the main body are integrated with digital industries such as urban digital tourism, "digital vegetables" and community group buying. In terms of rationalization of rural and urban factor allocation, Tian Yipeng (2021) proposed that the gradual application of new technologies in rural production and life in recent years proves that new technologies can attract new people to the countryside while maintaining the original rural population. At the same time, the phenomenon of "two-place residence" is emerging, and its most prominent feature is its experience and the "convection" between urban and rural society. With this as the carrier, the conditions for the normal interaction between urban and rural population have been formed. In terms of the income equalization of urban and rural residents, Wu Chenzi et al. (2023) believe that with the accelerated penetration of digital technology into rural areas, digital technology is innovating and integrating with various rural industries and various digital agricultural products circulation methods, promoting the diversification of farmers' income increase methods and providing possibilities for improving the income distribution gap between urban and rural workers. In terms of the equalization of urban and rural public services, Hu Weiwei et al. (2023) believe that it is necessary to further strengthen the state's financial support for the construction of rural information infrastructure, guide more resources to the countryside with the help of the "project system", and promote the "catch-up" laying of rural information infrastructure through the establishment of special funds and special funds.

(2) Literature review

By combing the relevant researches on digital technology and urban-rural integration, we find that: in terms of the measurement of digital technology development index, the current relevant researches lack unified indicators for the measurement of digital technology, and the

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measurement indicators are not comprehensive enough, and the measurement methods are not scientific enough. In terms of high-quality integration between urban and rural areas, most scholars focus on the integration path of industries and production factors between urban and rural areas, but do not highlight how to achieve high-quality integration. In terms of the research perspective of digital technology and high-quality integration of urban and rural areas, most scholars only explore the realization path of digital technology for urban-rural integration from a partial dimension, lack the overall perspective of how digital technology enables high-quality integration of urban and rural areas, and do not explore the corresponding mechanism between the two. Based on this, this paper clarifies the connotation of digital technology development and high-quality urban-rural integration, takes the equalization of basic public services in urban and rural areas as the proxy variable of high-quality urban-rural integration, uses the panel data of 282 prefecture-level cities in China to build a utility model among variables, and analyzes the relationship between digital technology and high-quality urban-rural integration. Finally, based on the empirical analysis results, corresponding policies and suggestions are put forward to explore the mechanism and realization path of digital technology enabling high-quality urban-rural integration, and contribute to the realization of common prosperity for all people.

3. Theoretical Analysis and Research Hypothesis

(1) Application of digital technology and high-quality integration between urban and rural areas

At present, the development of digital economy is on the rise, digital economy has become a new driving force for global economic development, countries are planning to rely on digital technology to achieve a new round of industrial transformation, occupy the global high-end value chain, and the continuous development of digital technology will effectively promote the high-quality integration between urban and rural areas. Sun Tao et al. (2023) believe that by combining the digital economy and the digital technology and digital platform brought by the digital economy with the concept of urban and rural development, through such channels as urban and rural economic integration, urban and rural social integration and urban and rural spatial integration, the driving role of the digital economy can be given full play, and the living conditions of urban and rural residents can be promoted without differentiation and the quality of life can be balanced, so as to achieve multi-dimensional integration of urban and rural areas. Yin Qingmin (2022) The digital economy adjusts the way of resource allocation through new technologies, new business forms and new models, breaks the restriction of regional space, and enables the integrated development of urban-rural relations. Based on this, this paper proposes hypothesis 1.

