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Study on the Spatial Effect of Digital Economy on The Improvement of Human Capital Level

-- Empirical Evidence from The Beijing-Tianjin-Hebei Urban Agglomeration

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Abstract: Digital economy promotes new industries and integrates with traditional industries, which has an impact on the level of human capital. This paper constructs the digital economy development indicators of the 13 cities in Beijing, Tianjin and Hebei from the dimension of Internet development and digital financial development, Using the entropy value method to measure the development level of the digital economy, From a spatial perspective, Building a spatial Dubin model based on the geographic and economic distance nested weight matrix, Analyzing the impact of digital economy on the improvement of human capital level in 13 cities in The Beijing-Tianjin-Hebei region between 2012 and 2021, The study shows that the level of digital development and human capital of all cities in the Beijing-Tianjin-Hebei region are gradually improving, However, there is an uneven spatial distribution; The improvement of the development level of digital economy has a significant positive space spillover effect on the improvement of human capital level; Uneven distribution of talents in the region, Talent is competitive in the regional space. Based on the research conclusion, this paper provides relevant policy suggestions from the aspects of formulating talent introduction policies, optimizing the layout of spatial industry and making full use of data elements.

Keywords: Digital economy; Human capital level; Beijing-Tianjin-Hebei region.

1. Introduction

The digital economy has become an important engine for high-quality social and economic development. In 2022, global digital trade will reach us $3.82 trillion. The digital economy is booming and playing an important role in promoting consumption, providing employment and optimizing the industrial structure. National Beijing-Tianjin-Hebei urban agglomeration as an important strategic region, with the unique and geographical and resource advantages is becoming the key driving force of the national economic development, with the advancement of the coordinated development of Beijing-Tianjin-Hebei, traditional industry under the support of new digital technology is realizing industry digital upgrading, new digital industry in the data elements and digital technology under the support of the development.

The definition of digital economy can be traced back to the book Digital Economy Era of Tapscott [1] (1996). The book does not clearly stipulate the concept of "digital economy", but collectively calls the collection of social and economic related fields in the era of network intelligence as digital economy. Since then, the research on digital economy has become the focus of attention. Digital economy has experienced three different stages of economic development: information economy, Internet economy and digital economy. With the different historical development periods, the definition of digital economy is roughly divided into the following three categories. From the broad economy, digital economy is a new economic form serving various industries; second, from the narrow perspective, digital economy is a new economic form produced by information communication technology and digital revolution; third, the deep integration of digital infrastructure, Internet and big data becomes a new economic form with data as the key factor of production. The measurement study on digital economy is divided into four categories: one is the study on national economic accounting methods, mainly conducted by the World Bank, the United Nations and other international organizations, to revise the digital economy part in National Account System (2008); the other is the study on added value measurement, the American BEA defines the scope of digital economy, calculates the added value and total output of digital economy, and the amount of added value directly obtains the development level of digital economy [2]. Some domestic scholars use the method of added value to measure the level of digital economy in China[3], but since there is no fixed standard for the industrial scope of the digital economy, the measurement results vary; the construction of digital economy is still in the development stage, due to the limitation of data and technology, it is difficult to apply[4]; the measurement of index is also the most widely studied measurement method, Liu Jun et al. to the digital economy development levelfrom the digital basis and digital application [5] . The digital economy, dominated by big data, artificial intelligence, cloud computing and other digital technologies, is increasingly closely integrated with social production and life, and the digital economy is expected to become the core engine of future economic development [6].

The term "human capital" was first mentioned by Schultz in the Economic Society speech, Subsequent scholars have continuously participated in the human capital research, Human capital and material capital jointly constitute the capital, Material capital determines the technological structure of the economy, And the technical structure is reflected by human capital, Empirical studies show that, Human capital helps to promote economic level growth [7], Under the effect of regional coordinated development, National high-quality development depends on more human

resources, Human capital is an important resource to achieve high-quality national development, Related studies measure the level of human capital from the years of labor and education and the average years of education, and gradually change from a single education dimension to a multi-dimensional system index. Digital economy with data as a key factor of production, digital technology and digital infrastructure construction power production mode of change, the study found that technological progress will affect the employment structure, based on digital technology, the job market produced the talent differentiation phenomenon, highly skilled human capital proportion to increase rapidly, to some extent, promote human capital level, industrial intelligent level to promote industrial structure upgrading, such as knowledge and technology intensive services development in the market, promote the industry employment system update. Haita WANG (2022) Research found that digital economy is an important factor affecting the development of human capital [8], one side, The development of the digital economy promotes the market demand for highly skilled people, More talent resources to improve personal ability through "learning" or retraining, Promote the overall promotion of human capital level; on the other hand, The combination of digital technology and traditional industries can upgrade the consumption structure, Raise the level of human capital, Promote the development of labor-intensive industries to technology-intensive industries, But at the same time, it has hit the labor-intensive industries, Causing structural unemployment, Therefore, the research on digital economy and the improvement of human capital level has become a livelihood issue.

