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Analysis of the impact of digital economy on the new smart city

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Abstract

At present, digital and intelligent development has become the trend of The Times, and how to make good use of the digital economy(DE) to help us build smart city(SC) has become an important issue in the development process of SC. Based on the Dagum coefficient(DC), nuclear density (ND), spatial autocorrelation(SA) and other relevant knowledge, this paper divides different regions in China to judge the development degree of SC and the development of DE in different regions. This paper uses the panel data of 30 provincial administrative units in China from 2003 to 2019 to establish a spatial econometric model of the impact of DE on SC. The findings are as follows: (1) The results of DC and ND show that there are regional differences in the concept of popular sentiment in the development of SC in China, and the Gini coefficient in the eastern part is smaller than that in the western and central parts; (2) SA results show that SC development in various regions has obvious spatial correlation characteristics; (3) Spatial econometric regression results show that DE promotes the development level of SC. According to the conclusion, the rapid development of DE is conducive to reducing the Gini coefficient across the country and narrowing the national distribution gap. High-precision digital economic data provides strong support for the stable operation of different systems in urban construction, and helps to optimize the new SC system.

Keywords

Digital economy, Smart city, Spatial econometric model, Dagum coefficient.

1. Introduction

The concept of SC originated from the concept of "smart Earth" proposed by IBM, and similar concepts have been digital cities. In November 2008, just at the beginning of the global financial crisis from 2007 to 2012, IBM released in New York, the theme report "Smart Earth: Next Generation leaders Agenda" proposed "smart Earth", that is, the new generation of information technology is fully used in all walks of life (Qianbing Xiao, 2021)[4].

Specifically, the concept of "wisdom" is to enable human beings to manage the state of production and life in a more sophisticated and dynamic way through the application of a new generation of information technology, by embedding and equipping sensors into various objects of production and life systems such as power supply systems, water supply systems, transportation systems, buildings, and oil and gas pipelines in every corner of the world. Connect the formed Internet of things with the Internet, realize the integration of human society and physical systems, and then integrate the Internet of Things through supercomputers and cloud computing. Since then, this concept has been accepted by countries around the world, and as an economic growth point to cope with the financial tsunami. At the same time, the development of SC is believed to help promote the coordinated and sustainable development

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of urban economy, society, environment and resources, alleviate the "big city disease" and improve the quality of urbanization.

DE, also known as Internet economy, network economy and new economy, refers to the economic activities driven by digital industry based on digital computing technology, as well as the innovative economic activities of non-digital industries through digital technology. According to the National Bureau of Statistics of China, DE refers to a series of economic activities that take data resources as the key production factors, modern information networks as an important carrier, and the effective use of information and communication technologies as an important driving force for efficiency improvement and economic structure optimization.

With the rapid development of information and communication technology in recent years, the Internet, e-commerce, mobile communication and so on are increasingly changing the direction of economic and social development and people's way of life. In the turbulent global era, countries around the world have introduced DE development strategies at the national level to achieve economic recovery and sustainable development. This paper mainly reviews the development trend of DE and the development strategies of DE of various countries, and proposes that the development of DE can promote the development of strategic emerging industries of various countries, which is conducive to the optimization of industrial structure and sustainable growth.

In the process of SC, constantly optimizing the wisdom of the city is the most important issue at present. SC mainly use the new generation of information technology to build a super brain and make unified planning for the coordinated development of cities, so as to ensure the sustainable development of cities and solve some problems in the past citie (Yilin wu,2021)[7]. In the current development process of the DE, the wisdom of the city can be represented by digitalization to a certain extent, and the development of the DE is directly related to the wisdom of the city. People, organizations, and machines in today's economy are interconnected through the Internet, mobile technology, and the Internet of Things. Many merchants also carry out market business through the Internet. The popularization of computer network and communication technology is the foundation of the development of DE.

In this paper, the Gini coefficient of different regions is calculated to determine the development difference between regions, so as to understand the importance of DE in the development of SC, and constantly optimize and update the help points of DE to the development of SC. From the current research of scholars, no one has studied the impact of DE on SC too deeply. Most scholars are committed to studying the construction process under the SC and constantly optimizing the rules under the SC process. However, from the perspective of the current development vitality of the DE, the strong vitality of the DE will drive the optimization and construction of the SC.