H1: Digital technology can effectively enable high-quality urban and rural integration

(2) The endogenous mechanism of digital technology development affecting the high-quality integration of urban and rural areas

The application of digital technology and the integration of digital resources have spawned a series of new industries, new models and new business forms, among which new services and new technologies represented by big data, artificial intelligence, cloud computing and blockchain are conducive to the optimization of industrial structure from within and between industries, and the realization of multi-dimensional integration of urban and rural areas. Li Yuan (2024) believes that by giving full play to the radiating and leading role of urban service industry and manufacturing industry in rural areas, and relying on the construction of digital countryside, rural industry forms can be expanded, the quantity and quality of employment of rural population can be improved, the rural welfare level and even the whole social welfare level can be improved, the gap between urban and rural areas can be narrowed, and the

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coordinated development of urban and rural areas can be promoted. Chen Haipeng et al. (2023) put forward that the development of digital economy makes the Internet platform constantly upgrade, applies digital technology to the agricultural industry, organically combines modern agriculture, new industry and modern service industry, expands industrial functions, cultivates a variety of business forms, realizes the cross-space exchange of elements between urban and rural areas, and provides a new technical perspective for the reconstruction of new urban and rural relations. Sun Tao et al. (2023) believe that digital elements and digital technologies form new industries through industrialization development and the birth of new business models, increase the proportion of digital industries, reshape traditional industrial structure, and narrow the gap between urban and rural areas. Based on this, hypothesis 2 is proposed.

H2: The development of digital technology promotes the high-quality integration of urban and rural areas by promoting industrial transformation and upgrading

4. Empirical Research Design

(1) Model setting

1) Baseline regression model

In order to verify the linear impact of digital technology on the equalization of basic public services in urban and rural areas, the following dual fixed-effect model is constructed:

$$Dist_{it} = \alpha_0 + cDig_{it} + \sum_{j=1}^{4} \alpha_j X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \tag{1}$$

Where: and represents the city and year respectively, represents the level of equalization of basic public services in urban and rural areas in prefecture-level cities, represents the development level of digital technology, and is a control variable group, specifically including the level of regional urbanization(Ur) ,employment structure.

($Stru$) ,regional GDP per capita ($lnper\_gdp$) and regional fiscal expenditures($lnexpense$).α_0Is the intercept term, $is\ the\ estimated\ coefficient\ of\ digital\ technology, u_i$ and λ_t represents the individual and time fixed effects respectively, ε_{it} represents the independent and equally distributed random error term.

2) SLS model

Considering the possible endogeneity problem, 2SLS was used to eliminate the effect of endogeneity on the model. In the first stage of 2SLS, endogenous explanatory variables were used to regression the instrumental variables to get the fitting values. In the second stage, the explained variables are used to regression the fitted values obtained in the first stage.

The first stage regression of the two-stage least squares estimation is shown as follows:

$$Dist_{it} = \delta_0 + \delta_1 W_i + \delta_2 X_{it} + \tau_i \tag{2}$$

Where,W_i is the instrumental variable, $\tau_i$is the random error term, and other variables have the same meaning as equation (1).

3) Intermediary effect model

In order to discuss the mechanism of digital technology for the equalization of basic public services in urban and rural areas, Wen Zhonglin et al. (2004), referring to the practice of Wen Zhonglin et al. (2004), built an intermediary effect model on the basis of formula (1), adopted stepby-step regression and Sobel test to test the intermediary mechanism, and set the intermediary effect model as follows:

$$M_{it} = \beta_0 + \alpha Dig_{it} + \sum_{j=1}^{4} \beta_j X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (3)$$

$$Dist_{it} = \gamma_0 + c' Dig_{it} + \mathrm{b} M_{it} + \sum_{j=1}^{4} \gamma_j X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (4)$$

Where: M represents the intermediate variable, according to the above analysis, industrial structure upgrading(Isu) is selected as the intermediary variable.The regression focuses on the magnitude and direction of coefficient c, a, c' and b.

(2) Indicator selection and variable description

1) Explained variables

The equalization of basic public services in urban and rural areas (Dist). To measure the equalization degree of basic public services within each province, it is necessary to measure the supply level of basic public services first. Starting from the essence of basic public services, this paper selects three dimensions of science and technology, culture and education, and medical and health to measure the supply level of basic public services. The indicators of these three dimensions cover people's needs for modern life, basic survival rights and abilities, and basic health needs. It can roughly reflect the supply level of basic public services in various regions under the existing data conditions, and the specific indicator system is shown in Table 1.