To sum up, the study on human capital and digital economy is relatively rich, most research based on the national and provincial level, the regional digital economy and human capital level research is less, in the Beijing-Tianjin-Hebei coordinated development strategy for national strategy, the digital economy for the Beijing-Tianjin-Hebei region as one of the most important areas of digital economy development in China, the regional human capital level changes, give full play to the regional talent advantage, to promote the Beijing-Tianjin-Hebei economy development is of great significance. In view of this, this paper is based on the 2012-2021 Beijing-Tianjin-Hebei 1 panel data, build related index system, through the entropy method to measure the development level of digital economy, and analyze the dynamic evolution process, on this basis, based on the geographical and economic distance nested weight matrix building space dubin model, empirical analysis from the perspective of space digital economy impact on the level of human capital.

2. Theoretical Framework

The improvement of human capital level is a process in which low-skilled human resources are replaced by highly skilled human resources. The internal driving force for the improvement of human capital level is technological progress. Every technological innovation in history can drive the economic revolution, and the economic development will drive the upgrading of industrial structure, thus promoting the improvement of human capital level.

Digital economy mainly through the digital and digital industrialization two forms of modern industry, make the labor in the job market to improve digital literacy, the first is the digital economy based on the Internet communication technology, the traditional industry upgrading, promote the human capital structure upgrade to enhance the level of human capital, the depth of the industry between the employment market boundary fuzzy, the coordinated development of industrial chain, promote the promotion of human capital level. Second, digital economy gives birth to new industries and new business models, such as high-tech industries such as artificial intelligence, cloud computing and the Internet of Things, and new business models such as online ride-hailing, e-commerce and bike-sharing. The emergence of new industries is bound to drive the gathering of talents and promote the improvement of human capital level. In the digital age, the proportion of knowledge and skill industry is increasing, and related skilled talents need to have digital literacy. On the one hand, many talents improve their abilities through "learning" and "re-education" to adapt to the new market environment; on the other hand, Internet education promotes the improvement of human capital level, and many workers can enjoy educational resources anytime and anywhere to improve the basic education level, thus greatly improving digital literacy and skill level.

Digital economy has a direct impact on the level of human capital at the same time, also can realize resource sharing to accelerate the data resource flow in the area, the development of digital technology can break the limitation of space, make the labor resources and production factors flow between cities, no longer limited by space, due to the digital technology and data elements have strong liquidity, not limited by time and space, so the digital economy can not only improve the human capital level in the region, at the same time will also produce space spillover effect on adjacent area.

3. Data Sources and Study Methods

3.1. Variable selection and data source

3.1.1. Measurement of the development level of the digital economy

Current academic involved in the city level of digital economy specific measurement literature, mostly from the provincial level, measurement method mainly for added accounting method and build evaluation index system method, based on data availability and reference to the digital economy and its core industry statistical classification (2021) the classification standard and Zhao Tao [9] (2020), the Internet development as the core, this paper combined with the city level related data availability, from the development of the Internet and digital financial pratt & whitney measure digital comprehensive development level of the economy. The four indicators of Internet penetration rate, related employees, related output situation and mobile phone penetration rate are adopted. The specific contents of the above four indicators are shown in Table 1. The digital finance development indicators adopt the digital inclusive finance index, which is jointly compiled by the Digital Finance Research Center of Peking University and the Ant Technology Group Research Institute.

Table 1. Digital economy development index system

Level 1 dimension	Secondary dimension	Specific indicators	Weight /W
Internet development	Internet penetration rate	Number of Internet broadband access users in 100 people	0.16
	Related employees	The proportion of computer service and software employees in the employees of urban units	0.25
	Related output	Total telecom business per capita	0.36
	Mobile phone penetration rate	Number of mobile phone users in 100 people	0.15
Digital finance development	Digital financial inclusion	The China Digital Financial Inclusion Index	0.08

In this paper, 11 prefecture-level cities in Beijing, Tianjin and Hebei Province were selected as the research objects. The sample data sources are China City Statistical Yearbook, statistical Yearbook of all provinces and cities, and the Digital Inclusive finance Index of Peking University over the years. Among them, some of the missing values were supplemented by imputation method. In order to obtain the final digital economy development index, this paper adopts the entropy value method to objectively empower the index, weight the index and its weight, and finally obtains the digital economy development level index (de).

