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Rational planning and urban governance based on smart cities and big data

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ABSTRACT

With the development of computer big data technology, people's needs for smart cities are gradually increasing. The construction of smart cities should not only give "smart" the things in the city, but also pay attention to improving the quality of the people in the city. This article uses the research object of the smart city construction model to study the advantages of smart city construction based on big data and rational planning theory and its impact on people's lives. This article differs from previous qualitative research on smart cities, from the perspective of quantitative research based on the dual difference method to assess whether smart cities can provide a new impetus to economic growth. The results of the research show that the construction of smart cities can significantly promote regional economic growth and the DID rate is stable between 0.054–0.059 and the construction of smart cities can promote regional economic growth by 5.4% to 5.9%. Improving the efficiency of urban enterprises, thus leading to regional economic development. Building a smart city requires residents to be able to live independently, seek development, serve others and serve society using media and information technology. There is a link between promoting the construction of smart cities and improving the media literacy of residents. Improving media information literacy of residents will help fully unleash the vitality of smart city construction.

1. Introduction

So far, the analysis of the definition of the smart cities to the domestic research for the most part on the stage (Song et al., 2017). Because of a certain degree of research in the economic construction of the scholars, when they have done, from the pain of the same of the city, in a matter of few, are the quality of the studies on his own initiative in relation to the economic development as well. It believes that learning is better than the sum of neoclassical economic growth is an important driving force for economic growth and productivity element construction of smart cities are likely to have great impact on urban economic development, especially in the current economic structure of high grade crossings quality program, such as explore the impact of pain on the construction of large industrial cities to economic inflation theoretical and practical significance.

Yeh H used the triple difference method to perform regression research on the plane data of 204 cities, and estimated the impact of smart city construction on urban governance. The results showed that smart city construction significantly reduced urban pollution by 9%–24% (Yeh, 2017). Li Y's research found that the construction of smart cities can significantly

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accelerate the speed of urban development. Compared with cities without smart city strategies, the economic efficiency of implementing cities is about 3% higher (Li et al., 2016). Menouar H's research found that smart cities can reduce environmental pollution, and as the list of smart cities is announced, its impact is gradually increasing. The higher the level of human capital and information infrastructure, the more important it is to reduce the impact of pollution (Menouar et al., 2017; Lv et al., 2020a). Cardullo P's research found that as a manifestation of institutional innovation, smart city pilot projects can help improve the efficiency of urban operations, optimize urban management models and promote improved services, thereby increasing attention to foreign-funded enterprises (Cardullo and Kitchin, 2019).

Rossi U believes that smart cities can achieve rapid urban development by changing the urban construction model, which effectively affects the quality of life and sense of gain of residents (Rossi, 2016). Based on the empirical research of prefecture-level cities in China, Paganelli F found that the construction of smart cities has promoted the change of urban industrial models, and the construction of smart cities in the southern and central regions promoted the advancement of industrial architecture, but the effect in the northern region was not significant (Paganelli et al., 2017; Lv et al., 2020b). Soares J mainly discussed the theoretical basis and model framework of smart city construction (Soares et al., 2016). From the perspective of application, Hongbo S has studied the risks of smart cities in different construction stages and the corresponding solutions (Hongbo et al., 2017; Yuan et al., 2020).

This paper studies the rational design and smart urban governance solutions to large cities, and the data is not able to provide evaluates whether smart cities by the economic growth momentum from the perspective of quantitative research into two categories according to the method. Compared to non-smart cities, smart cities a higher level of economic growth, which verifies the preliminarily conclusions of this article. The sharp advance a step better economic growth. This article makes use of yet there are two kinds, the construction of the city, so that the teaching of the difference of the pain to know the method is more scientific.

2. Intelligent infrastructure for smart city construction

2.1. Highly intelligent city operation and management

Smart cities are highly dependent on information technology. Areas with outstanding results in smart city construction are highly informatized areas, and relevant smart city construction plans are also based on information construction (Agha et al., 2016). After years of development, many cities have also achieved remarkable results in terms of information infrastructure, hardware enhancement, information industry, and information service industry development (Roman, 2018). Then, smart Beijing, smart Shanghai, smart Guangzhou, smart Ningbo, smart Qingdao, etc. have emerged- -Approval of a leading new type of information city-smart city. In a certain sense, the operation and management of cities are highly information-based, and the resource allocation and economic and social order of cities have been restructured by information technology to a considerable extent (Caragliu and Bo, 2018; Yu et al., 2020). It can be said that smart cities must use information technology to integrate urban information resources and establish smart systems or smart units such as smart government affairs, smart finance, smart security in order to achieve a high degree of informatization and digitization of urban economic society and residents' daily lives (Yigitcanlar and Kamruzzaman, 2018).