Table 1. Index system of equalization of basic public services in urban and rural areas

Secondary index	Three-level index	Index analysis	Index weight
Science and technology	Mobile phone	Number of mobile phone users in 100 people	0.0546082
	Internet	100 people with broadband Internet access	0.2508628
Cultural education	Library collection	Library holdings per 100 people	0.2625916
	Primary education	Number of teachers per pupil	0.1274156
Medical and health care	Number of doctors	Number of medical practitioners per 100 people	0.1691168
	Number of bed	Number of hospital beds per 100 people	0.1354051

This paper draws on Li Bin's (2016) measurement method on the equalization of basic services in urban and rural areas. Based on the panel data of prefecture-level cities from 2011 to 2021, the entropy method is used to empower relevant indicators. The evaluation method of urban and rural public service equalization is as follows: Firstly, the index system is used to calculate the public service scores of municipal districts and non-urban areas respectively, and then the ratio of the scores of non-urban areas to the scores of municipal districts is used to express the equalization level of urban and rural public services in the region. Since the level of public service in non-urban areas in China is generally lower than that of local municipal districts, the value range of most calculation results is (0,1), but there are still a few cases greater than 1. Therefore, the square after the difference between the calculation result and 1 represents the level of urban and rural basic public service equalization (Dist). The smaller the value, the higher the level of public service equalization. The specific calculation process of entropy weight method is as follows:

The first step is data standardization: formulas (1) and (2) are used to represent positive and negative indicators.

$$X' = \frac{X-m\quad(X)}{max(X)-min(X)} \tag{5}$$

$$X' = \frac{max(X)-X}{max(X)-mi\quad(X)} \tag{6}$$

The second step is to calculate the weight of the index value of item i for year t:

$$Y_{ij} = \frac{X'_{it}}{\sum_{t=1}^{m} X'_{it}} \tag{7}$$

The third step is the calculation of index information entropy:

$$e_i = -k \sum_{t=1}^{m} (Y_{it} \times ln\, Y_{it}) \tag{8}$$

$$k = \frac{1}{ln\, m}, 0 \leq e_i \leq 1, Y_{it} = 0, Y_{it} \times \ln Y_{it} = 0;$$

The third step is the calculation of information entropy redundancy:

$$d_i = 1 - e_i \tag{9}$$

The fourth step is to determine the weight of indicators:

$$w_t = \frac{d_i}{\sum_{i=1}^{n} i} \tag{10}$$

Among: X'_{it} and X_{ij} are the standardized value and original value of the single index of item i in year t, respectively. $maxX_i$ and $minX_i$ are the maximum and minimum values of the i single index in all years, respectively.n is the number of evaluation years, m is the number of evaluation years.

2) Core explanatory variables

Table 2. Evaluation index system of digital technology development level

Secondary index	Three-level index	Index analysis
Digital technology output	Internet-related output	Per capita telecommunications revenue
Digital transaction development	Inclusive development of digital finance	The total index of Peking University Digital Financial Inclusion Index
Digital infrastructure	Internet penetration	100 people Internet broadband access users
	Mobile phone penetration	Number of mobile phone users in 100 people
Digital factor input	Information transmission practitioners	Number of employees in information transmission (10,000) proportion of employees in urban units
	Internet related practitioners	Number of employees in computer services and software (10,000) proportion of employees in urban units

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As a comprehensive technology system, digital technology has not been officially published and there are few literatures related to the index measurement. This paper uses Liu Jingling and Chen Yanying (2022) for reference in measuring the development of digital technology. The comprehensive development level of digital technology in each city is evaluated from four aspects: digital infrastructure, digital factor input, digital technology-related output and digital transaction development. Digital infrastructure includes Internet penetration and mobile phone penetration; Digital factor input includes information transmission, computer services and software industry employees accounted for the proportion of urban units employees; Digital technology outputs include per capita telecommunications revenue; The development of digital transactions is measured using the total index of Peking University's Digital Financial Inclusion Index.