3.1.2. Measurement of human capital level

Human capital is an important driving force to promote the upgrading of industrial structure and economic development. At present, the measurement methods of human resources level mainly include cost method, educational characteristic method and income method. Due to the availability of data and the single study of indicators are mostly concentrated at the provincial level. At the city level, most of the number of ten college students is measured, and this paper also uses this measurement method to measure the level of human capital (hc).

3.1.3. Selection of control variables

Economic development level (lngdp), the level of regional economic development is positively correlated with the level of human capital, and the human resources have a gathering effect in the more developed areas. This paper measures the level of regional economic development by the per capita GDP. The degree of opening to the outside world (open) and the degree of regional opening will bring talent spillover effect to the region. The more open the region, the more likely to gather, and the actual use of the proportion of foreign investment in the regional GDP. Financial development level (fin), the level of financial development is closely related to the degree of economic development in the region, and has a direct impact on the improvement of human capital level. The level of financial development is measured by the ratio of the loan balance of each region and the regional GDP. Industrial structure (str). The upgrading of industrial structure will drive the change of human capital structure, and the development level of industrial structure is measured by the proportion of secondary and tertiary industries in the total output value of the region.

3.2. Selection and setting of the space panel model

3.2.1. Spatial weight matrix

Spatial weight matrix in spatial measurement will play an important role in the results, previous studies usually use geographical distance matrix, economic distance matrix to study the digital economy and the spatial distribution characteristics of resource allocation [10], digital economy is closely related to economic development, human resources gathered to a certain extent restricted by economy, so this paper build geographical and economic distance matrix, distance and economic factors at the same time, more in-depth analysis of the development of digital economy for the level of human capital promotion space effect.

The specific formula is as follows:

$$W_1 = \begin{cases} \frac{1}{d_{ij}}, & i \neq j \\ 0, & i \neq j \end{cases}$$

$$W_2 = \begin{cases} 1/|\ （PGDP_j - PGDP_i）/（PGDP_j + PGDP_i）|, & i \neq j \\ 0, & i \neq j \end{cases}$$

$$W = （1/|PGDP_j - PGDP_i + 1|）\times e^{-d_{ij}}$$

Where, W_1 is the geographic distance matrix, d_{ij} represents the distance between cities, W_2 is the economic distance matrix, W is the spatial economic distance matrix, $PGDP_j$、$PGDP_i$represent the per capita GDP of cities *j* and *i* between 2012-2021.

3.2.2 Spatial autocorrelation test Before the establishment of spatial measurement model, it is necessary to test whether there is spatial correlation between variables. Mroan's I index is the mainstream method to test spatial autocorrelation. The specific calculation formula is as follows:

$$Moran's\ I = \frac{N}{S_0}\frac{\sum_{i=1}^{N}\sum_{j=1}^{N} w_{ij}(y_i - \bar{y})(y_j - \bar{y})}{\sum_{i=1}^{N}(y_i - \bar{y})^2}$$

Where N is the number of spatial cells, there are 13 cities in this paper, N takes 13, y_i represents the value of the variable *y* in space *i*, $\bar{y}$ is the mean, w_{ij} represents the elements in the matrix W, S_0 represents the sum of all elements in the matrix, S_0 formula is as follows:

$$S_0 = \sum_{i=1}^{N}\sum_{j=1}^{N} w_{ij}$$

3.2.2. Selection of the spatial measurement model

Spatial lag model (SAR), spatial error model (SEM) and spatial dubin model (SDM) is a common in the study of several spatial measurement model, spatial lag model and spatial error model respectively consider the independent variable and error term of spatial lag factor, spatial dubin model also considered the independent variable and dependent variable spatial lag term, makes the results more accurate.

This paper first through the LM test preliminary determine space dubin model, using Hausman test model of fixed effect, finally through the Wald and LR test space dubin model

robustness, the final selection space dubin model test analysis, test results show that double fixed effect model is better than the individual fixed effect and time fixed effect model, comprehensive test results build double fixed effect space dubin model, specific as follows:

$$hc_{it} = \rho W hc_{it} + \beta_1 de_{it} + \beta_2 W de_{it} + \beta X_{it} + \varepsilon_{it}$$

Among them, i and t represent regions and years respectively; hc is the human capital level, de is the core explanatory variable digital economic development level,Wis the spatial weight matrix,representing the spatial relationship between cities; ρ is the spatial autoregression coefficient; β_1 and β are the estimated coefficient of de and control variable X, and β_2 is the hc lag coefficient.