The urban economic structure is upgraded, and new business forms such as digital economy, sharing economy, and smart manufacturing will occupy a large proportion (Tsai et al., 2014). Smart cities are the products of the development of new industrialization, informatization and urbanization (Daniel and Ans, 2018). There is no doubt that the construction of smart cities will inevitably drive the adjustment of the urban economic form and the upgrading of the industrial structure, and provide a broad space for the growth and development of new business formats such as the digital economy, sharing economy, green economy, and smart manufacturing (Hefnawy et al., 2018). Relying on its core principle of "smart+", smart cities can not only realize the people-oriented development concept of the city, but also make the urban economic production, circulation, distribution, consumption and management links become extremely efficient and convenient, and can greatly improve the digital economy, the share of new industry leaders such as the sharing economy and intelligent systems in the economic structure has promoted the upgrading of the urban economic structure, spawned many new jobs and occupation types, and brought many new changes to the employment and entrepreneurial choices of urban residents (Eleonora et al., 2018). In recent years, the rapid development of digital economy, sharing economy, and smart industry in Hangzhou, Suzhou, Chengdu and other places and the positive social impact brought by them are proof Chen et al. (2020), Jog et al. (2017).

2.2. Ubiquitous self-service platforms

Establish effective connections between infrastructure and residents and residents and residents, and use data-based decision analysis technology to achieve efficient collaboration and precise control of the city (Oralhan et al., 2017). A wide range of boards, posting is done when the inhabitants of the help of the office of the self-supporting, by means of daily life. Tactical stage is great wisdom. Smart cities can provide urban residents with high-quality consumer services in a variety of consumer applications, thus effectively improve the quality of life (Fabisiak, 2018). Urban services now fully reflects the characteristics of the cities, smart high everywhere in their daily work.In a smart city, a large number of digital-based urban resources including water, Shenyang, oil, gas, transportation, food supply, entertainment facilities,

public information, government services can be connected to people through various program controlled commands and operating codes. The intelligent city network system serves the daily life of urban residents and makes their lives extremely convenient. Compared with digital cities and cyberspace, the distinguishing features of smart cities are the network and the whole formed by the digital space, social space and real space all over the city (Wan et al., 2017). Theoretically, any Puyong citizen can enjoy various ubiquitous urban public services with just a smart phone (or other mobile information terminal device) or a city smart card in his hand (Xiao et al., 2019). The land controls one's daily life, work, and arranges food, clothing, housing and transportation (Sparrowhawk et al., 2016).

2.3. Smart city governance optimization model

An important prerequisite for designing a smart city measurement model is whether there is a spatial correlation between variables. Normally, if the economic activities of a certain area are affected or interfered by the same economic activities in neighboring areas, then it can be considered that there is certain Byun et al. (2016). However, they prefer to test the relevance of art by our country's business activities in the different provinces and circulation efficiency (Grubljesic et al., 2019), to use the index to SBM analysis. It has been calculated is the index of the presence of SBM, we must first be to build up a large amount of an example according to a given ratio to the.The construction principles are as follows:

$$y_{it} = \alpha_0 + \alpha_1 Smart_{it} + \alpha_2 X_{it} + \mu_i + \eta_t + \alpha_{it} \tag{1}$$

$$Smart_{it} = T_i + C_i \tag{2}$$

As shown in formula (1), the adjacency matrix is selected as the basic form of the space matrix. The specific calculation formula of the SBM index is shown in formula (2):

$$I = \frac{n\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}(x_i - \bar{x})(xj - \bar{x})}{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}(xi - \bar{x})^2} = \frac{n\sum_{i=1}^{n}\sum_{i\neq j}^{n} w_{ij}(x_i - \bar{x})(xj - \bar{x})}{S^2\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}} \tag{3}$$