KMO and Bartlett's tests were required for variables before principal component analysis. The KMO test result was 0.773, and the Chi-square statistical significance of Batrlett's spherical test was 0.000, indicating that the validity detection of the relationship strength, relationship duration and relationship quality measurement scale met the statistical requirements. Principal component analysis is a more suitable and ideal method. The specific steps are as follows:

Step 1: Standardize the data of each indicator according to formula (1).

$$x_{iy}=\frac{x_{iy}-minx_{iy}}{maxx_{iy}-mi\quad_{iy}} \tag{11}$$

The second step: the principal component analysis method is used to calculate the weight of the digital technical indicators, and the covariance matrix of the basic indicators is used as the input.

The third step: According to the index weight, weighted to calculate the comprehensive index score, that is, the digital technology development index.

Table 3. Results of principal component analysis

Serial number of eachfactor component	Correlation matrix eigenvalues			Factor extraction result		
	Eigenvalue	Each factor variance contribution rate	Cumulative variance contribution rate	Eigenvalue	Each factor variance contribution rate	Cumulative variance contribution rate
1	2.63457	0.5269	0.5269	2.63457	0.5269	0.5269
2	0.962145	0.1924	0.7193	0.962145	0.1924	0.7193
3	0.728312	0.1457	0.8650	0.728312	0.1457	0.8650
4	0.457929	0.0916	0.9566			
5	0.217041	0.0434	1.0000			

3) Mediating variables

Industrial structure upgrading (Isu) : The three industries are gradually showing a non-equilibrium trend in regional economic growth, and promoting economic transformation to achieve industrial structure upgrading has become the main theme of China's new era. In this paper, referring to the method of Xin Fei et al. (2019), the proportion of tertiary industry added value in GDP added value is used to measure.

4) Control variables

In order to avoid endogeneity problems caused by missing variables as much as possible, a series of control variables are included in the empirical analysis. The selected control variables

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mainly include: (1) regional urbanization level (Ur). Using the method proposed in Chen Xianbing's (2023) paper for reference, the ratio of urban population to the total population of the region was used to represent. (2) Employment Structure (Stru), measured by the proportion of the number of people employed in the tertiary industry to the number of people employed. (3) lnper-gdp, in order to measure local economic development or income level (excluding the impact of inflation), refers to the practice of Li Bin et al. (2015), uses the ratio of annual total GDP and annual average population of prefecture-level cities, and calculates the data after logarithm. (4) Local fiscal expenditure (lnexpense). Using the method proposed by Xu Xiaodan et al. (2023) for reference, the local fiscal expenditure data of 282 prefectural cities from 2011 to 2021 were sorted out from the China City Statistical Yearbook, and the data were calculated after logarithm was taken.

(3) Data source and variable description

1) Data source. The regions involved in this paper are all prefecture-level cities, and the main data comes from China City Statistical Yearbook and China Statistical Yearbook. Due to incomplete statistical information and data, some regions are screened out, and finally the panel data of 282 prefecture-level cities from 2011 to 2021 is selected. In addition, to solve the problem of a small amount of missing data in some indicators, we tried to complete them by referring to the Statistical Yearbook and Statistical Bulletin of National Economic and Social Development of the region in each year, and used linear interpolation method to complete the other unavailable data one by one.

2) Descriptive statistics. The following table shows the results of descriptive statistical analysis of each variable. In order to eliminate heteroscedasticity and to make the results more meaningful in economics, logarithmic treatment is carried out for per capita GDP and local fiscal expenditure.

Table 4. Descriptive statistical results

Type	Variable name	Mean value	Standard deviation	Least value	Maximum
Explained variable	Equal access to basic public services in urban and rural areas	0.2036	0.1411	0.000002	1.3421
Core explanatory variable	Digital technology	0.3682	0.1397	0.0050	1.0000
Control variable	Local fiscal expenditure	14.9387	0.7283	12.5671	18.2500
	Per capita GDP	10.7363	0.5679	8.7729	12.4564
	Employment structure	0.5593	0.1445	0.1514	1.4020
	Regional urbanization level	0.5540	0.1471	0.1815	0.9762
Intermediate variable	Upgrading of industrial structure	0.4236	0.1000	0.1015	0.8387
	Financial pressure	1.9918	1.9074	-0.35118	18.7450