4. The Spatial and Temporal Evolution Characteristics of Digital Economy and Human Capital Level Improvement

4.1. Characteristics of the development level of digital economy

Figure 1 shows the results of the Kernel density estimation of the overall digital economy in the Beijing-Tianjin-Hebei region. From the perspective of the overall distribution, during the sample observation period, the development level of regional digitalization shows a trend of shifting to the right, and the height of the main peak shows a sharp increase- -a sharp decline and maintaining a relatively stable evolution process, indicating that the digital development level of each city is gradually improving. From the perspective of wave peak form, the development level of digital economy has experienced an obvious evolution process from "one main side" to a relatively weak "one main side", and the characteristics of polarization tend to weaken. From the perspective of distribution extension, the overall curve has obvious right tail phenomenon, and the distribution extension has a small range of contraction, which indicates that cities with high development level of digital economy in the Beijing-Tianjin-Hebei region will maintain a high level of development, while cities with low development level have a trend to catch up.

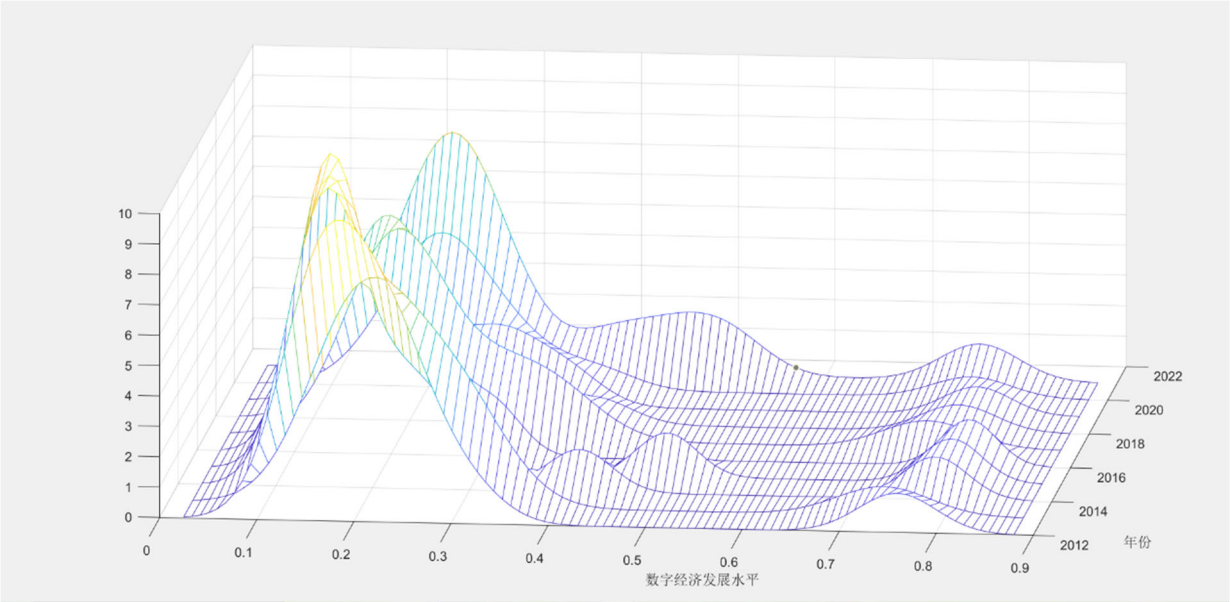

Figure 2. Dynamic chart of the overall digital economy development level in the Beijing-Tianjin-Hebei region

4.2. Spatial evolution characteristics

In order to test the spatial correlation of the development level of digital economy in 13 cities in the Beijing-Tianjin-Hebei region, the global Moran's I index of the digital economy in the Beijing-Tianjin-Hebei region from 2012 to 2021 was calculated. We can see from Table 2 that the Moran's I index was positive and showed different degrees of significance, that is, the digital economy in the Beijing-Tianjin-Hebei region has significant spatial agglomeration effect. On the whole, the Moran's I index of the development level of digital economy is U-shaped, which also reflects the deepening mutual influence of the development level of digital economy among cities in Beijing, Tianjin and Hebei, and is suitable for further exploration with spatial measurement model. In the past ten years, the national Moran's I index of human capital level fluctuates between-0.07 and-0.2. There is a spatial dependence in the process of improving the level of urban human capital level, and there is a significant negative spatial effect. Adjacent cities have an inhibitory effect on the human capital level of their cities. This is also related to the development stage of the Beijing-Tianjin-Hebei region. Beijing and Tianjin play the function of the metropolitan circle and attract talents from nearby cities, resulting in the phenomenon of brain drain in neighboring cities, which is not conducive to the improvement of human capital level. However, the global Moran index cannot reflect the correlation between regions, and local spatial analysis can analyze the spatial correlation between its adjacent regions. Therefore, this paper selects the development level of digital economy in 2015 and 2020 for local spatial correlation analysis.