2. Literature review and theoretical analysis

2.1. Literature review

At present, some scholars are concerned about the development status of the DE. Tianyu Li and Xiaojuan Wang(2021)[6] proposed that in the post-epidemic era, it is necessary to promote the formation of a new development pattern with domestic big cycle as the main body and domestic and foreign double cycle through extensive empowerment of the DE. Zude Xian and Tianqi Wang(2022) [11]further improve the scale calculation framework of the DE and provide some references for policies to promote the development of the DE. Menggen Chen and Zhang Xin(2022)[3] have perfected the econometric theory of the DE and provided a basis for promoting the high-quality development of China's economy. Fengfu Mao and Zhang Fan(2021)[1] used the industrial caliber of DE micro-enterprise data aggregation data, the paper accurately describes the temporal and spatial evolution of China's DE. Zhaoan Han and Haizhen

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Wu et al. (2021)[10] estimated the scale of China's inter-provincial DE, analyzed its characteristics, disequilibrium and regional differences, and clarified the current situation, characteristics and regional differential economic development of China's inter-provincial DE, which is of great significance for the coordinated development of its domains. Yuezhou Cai and Xinxing Niu (2021)[9] studied the characteristics of digital technology /ICT penetration, substitution and synergy, identified the value creation mechanism of DE such as "substitution effect" and "synergy effect", and divided the DE into two parts: "digital industrialization" and "digital industrialization". We use the tools of national economic accounting, growth accounting and econometric analysis to measure the value added scale of China's DE and analyze its structural characteristics.

2.2. Theoretical analysis

(1) Smart city

In November 2008, IBM(International Business Machines Corporation) proposed the "smart Earth" concept, and in 2010, IBM formally proposed the "SC" vision. SC is the advanced form of urban information technology that fully applies the new generation of information technology to all walks of life in the city based on the next generation of innovation in the knowledge society (Innovation 2.0), and realizes the deep integration of informatization, industrialization and urbanization, which helps to alleviate the "big city disease", improve the quality of urbanization, and achieve fine and dynamic management. And enhance the effectiveness of urban management and improve the quality of life of citizens. SC is a concept in continuous development, is the product of the development of urban information to a certain stage, and continues to improve with the development of technology, economy and society. With the strong driving force of new generation information technologies such as big data, cloud computing, Internet of Things, geographic information, and mobile Internet, we will develop smart applications and establish a new and sustainable urban development model, thus outlining a blueprint for the future "SC".

(2) Digital economy

DE is a relatively novel economic development mode in the economic development concept of the new era, which mainly changes the transaction mode between consumers, suppliers and governments in the traditional market by combining the international high-tech information technology with the latest research project technology, and applying it to the improvement of traditional industries and the development and development of new industries. To achieve a rapid increase in economic transactions. At the same time, the DE development model can produce a higher level of technical support for the manufacturing, transportation, sale and maintenance of products, so as to provide better economic development support for our society. In the planning of SC construction, DE is a very important part, which is directly related to the development degree of market economy. At the same time, the development of DE can in turn play a certain role in promoting the construction of SC. Therefore, DE plays an important role in the modernization of urban economy.

2.3. The impact of DE on SC

Sun Hong and Jidong Zhang (2012)[5] believe that DE will become an important direction of world economic development in the future and provide new impetus for economic growth. Hailin Qin and Ma Tao (2020)[2] believe that the scientific and technological innovation elements represented by the DE will promote the high-quality development of the economy and society, and is the core force to generate new development momentum. From the perspective of new driving force of economic growth, Yizhou Tang (2020)[8] makes clear the mechanism and media of DE enabling high-quality economic development with SC construction as a proxy variable to provide certain decision-making reference for improving urban total factor

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productivity, regards SC construction as a quasi-natural experiment, and avoids endogenous problems by using the method of differential difference. Improve the reliability and scientificity of research conclusions. To sum up, this paper believes that the DE can affect the construction and development of SC.