5. Empirical Results and Analysis

(1) direct impact effect test

1) Baseline regression test

The linear relationship between digital technology and the equalization of basic public services in urban and rural areas is investigated by using the dual fixed-effect model. The regression results are shown in the following table. Columns (1) - (4) show the regression results of gradually adding control variables, column (1) shows the regression results of not adding control variables, and column (2) - (4) shows the regression results of gradually adding population structure control variables, employment structure control variables and economic factors control variables. The results show that after adding all control variables, the regression coefficient of digital technology development on the equalization of basic public services in urban and rural areas is -0.102, which is significant at the significance level of 5%. As the smaller the value of the measurement index of the equalization of basic public services, the higher the degree of equalization, this result reflects that the development of digital technology has a significant promoting effect on the equalization of basic public services, and every unit that the development level of digital technology increases, the degree of equalization of basic public services will increase by 0.102 units. From the perspective of control variables, fiscal expenditure and per capita GDP have a significant promoting effect on the equalization of basic public services in urban and rural areas, while regional urbanization and employment structure have a limited effect on the implementation of the equalization of basic public services in urban and rural areas. To sum up, it can be preliminarily concluded that the development of digital technology can promote the equalization of basic public services in urban and rural areas.

Table 5. Results of baseline regression

Variable	Equal access to basic public services in urban and rural areas			
	(1)	(2)	(3)	(4)
Digital technology	-0.134**	-0.134**	-0.134**	-0.102**
	(-3.26)	(-3.27)	(-3.27)	(-2.82)
Regional urbanization level		0.0215	0.0213	0.0463
		(0.49)	(0.49)	(1.07)
Employment structure			-0.0134	-0.0199
			(-0.28)	(-0.42)
Regional fiscal expenditure				-0.0596**
				(-3.29)
Per capita GDP				-0.0345**
				(-2.66)
_cons	0.287***	0.274***	0.281***	1.487***
	(24.06)	(9.07)	(5.81)	(6.46)
N	3102	3102	3102	3102
R^2	0.162	0.162	0.162	0.227

2) Heterogeneity test

In order to analyze whether there are regional differences in the impact of digital technology on the equalization of basic public services in urban and rural areas, the research samples were divided into three groups according to geographical location for heterogeneity test. As shown in Table (2) below, digital technology has the most significant impact on the equalization of basic public services in the eastern region, followed by the central region, and has no significant impact on the equalization of basic public services in the western region. The reason for this regional difference may be due to the early start and rapid development of digital technology in the eastern region, the release of digital dividends more fully, and the imbalance of urban development in the eastern region, the improvement of basic public service equalization space is large, and the marginal effect of digital technology enabling basic public service equalization is also more significant. In the western region, due to the vast land, relatively complex geographical features and a large number of ethnic minorities, the supply of public services is more difficult and costly, which weakens the enabling effect of digital technology on the equalization of basic public services in urban and rural areas to a certain extent.

Table 6. Results of heterogeneity test

Variable	Equal access to basic public services in urban and rural areas			
	(1)	(2)	(3)	(4)
Digital technology	-0.102** (-2.82)	-0.244*** (-4.13)	-0.0871 (-0.98)	-0.00769 (-0.11)
Regional urbanization level	0.0463 (1.07)	0.177** (2.79)	-0.123 (-1.66)	0.0396 (0.45)
Employment structure	-0.0199 (-0.42)	0.0453 (1.12)	-0.0598 (-1.65)	-0.00768 (-0.08)
Local fiscal expenditure	-0.0596** (-3.29)	-0.0241 (-0.80)	-0.0326 (-1.31)	-0.0390 (-0.65)
Per capita GDP	-0.0345** (-2.66)	-0.0479 (-1.91)	0.00593 (0.33)	-0.0690 (-1.54)
_cons	1.487*** (6.46)	1.086* (2.19)	0.817 (1.97)	1.456** (2.79)
N	3102	1056	1100	946
R2	0.227	0.341	0.289	0.168