Table 2. The Global Moran Index

year	*de*		*hc*	
	I	p-value*	I	p-value*
2012	0.025	0.024	-0.147	0.029
2013	0.134	0.005	-0.154	0.009
2014	0.064	0.010	-0.116	0.057
2015	0.114	0.029	-0.137	0.071
2016	0.013	0.005	-0.206	0.008
2017	0.042	0.007	-0.173	0.026
2018	0.048	0.041	-0.188	0.069
2019	0.010	0.025	-0.130	0.097
2020	0.010	0.015	-0.073	0.054
2021	0.023	0.001	-0.146	0.027

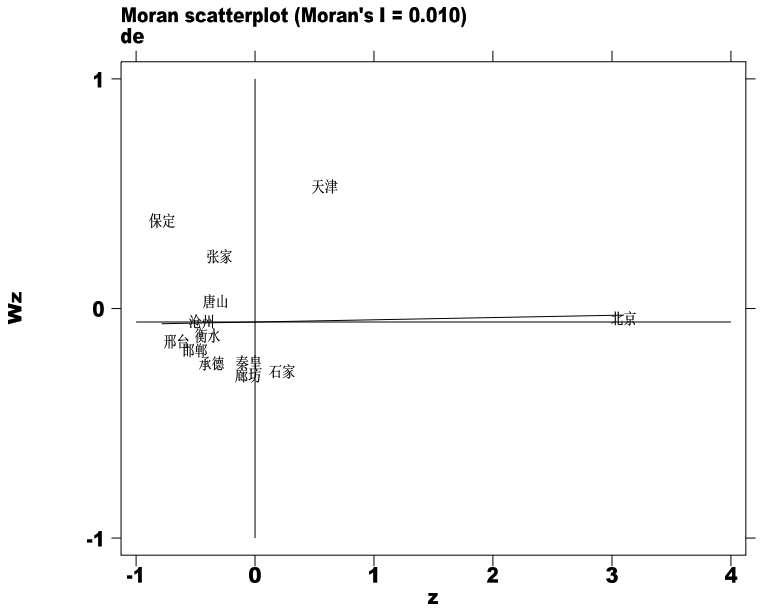

Figure 3. Local Moran scatter plot of the development level of digital economy in 2015

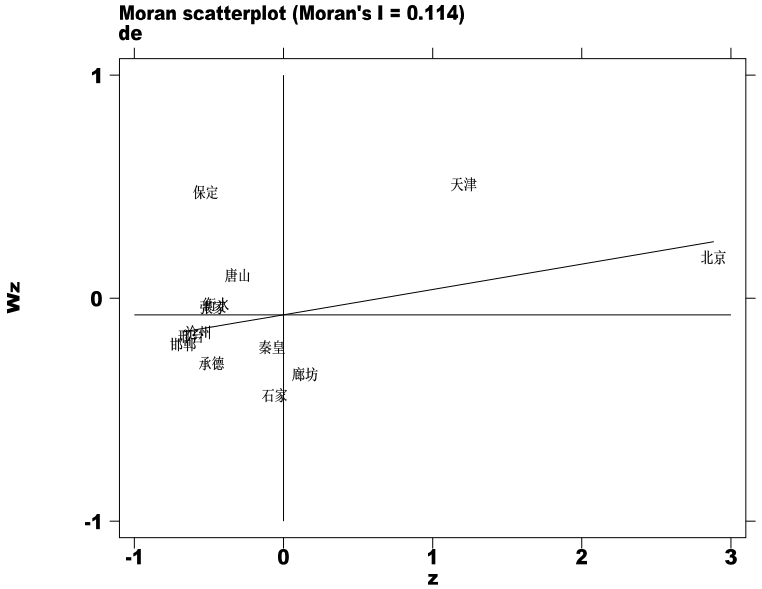

Figure 4. Local Moran scatter plot of the development level of the digital economy