3. Research methods and data description

3.1. Model design

(1)DC

In this paper, the Dagum Gini coefficient decomposition method is used to measure the Gini coefficients of three subgroups in east, central and western China, so as to discuss the interval difference and the contribution rate of spatial difference of the level of new SC. This method is a common indicator used internationally to measure the income level of residents in a country or region, which can clearly distinguish the spatial sources of the tested samples and make the results more accurate. Therefore, this method is adopted in this paper to measure the level of new SC in the eastern and central regions of China. The Gini coefficient of China's new SC is defined as follows:

$$G = \frac{\sum_{j=1}^{k}\sum_{h=1}^{k}\sum_{i=1}^{n_j}\sum_{r=1}^{n_h}\left|y_{ji} - y_{hr}\right|}{2n^2\bar{y}} \quad (1)$$

Among them, G represents the overall Gini coefficient of new SC in the country, and j and h represent the number of regional divisions. This paper adopts the subgroup division of east, central and western regions. i and r represent the number of provinces in the region, n and k are the number of provinces and regions respectively, n_j (n_h) is the number of provinces in region j (h), y_{ji} (y_{hr}) is the new SC index in region j (h). $\bar{y}$ is the average of the New SC Index for each region. When estimating the Gini coefficient, it is first necessary to sort according to the level of new SC in each region, and then the Gini coefficient is divided into three parts, namely, the difference contribution within the region G_w, the difference contribution between regions G_{nb} and the super-density contribution of cross-influence between regions G_t, and the three meet the relation G=G_w+G_{nb}+G_t.

(2) ND

Kernel density estimation can show the data distribution in a smooth way by using the peak function according to the distribution state of the data. It is an important tool for analyzing the unbalanced distribution of data in the research space, and has strong stability. The most commonly used kernel function is the Gaussian kernel function adopted in this paper, followed by polynomial kernel function and linear kernel function. In this paper, Gaussian kernel density estimation is used to show the distribution position and shape of the observed values, and to describe the basic distribution trend of the observed values. Based on the kernel density method, the density function of the random variable X can be expressed as:

$$f(X) = \frac{1}{nh}\sum_{i=1}^{n} K\left[\frac{X_i - x}{h}\right] \quad (2)$$

$$K(X) = \frac{1}{\sqrt{2\prod}}\exp\left(-\frac{X^2}{2}\right) \quad (3)$$

Where, n represents the number of observations; X_i represents independent and equally distributed observations, x represents the mean value of observations, K is the kernel density function, and h is the broadband of the kernel density function, which determines the accuracy and smoothness of the estimated density curve. The larger the broadband is, the smaller the variance of the nuclear estimation is, and the smoother the curve will be.

(3)Spatial metrology model

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In order to analyze whether the DE has an impact on the development level of new SC, taking into account the total population (People), per capita years of education (Edu), industrial structure (IS), Fiscal and other indicators, the panel data model is established as follows:

$$eeu_{it} = \alpha_0 + \alpha_1 die_{it} + \alpha_2 peo_{it} + \alpha_3 edu_{it} + \alpha_4 is_{it} + \alpha_5 fis_{it} + u_{it} + \varepsilon_{it} \quad (4)$$

Where, i represents the time, t represents the province, eeu_{it} represents the level indicator of the new SC, $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5$ represents the estimated coefficient, α_0 represents the constant term, u_{it} represents the individual heterogeneity that does not change with time, and ε_{it} represents the random disturbance term.

This paper chooses the spatial metrology model to study the impact of DE on the new SC. The model is a spatial autoregressive model (SAR), a spatial error model (SEM), and a spatial Durbin model (SDM). SDM is a generalized spatial model, which generally evolves into various models by changing λ, ρ, θ. SDM model evolves into spatial autoregressive model (SAR) when λ=0 and θ=0, and SDM model evolves into spatial error model (SEM) when ρ=0 and θ=0.