3) Endogeneity and robustness test

① Instrumental variable method

Table 7. Test results of instrumental variable method

Variable	Instrumental variable The first stage	Equal access to basic public services in urban and rural areas The second stage
Digital technology		-0.049** (-1.99)
Control variable	Control	Control
Instrumental variable	-0.938*** (-73.84)	
Constant	0.0002 (0.01)	-0.3015*** (-3.65)
F value	5452.66	
Observations	2,538	2,538
R-squared	0.8575	0.8284

In order to eliminate endogenous interference as much as possible, two-stage least square method (2SLS) was used to test the impact of digital technology on the equalization of basic public services in urban and rural areas, and the second-order lag term of digital technology was selected as the instrumental variable. The following table reports the regression results of the 2SLS model. The first stage is the regression result of the control variable to the independent variable. It can be seen that the regression coefficient of the instrumental variable is negative and significant at the level of 1%, and the "correlation" of the instrumental variable is satisfied. The results of the second stage regression show that the regression coefficient of digital technology is -0.049, which is significant at the 5% level, indicating that the basic view of this paper is still valid after excluding the endogeneity problem of the model.

② Change the core explanatory variables

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In order to avoid the deviation of results caused by a single measurement method, entropy weight method is used instead of principal component analysis method

The development of digital economy in prefecture-level cities is studied, and fixed effect test is carried out. The results are shown in the table below. When the entropy weight method is used to measure the development of digital technology, its impact on the equalization of basic public services in urban and rural areas is 22.5%, which is significant at the 5% level, once again verifying the robustness of the benchmark regression results in this paper.

Table 8. Retest results of robustness of baseline regression

Variable	Digital technique	
	(1)	(2)
Entropy weight method		-0.225**
		(-3.12)
Principal component analysis	-0.102**	
	(-2.82)	
Regional urbanization level	0.0463	0.0400
	(1.07)	(0.93)
Employment structure	-0.0199	-0.0218
	(-0.42)	(-0.47)
Regional fiscal expenditure	-0.0596**	-0.0583**
	(-3.29)	(-3.14)
Per capita GDP	-0.0345**	-0.0351**
	(-2.66)	(-2.71)
_cons	1.487***	1.518***
	(6.46)	(6.69)
N	3102	3102
R^2	0.227	0.230

(2) Indirect effect test

The results of baseline regression and robustness test above prove that the development of digital technology can significantly improve the level of equality of basic public services in urban and rural areas. So through what mechanism does digital technology promote the equalization of public services? This part will test the upgrading of industrial structure as an intermediate variable in view of the perspective of industrial structure upgrading proposed in the aforementioned theoretical framework. The test results of industrial structure upgrading as an intermediary variable are reported in the table. It can be seen that the value of coefficient a in the model is 0.199, which is significant at the 1% level, indicating that the development of digital technology has significantly promoted the upgrading of industrial structure. The value of coefficient b is -0.116, which is significant at the level of 10%, indicating that the upgrading of industrial structure has significantly narrowed the gap between urban and rural basic public services. The value of coefficient c' is -0.079, which is significant at the level of 10%, and its absolute value is less than the absolute value of coefficient c, which meets the conditions for the establishment of intermediary effect. Meanwhile, the Z-value of sobel test is also significant at the level of 1%. Therefore, it can be considered that there is a significant intermediary effect of industrial structure shengji, and the development of digital technology has promoted the equalization level of basic public services in urban and rural areas by promoting the upgrading of industrial structure.