As shown in Figure 3 and Figure 4, the Moran's I scatter map of the digital economy development level is mostly located in the "low-low" cluster area in the third quadrant, while Beijing and Tianjin are located in the "high-high" cluster area. In 2015, there were two cities in high-high areas, namely Beijing and Tianjin, and six cities in "low-low" cluster areas, accounting for more than 60%. In 2020, there were 7 cities in "low-low" and "high-high" cluster areas. The overall development level of regional digital economy showed a relatively stable trend. Specifically analyzing the spatial

correlation of the 13 cities, Background and Tianjin is always located in the "high-high" gathering area, The digital economy has a high level of development and a spatial agglomeration effect, The main reason is that Beijing and Tianjin are located within the capital economic circle, Advanced in digital technology, The industrial structure is more reasonable, Digital industrialization and a high level of industrial digital development, It has a diffusion effect on the surrounding cities; Zhangjiakou, Baoding and Tangshan are located in the "high-low" gathering areas, The development level of digital economy is not high, but the development level of neighboring cities is high, Have a certain development potential; Handan, Xingtai, Chengde, Hengshui, Qinhuangdao and Cangzhou are located in the "low-low" gathering area, The level of digital economy development in itself and in neighboring cities is not high, There is still a large space for development; Shijiazhuang is always located in the "low-high" gathering area, Local digital economy has a high level of development but is surrounded by low digital economy cities, This is also thanks to Shijiazhuang serving as the capital of Hebei province, It has a driving effect on the surrounding cities.