3.2. Index system

After referring to the assessment methods of SC and DE level, the following index system of DE index system Table 1 Table of DE index system is established:

Table 1 Table of DE index system

name of index	indicator unit
GDP(100 million yuan) China Economic Network	-
Estimates of China's capital stock K	100 million yuan
Internal expenditure on research and experimental development (R&D) funds	Ten thousand yuan
Technical contract turnover	Ten thousand yuan
Total volume of post and telecommunications services	100 million yuan
energy consumption	Ten thousand tons
Total volume of telecommunication service	100 million yuan
Postal outlets	bureau

The SC indicator system is shown as follows:

Table 2 SC index system table

name of index	indicator unit
Foreign exchange earnings from international tourism	million dollars
Gross regional domestic product	100 million yuan
Individual employment	thousands of people
Urban gas penetration rate	%
Number of health care institutions	individual
Harmless disposal capacity of domestic waste	tons per day
Private car ownership	Ten thousand units
The number of domestic patent applications accepted	item
Performing troupe	individual

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Number of urban workers who participated in basic medical insurance at the end of the year	thousands of people

After the collected data is standardized, the entropy weight method is used to calculate the weight of each indicator, and finally the development level of DE and new SC in 30 provinces across the country is calculated.

4. Empirical analysis

4.1. Description of SC measurement level

(1) Measurement results of the level of new SC

According to the new SC measurement indicators and methods, the level of new SC in 30 provinces in China except Hong Kong, Macao, Taiwan and Tibet was measured, and the research samples were divided into three regions: eastern, central and western regions.

The average value of comprehensive new SC in the country shows a horizontal straight line, with little fluctuation from 2003 to 2019. The level of new SC in the eastern region is significantly higher than the national level, and shows a slow downward trend during the measurement period, the level of new SC in the central region is relatively close to the national average level, and the level of new SC in the western region is far lower than the national level.

The development status of new SC in various provinces in China from 2003 to 2019 is further analyzed. It can be clearly seen from the figure that the average level of SC in various provinces in the country fluctuates in the range of 0.001 to 0.125 and the difference is obvious. Among them, Guangdong Province has the highest level of new SC (0.125), followed by Jiangsu Province (0.083), Zhejiang Province (0.074), and Shandong Province (0.063), mainly in the eastern region. The average value of new SC in 30 provinces is 0.033, which is higher than the national level in 13 provinces. The lowest is Qinghai Province (0.001), followed by Ningxia (0.002), Hainan (0.005), Gansu and Guizhou (0.011), mainly in the western region.

(2)Gini Coefficient

According to this study, the level of new SC in the eastern and western regions of China presents a relatively obvious stratification state, and the Gini coefficients of the three regions are lower than the national Gini coefficients, among which the Gini coefficients of the western region and the eastern region are similar and relatively flat. The Gini coefficient in the central region fluctuates greatly, reaching its peak in 2008 and its lowest point in 2005. Specifically, the average Gini coefficient in the eastern region is 0.3265, and the average Gini coefficient in the western region is 0.3295. The average values in the western and eastern regions are almost equal, but both are lower than the national average (0.4112). In addition, the western region has been showing a slow rising state during the measurement period, while the eastern region has shown a wave trend of first rising, then falling, then rising.

Table 3 Spatial source decomposition of SC differences

Year	Area	Contribution（%）	Area	Contribution（%）	Supervariable density	Contribution（%）
2003	0.1020	25.09	0.2826	69.53	0.0219	5.38
2004	0.1098	25.75	0.2826	66.28	0.0340	7.97
2005	0.1105	25.83	0.2829	66.11	0.0345	8.06
2006	0.1120	26.01	0.2883	66.97	0.0302	7.02
2007	0.1123	25.80	0.2871	65.99	0.0357	8.21
2008	0.1089	25.57	0.2718	63.83	0.0452	10.61
2009	0.1065	25.16	0.2751	64.99	0.0417	9.85

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2010	0.1070	25.68	0.2663	63.91	0.0434	10.41
2011	0.1079	25.79	0.2681	64.08	0.0424	10.13
2012	0.1086	26.31	0.2634	63.81	0.0408	9.88
2013	0.1067	26.60	0.2547	63.49	0.0398	9.91
2014	0.1076	26.97	0.2502	62.71	0.0412	10.32
2015	0.1076	27.08	0.2426	61.04	0.0473	11.89
2016	0.1040	26.77	0.2372	61.03	0.0474	12.20
2017	0.1074	27.68	0.2240	57.74	0.0566	14.58
2018	0.1148	28.81	0.2157	54.12	0.0680	17.07
2019	0.1146	28.99	0.2135	54.04	0.0671	16.97