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Table 9. tests the results of industrial structure upgrading as the intermediate variable

Variable	Upgrading of an industrial structure		
	path c Dist	Path a Isu	Path b and c' Dist
Dig	-0.102** (-2.82)	0.199*** (6.49	-0.0790* (-2.04)
Isu			-0.116* (-2.26)
_cons	1.487*** (6.46)	0.291*** (3.62)	1.521*** (6.90)
Control variable	YES	YES	YES
Individual control effect	YES	YES	YES
Time control effect	YES	YES	YES
N	3102	3102	3102

6. Conclusion and Policy Opinions

The integrated development of urban and rural areas is the fundamental solution to solve the problem of unbalanced development of urban and rural areas and insufficient development of rural areas. It is also an important goal for the revitalization of the socialist countryside with Chinese characteristics. Digital technology, with its high versatility, extensive penetration and extensive sharing ability, is rapidly penetrating into all aspects of urban and rural social and economic life, providing new opportunities and impetus for the integrated development of urban and rural areas. Therefore, it is of profound significance to explore the impact of digital technology development on the high-quality integration of urban and rural areas. This paper explores the mechanism and realization path of digital technology enabling high-quality integration between urban and rural areas from both macro and micro levels.

First, this study calculated the digital technology development index of 282 prefecture-level cities using principal component analysis method, and selected six index data from three dimensions of science and technology, culture and education, and medical and health to synthesize the urban and rural basic public service equalization index. The effects of digital technology development on the equalization of basic public services in urban and rural areas are analyzed by using the dual fixed-effect model, and the heterogeneity analysis and correlation robustness test are carried out. Finally, the mechanism is analyzed. The findings are as follows: First, the development of digital technology has a significant positive impact on the equalization of basic public services in urban and rural areas. Second, the development of digital technology has a greater role in improving the level of equality of basic public services in urban and rural areas in the eastern region. Third, the development of digital technology can affect the equalization of basic public services in urban and rural areas by promoting the upgrading of industrial structure.

According to the results of empirical analysis, the following suggestions are put forward:

First, accelerate the construction of digital infrastructure in central and western China, expand the coverage of digital financial inclusion, and alleviate the imbalance in digital technology development among regions. Compared with cities and eastern regions, rural areas and central and western regions are the weaknesses in China's digital technology development, and these areas have not fully enjoyed perfect digital technology services. Therefore, digital technology resources should be tilted towards economically less developed areas such as rural areas and the central and western regions. It is necessary to vigorously promote the construction of rural network infrastructure, build and repair rural information highways as soon as possible, and create basic conditions for enhancing rural information consumption capacity. At the same time, to promote the free flow of urban and rural factors, through the promotion of digital services

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such as the Internet of things and digital finance in rural areas, improve rural labor productivity, narrow the gap between urban and rural income levels, improve farmers' sense of social justice, and promote the high-quality integration of urban and rural areas.

Second, promote the upgrading and transformation of industrial structure, and give full play to the dividends of digital technology. We will focus on the deep integration and development of new digital technologies such as big data, artificial intelligence and blockchain with the real economy such as agriculture and services. On the one hand, we should consolidate the foundation of digital agriculture and promote the digital transformation of agriculture. Promote the integration of agricultural data, strengthen Internet technology to carry out all-round, all-round and whole-chain digital transformation of all aspects of traditional agriculture, improve total factor productivity, and accelerate the construction of a modern agricultural industrial system. On the other hand, we should accelerate the transformation of traditional service industries, use digital technology to achieve online transfer of traditional service industries, and break the geographical restrictions of traditional service industries. We will expand the income channels of urban and rural residents through the adjustment and upgrading of the industrial structure and promote the common prosperity of all people.

Third, promote the use of digital technologies to expand jobs, optimize employment structure and improve employment quality services. On the one hand, we should pay attention to guiding the healthy development of all kinds of platform enterprises and tap the growth potential of new jobs. Establish a dynamic employment monitoring system for the development of digital technologies, dynamically assess the full impact of the development of digital technologies and the integration of traditional industries on employment, and improve the policy system for matching labor supply with the development of digital technologies. On the other hand, through the popularization of digital skills education, reform of college personnel training mode and other ways to improve the quality of workers. In particular, we should pay attention to the improvement of the human capital level of rural residents, comprehensively improve the ability of farmers to use information to develop production, improve life, increase income and get rich, so that they can adapt to the employment needs of generations of digital technology, and improve their employment satisfaction and income.

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