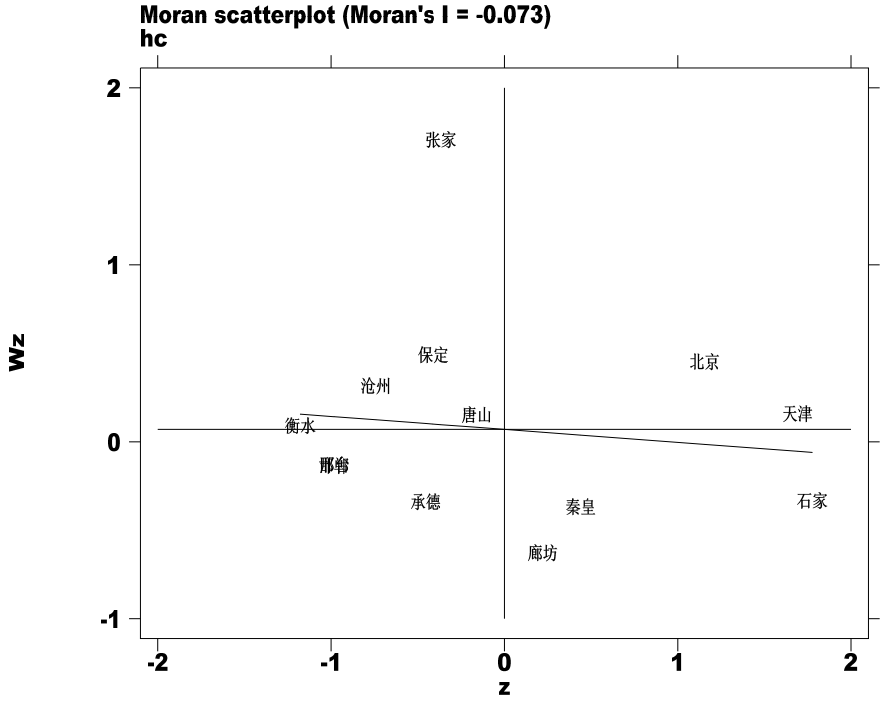

Figure 5. Local Moran Index of human capital level in 2015

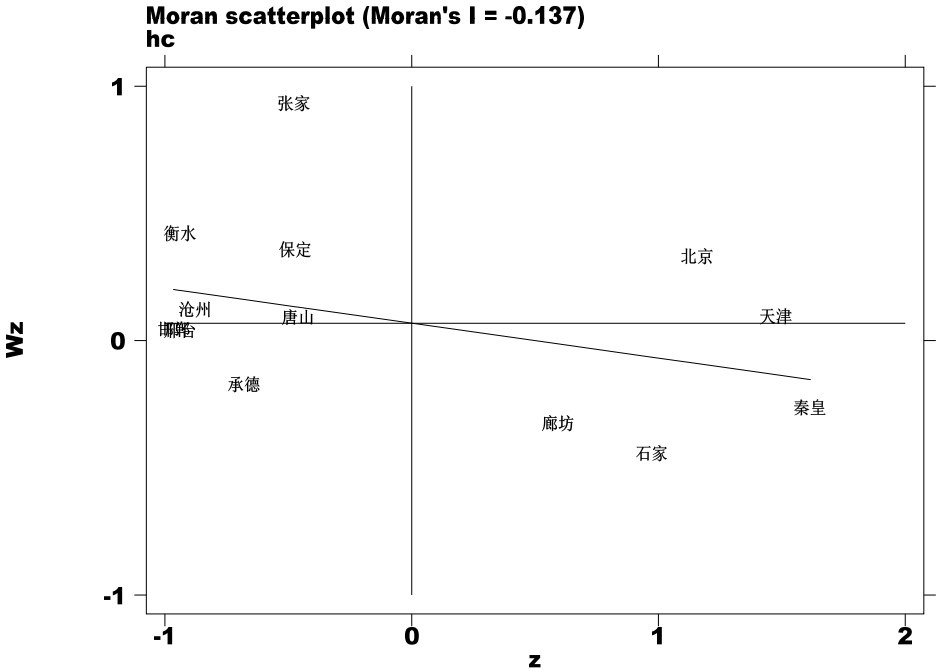

Figure 6. Local Moran index of human capital level in 2020

5. The Spatial Effect of Digital Economy on The Improvement of Human Capital Level

5.1. 5.1 Benchmark regression results

To ensure the validity of each variable estimates, For its stability test, The results show that each sequence is smooth, On the benchmark regression results reporting the impact of digital economy on human capital level, (1) and (2) are derived using least squares regression, From the regression results of the basic benchmark, it can be concluded that the digital economy in the Beijing-Tianjin-Hebei region can significantly promote the improvement of human capital level. Every unit of the development level of digital economy, Human capital levels were increased by 589 units, After the addition of control variables, the digital economy can still significantly promote the improvement of human capital level, But the promotion effect is not as great as the promotion effect alone, (3) - (5) columns using individual effect, time effect and double fixed effect model for regression, The results show that the digital economy has a significant positive impact on the improvement of human capital level, Therefore, the spatial measurement model is further used to estimate the level of human capital affected by the digital economy, To explore the mechanism and role of internal influence, It is of more profound significance to understand the digital economy and the improvement of human capital level.

Table 3. Benchmark regression results

	(1) model1	(2) model2	(3) Individual effect	(4) time effect	(5) Double fixation effect
de	589.876***	264.432**	86.064***	131.199***	18.293***
	(83.187)	(91.294)	(145.621)	(184.221)	(200.153)
lngdp		123.007**	-8.624**	32.323**	-38.437**
		(39.356)	(35.671)	(41.663)	(41.342)
fin		-0.000***	0.000***	-0.000***	0.000***
		(0.000)	(0.000)	(0.000)	(0.000)
str		6.447*	2.041*	5.785*	2.651*
		(3.429)	(3.542)	(5.127)	(4.719)
open		5544.145***	-331.890	10.320	-406.152
		(4.525)	(1.939)	(1.360)	(1.566)
_cons	120.731***	-1.8e+03***	128.428**	-646.535**	393.888**
	(19.908)	(329.874)	(302.237)	(423.069)	(568.802)
N	130	130	130	130	130
adj. R2	0.276	0.596	0.667	0.598	0.767

5.2. Analysis of the spatial Dubin model results

According to the previous discussion, While the development level of the digital economy has an impact on the improvement of the local human capital level, It will also have an impact on the human capital level of the neighboring cities through the spatial action, The model was first subjected to an LM test, To judge the spatial lag and spatial error effect of digital economy on the improvement of human capital level, The test results showed that the spatial lag model (SAR) and the spatial error model (SEM) were both significant at the 5% level, Model robustness of the test using LR and Wald, The P-values were all significant at the 10% level, Thus more suitable with the spatial Dubin model, Further testing for the effects of the model, The LR results showed superior using a two-way fixed effect model. The results are shown in Table 4

Space lag coefficient (rho) through significance test, Beijing-Tianjin-Hebei 13 cities between human capital level obvious spatial correlation, but in the double fixed effect model of negative space spillover effect, and global Mloan's I index analysis, the main reason is that the Beijing-Tianjin-Hebei region development "dumbbell" pattern, industrial structure and spatial layout difference is bigger, talent will gather to industry area, causing uneven distribution of human resources between cities, siphon effect makes Beijing, Tianjin adjacent to the brain drain phenomenon is serious, not conducive to the improvement of human capital level in the region.

Table 4. Results of fixed effects regression of the spatial Dubin model

	(1) Spatially-fixed-effect model	(2) The time-fixed-effect model	(3) Two-time fixed-effects model for space and time
de	100.5	165.7	1086.4**
	(0.86)	(0.64)	(2.84)
open	5329.4*	6592.5**	-9634.8***
	(2.48)	(2.82)	(-3.79)
fin	-0.000181*	-0.000238*	0.000481***
	(-1.98)	(-2.32)	(4.21)
ur	0.389	4.713	-41.71***
	(0.08)	(0.48)	(-3.88)
lngdp	27.87	-20.40	116.7
	(0.42)	(-0.19)	(0.88)
Spatial rho	0.140	0.0521	-0.298**
	(1.22)	(0.42)	(-2.71)
R^2	0.268	0.309	0.472
N	130	130	130

When there are endogenous effects in the spatial measurement model, the effects of explanatory variables on the explained variables cannot accurately reflect [10]. Therefore, partial differential methods are needed to classify spatial effects into direct effects, indirect effects and to explain spatial spillover with total effects. The direct effect represents the influence of the development of digital economy on the improvement of regional human capital level, and the indirect effect represents the influence of the development of digital economy on the improvement of human capital level in neighboring regions.