By observing the spatial source decomposition of SC differences in Table 3 Spatial source decomposition of SC differences, we can see that inter-regional differences make the largest contribution, contributing 62.92%, more than half; The intra-regional difference is the second, contributing 26.46%; The contribution of supervariable density difference is the smallest, only 10.62%. On the whole, the main sources of differences are inter-regional differences and intra-regional differences, the mean values of which are 0.2592 and 0.1087 respectively during the measurement period. In this paper, the country is divided into three regions for analysis. The inconsistent development level of new SC in the three regions is the reason for the large difference between regions and the small difference in super density. From the perspective of the range of variation, the smallest variation in the measurement period is the intra-regional difference (0.1148-0.102), followed by the super-variable density (0.068-0.0219), and the largest variation is the inter-regional difference (0.2883-0.2135). Among them, the inter-regional difference, intra-regional difference and supervariable density difference showed wavy changes, but the overall inter-regional contribution showed a backward trend, and the intra-regional and supervariable density contribution showed a positive trend. In 2003, the difference contribution between regions reached the maximum of 69.53%, and the supervariable density reached the minimum of 5.38% in the same measurement year.

(3)ND

Following the breakdown of Dagum's Gini coefficient above, we have a visual understanding of the differences and sources of new SC in the Eastern and western regions. In order to have a deeper understanding of the absolute difference of the level of new SC in different regions and the spatial dynamic evolution characteristics, the following uses kernel density estimation to further analyze the level of SC in the country, eastern and western regions from 2003 to 2019.

The national new SC mainly have the following characteristics: In terms of the number of wave peaks, during the measurement period, the national new SC show a single-peak state, and the area of the left and right sides of the peak is similar on the whole; From the perspective of distribution location, from 2003 to 2019, the national SC showed a trend of middle center, indicating that the national new SC showed a development state of first increase and then decrease; From the perspective of distribution pattern, during the measurement time, the main peak height of the density curve of the new SC gradually increased, and the width of the curve showed a small trend of narrowing, indicating that the difference in the level of SC between regions showed a narrowing trend. From the perspective of distribution extensibility, the distribution of SC shows a moderate phenomenon, indicating that the relative differences in the level of new SC between different provinces are concentrated. Therefore, the government should balance the construction and development of new SC in different regions and improve the level of new SC in the region.

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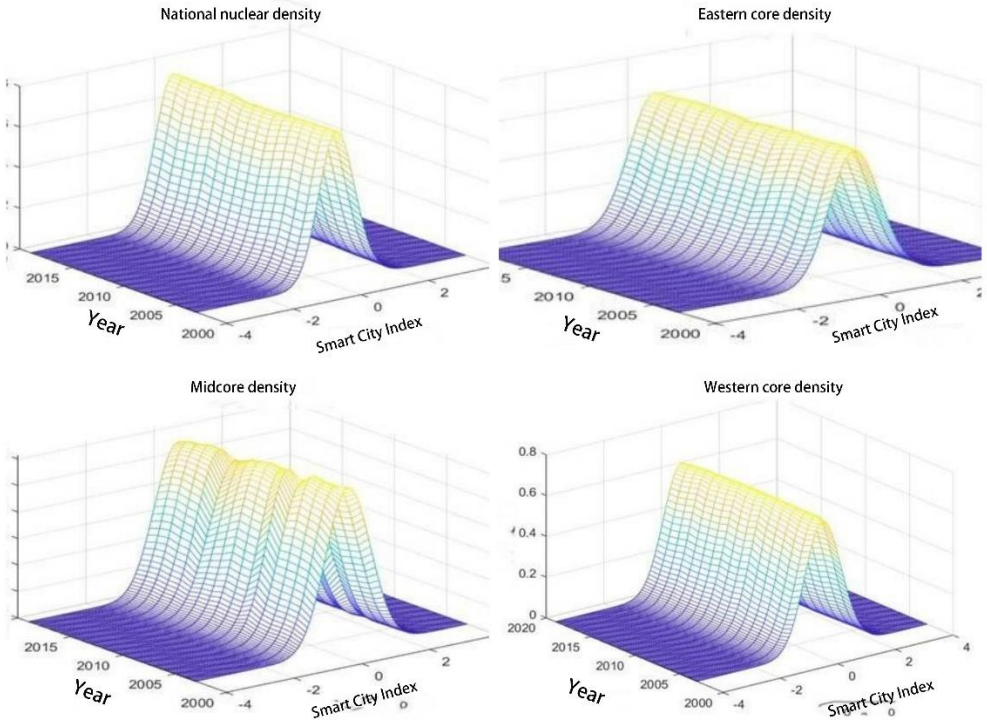

Figure 1 Nuclear density index diagram

From the point of view of the number of wave peaks, during the measurement period, the ND curves of the eastern and western regions showed a unimodal state. Moreover, the height of the main peak is gradually rising, and the level of new SC in the three regions is polarized. In terms of distribution, the core density curve centers of the three regions are all in the middle, indicating that the level of new SC in the three regions increased and then decreased over time from 2003 to 2019.

4.2. Benchmark model

This paper selects four methods of mixed OLS estimation, Fixed effect (FE), Random Effect (RE) and twoway-FE for data estimation, and obtains the test value of the impact of DE on the new SC in Table 4 Testing the impact of DE on new SC below. According to the data in the table, the Wald test value of random effect is 53.89, and the null hypothesis is rejected at the significance level of 1%. Therefore, random effect is better than the mixed OLS estimation method, and random effect should be selected. The combined F-value of the fixed effects and mixed OLS estimation method is 23.77, and the null hypothesis is rejected at 1% confidence level, indicating that the fixed effects estimation method is better than the mixed OLS estimation method. Therefore, the fixed effects estimation method is chosen to reject the null hypothesis at 1% level by using the Wald test table median. Therefore, the effect of fixed effect is better than that of random effect, so the fixed effect is selected. Finally, by combining the fixed effect and two-way fixed effect with F-value test method, the F-value shown in the table is 5.17, which is significant at 1% level. Therefore, the effect of two-way fixed effect estimation method is better than that of fixed effect estimation method, so the paper finally decides to use two-way fixed effect estimation method.

Table 4 Testing the impact of DE on new SC

Variate	OLS	FE	RE	FE-twoway
	(1)	(2)	(3)	(4)
DE	0.5736***	0.1199***	0.2325***	0.1220*
	(2.86)	(3.17)	(5.94)	(1.84)
people	0.0125**	-0.0447***	0.0053***	-0.0547***

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	(3.23)	(-8.58)	(1.92)	(-2.16)
edu	-0.0021***	0.0008***	-0.0004***	0.0008***
	(-2.44)	(3.48)	(-1.78)	(0.36)
is	-0.0351***	-0.0060***	-0.0121***	-0.0008***
	(-3.10)	(-1.50)	(-2.73)	(-0.10)
fiscal	0.0029***	0.0064***	0.0014***	0.0027***
	(0.40)	(2.12)	(0.42)	(0.55)
Constant	-0.0605***	0.3863	-0.0114***	0.4662
	(-2.59)	(9.34)	(-0.51)	(2.28)
F test	23.77***			
	[0.000]			
Hausman test		23.25***		
		[0.000]		
Wald test			53.89***	
			[0.000]	
Year-test				5.17***
				[0.000]

Note: T value or Z value in parentheses, ***, **, * indicates significant at 1%, 5%, 10% level respectively

According to the two-way fixed effect estimation method, the coefficient of DE is 0.1220, which is significant at 1% level and a positive indicator, indicating that when the level of DE is increased by one percentage point, the level of SC can be increased by 0.122 times on the basis of the original, and the development of DE level can effectively drive the development of SC level.

4.3. The spatial effect of DE on SC

(1) SA

Table 5 SA test at the level of regional new SC shows the results of SA test at the level of regional new SC. Observing the SA test at the level of regional new SC in this table 5, it can be seen that the global Moreland index of new SC from 2003 to 2019 is significant at the 5% level and has passed the SA test. There is a significant spatial positive correlation between the levels of new SC in each province, that is, the provinces with higher levels of new SC have higher levels of new SC in their neighboring provinces.