Table 5. Effect decomposition of the spatial Dubin model

	direct effect	indigo effect	gross effect
de	838.9183***	710.7972**	1549.715***
	(8.14)	(2.21)	(4.42)
open	6548.327***	-9685.515***	-3137.187
	(9.25)	(-4.38)	(-1.44)
fin	-.0002105***	.0004547 ***	-.0002443***
	(0.014)	(4.90)	(2.50)
str	-7.216788 **	-32.86672***	-.40.08351***
	(-2.11)	(-3.44)	(-3.38)
lngdp	128.6779 ***	61.26285	189.9408
	(3.72)	(0.56)	(1.50)

Note: * * *, * *, * are significant at 0.01,0.05 and 0.1, respectively; the coefficient estimated statistics in brackets.

As can be seen from Table 5, the direct, indirect and total effects of digital economy are all positive, and they all pass the significance test, indicating that the development level of digital economy can promote the improvement of human capital level of the city, and also promote the improvement of human capital level of adjacent cities. Opening to the outside world can significantly promote the level of local human capital, the surrounding cities have negative space spillover effect, is not conducive to the surrounding city human capital level, when a region of the opening to the higher level, the more easy to attract talent, talent gathering phenomenon is more obvious, the talent competition between city and city phenomenon is more intense. Financial development level of human capital level are significant, the overall negative significant level, to the city of human capital level positive space spillover effect, financial development level can drive the adjacent areas of talent flow, talent to the high level of financial development area, on the basis of improving self skills of the whole region of human capital level. Industrial structure in the middle of the Beijing-Tianjin-Hebei region play a significant negative spatial effect, which is related to the Beijing-Tianjin-Hebei collaborative development stage, the capital evacuation of industry and Tianjin and Hebei city positioning does not match, imperfect supporting facilities, talent with the industry, industrial structure imbalance this phenomenon is not conducive to the level of human capital, human capital level of significant negative spatial spillover effect.

6. Conclusion and Policy Recommendations

6.1. Conclusion

Two dimensions from the Internet development and financial development level of digital economy development index, using the entropy method to measure the 2012-202113 cities digital economy development level, using the least squares method and fixed effect model analyzes the Beijing-Tianjin-Hebei region digital economy development of human capital level influence mechanism, and further build space dubin model into space spillover effect. The main conclusions are summarized as follows:

First, the nuclear density distribution map of the digital development level of the Beijing-Tianjin-Hebei region shows a trend of shifting to the right, and the digital development level of each city is gradually improving. In terms of spatial characteristics, digital economy is positive spatial correlation, and human capital level is negative spatial correlation, between Beijing-Tianjin-Hebei city digital economic development level deepening influence each other, but the cities around Beijing and Tianjin are affected by the "siphon effect" brain drain phenomenon, talent attracted by economic metropolitan circle to big cities. Second, the improvement of the development level of digital economy has a significant role in promoting the improvement of the human capital level in the region and the adjacent cities. Compared with the improvement of the level of human capital in the adjacent cities. Third, the promotion of human capital is not conducive to the development of adjacent city, talent space competition relationship, the reason may be the Beijing-Tianjin-Hebei region talent distribution, economic development gap between the Beijing-Tianjin-Hebei region has strong dual economic characteristics, the Beijing and Tianjin strong "empty" effect and poor radiation dynamics, lead to the Beijing and Tianjin, the surrounding city talent missing phenomenon, is not conducive to the improvement of human capital level.

6.2. Suggestions

First, while the digital economy in the region is developing, reasonable talent attraction policies should be formulated to encourage local talents to return to their hometowns, introduce foreign talents, and effectively promote the improvement of human capital level in the region. Second, we should pay attention to the positive impact and spatial spillover effect of digital economy on the level of human capital, give full play to the promoting role of digital economy, make full use of the productivity and liquidity of data factors, and provide a more convenient and efficient way for the improvement of human capital level. Third, to undertake non-capital functions to transfer to Tianjin and Hebei, guide talents with the industry. The government will introduce relevant talent policies, design the top-level framework of talent integration, boost the convergence of regional talent policies,

mutual recognition of talent qualifications, and coordination of talent service standards, and deeply integrate the industrial chain with the talent chain.

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