Table 5 SA test at the level of regional new SC

Year	Moran'I	p-value*
2003	0.130	0.035
2004	0.132	0.039
2005	0.140	0.035
2006	0.132	0.04
2007	0.123	0.053
2008	0.123	0.059
2009	0.119	0.066
2010	0.112	0.075
2011	0.113	0.074
2012	0.122	0.061
2013	0.125	0.057

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2014	0.105	0.08
2015	0.094	0.102
2016	0.079	0.132
2017	0.051	0.2
2018	0.018	0.299
2019	0.005	0.346

According to the test results of the impact of DE on regional new SC in Table 6 Test of the impact of DE on regional new SC, it can be concluded that DE has a spatial effect on new SC. It can be concluded from the table that the coefficient of impact of DE on new SC is 0.1131, and the effect is significant at the level of 1%. Meanwhile, it has been proposed in the above content that, The DE has a positive effect on new SC, which shows that while the level of DE is effectively developed, it can promote the improvement of the level of new SC. However, due to the many factors that affect the level of new SC, the improvement of the level of DE can contribute to the development of new SC, but its effect has certain limitations.

Table 6 Test of the impact of DE on regional new SC

Variate	FE-twoway (1)	SEM-FE (2)	SAR-FE （3）	SDM-FE （4）	SDM-FE （5）
Variabkes	Main	Main	Main	Main	Wx
Digital	0.1220	0.1177	0.1131	0.1244	0.5440
	(1.84)	(3.23)	(3.10)	(3.34)	(1.91)
people	-0.0547***	-0.0454***	-0.0488***	-0.0411***	0.0240**
	(-2.16)	(-8.99)	(-8.70)	(-5.82)	(0.83)
edu	0.0008***	0.0008***	0.0008***	-0.0002***	0.00002***
	(0.36)	(3.15)	(2.86)	(-0.15)	(0.02)
is	-0.0008***	-0.0054***	-0.0033***	-0.0026***	-0.0171***
	(-0.10)	(-1.38)	(-0.80)	(-0.62)	(-1.20)
fiscal	0.0027***	-0.0060***	0.0057***	0.0044***	0.0018***
	(0.55)	(2.06)	(1.82)	(1.25)	(0.27)
λ		0.2742			
		(2.10)			
ρ		0.1746	0.0422**		
		(15.27)	(0.27)		
Sigma2_e	0.00002	0.00002	0.00002		
	(15.92)	(15.95)	(15.22)		
Lratio Test			32.05***		
			[0.000]		
Wald Test				32.00***	
				[0.000]	

Note: T value or Z value in parentheses, ***, **, * indicates significant at 1%, 5%, 10% level respectively

5. Conclusions and recommendations

In the context of the 5G era, the DE has also entered a new stage of development, which can provide more data support for the development of industrial economy. The construction of SC is an important task for the current development of the country. By building a SC with a

complete system, it is conducive to the further optimization of the urban industrial structure and the development of the national economy has entered a new stage. The high-precision data collected by the DE provides strong support for the stable operation of different systems in urban construction, and helps to optimize the new SC system. The effective integration of the DE into the construction process of new SC has a positive effect on accelerating the construction speed of new SC. Based on the above research, this paper puts forward the following policy recommendations:

(1) Improving DE facilities. The government needs to accelerate the construction of SC, strengthen the construction of digital infrastructure, promote the wisdom of municipal facilities, accelerate the establishment of the iot perception system for urban components, and improve the level of urban digitalization.

(2) Rational allocation of resources to achieve regional coordinated development. Clarify the positioning of urban development, face the actual needs of cross-regional data coordination, promote regional construction, achieve data opening and business coordination in neighboring regions, promote inter-regional data sharing, and achieve balanced economic development.

(3) Expand application scenarios and accelerate digital empowerment. Based on the urban brain, we will develop and apply smart medical, transportation, environmental protection, education and other platform systems, and gradually form a smart application platform system, so that the urban brain can truly play the role of the central hub of government services and urban operation. Guide enterprises to apply big data technology to operation management, explore smart factory models, improve the level of intelligent management, and promote the deep integration of big data technology and the real economy.

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