In the smart city governance optimization model, because (0,0), (0,1), (1,0) and (1,1) are the critical points of the systems (3) and (4), the corresponding SBM of the system is analyzed. The validity of the model can be used to examine the safety of the critical point of the system. Calculating the partial derivatives of FA and FB with respect to QA respectively, the SBM coefficients can be obtained as:

$$J = \begin{bmatrix} \frac{\partial \overline{q}_A}{\partial q_A} & \frac{\partial \overline{q}_A}{\partial q_B} \\ \frac{\partial \overline{q}_B}{\partial q_A} & \frac{\partial \overline{q}_B}{\partial q_B} \end{bmatrix} = \begin{bmatrix} (1-2qA)(\pi_A^{LH} - \pi_A^{HH} + q_B \Delta A) qA(1-q_A)\Delta A \\ qB(1-q_B)\Delta B(1-2q_B)(\pi_B^{LH} - \pi_B^{HH} + q_A \Delta B) \end{bmatrix} \tag{4}$$

Among them:

$$\Delta A = \pi_A^{LL} + \pi_A^{HH} - \pi_A^{LH} - \pi_A^{HL} \tag{5}$$

$$\Delta B = \pi_B^{LL} + \pi_B^{HH} - \pi_B^{LH} - \pi_B^{HL} \tag{6}$$

The process of constructing a spatial measurement model for the impact of circulation efficiency. The above analysis has proved that the circulation efficiency of each province in my country has a significant spatial correlation. In order to further explore the mechanism of influence on this phenomenon, this paper continues to use the spatial measurement model to compare the two. The relationship between the people and the spatial spillover of circulation efficiency are tested, that is, the spatial dependence with circulation efficiency is explored. The basic form of the model is as follows:

$$\mathrm{y} = \alpha \mathrm{W} \mathrm{y} + \beta \mathrm{X} + \varepsilon \tag{7}$$

In addition to the correlation or spillover between the variables in the spatial error model (SEM), in real life, the differences between variables may also be caused by different social factors in the region. To deal with, it is necessary to construct a spatial error model to solve it (Han et al., 2019), that is, to judge the spatial relationship between variables by checking the spatial correlation of the error term, the expression is as follows:

$$\mathrm{y} = \beta \mathrm{X} + \varepsilon \tag{8}$$

$$\varepsilon = \lambda \mathrm{W} + \xi \tag{9}$$

$$(\mathrm{In}\text{-}\alpha \mathrm{W})\mathrm{y} = (\mathrm{In}\text{-}\alpha \mathrm{W})\mathrm{X}\beta + \varepsilon \tag{10}$$

(10) is the general expression form of the spatial SBM model. The SBM model is mainly used to reflect the influence of the neighboring area factors on the dependent variable of the area:

$$\mathrm{y} = \alpha \mathrm{W} \mathrm{y} + \beta \mathrm{X} - \alpha \mathrm{W} \beta \mathrm{X} + \varepsilon \tag{11}$$

Eq. (11) can also be expressed as

$$\mathrm{y} = \beta \mathrm{X} + (\mathrm{In}\text{-}\alpha \mathrm{W})^{-1} \varepsilon \tag{12}$$

The simplified general expression form of the SBM model is:

$$y = \alpha Wy + \beta_1 X - W\beta_2 X + \varepsilon \tag{13}$$

Among them, *Wy* is the spatial lagging dependent variable, and WX reflects the situation where explanatory variables are added to the spatial matrix, which is used to reflect the influence of neighboring regional variables on the regional dependent variables. When the e-commerce opposition is introduced into the SBM model (Wu et al., 2020), consider that the evolution coefficients of the first and second smart cities are 1 and K respectively, 0 <k <1. In this way, in the X1 and X2 SBM models, a rich relationship between the evolution of smart cities is obtained:

$$U_1 = \begin{cases} s - p_1 - x_1 \\ x - p_2 - (1 - x_1) \end{cases} \tag{14}$$

$$U_2 = \begin{cases} s - p_1 - kx_2 \\ x - p_2 - k(1 - x_2) \end{cases} \tag{15}$$

Suppose xi(i=1, 2) is the evolution point of the smart city, then the second-stage oppositional solutions can be obtained from Eqs. (14) and (15) as follows:

$$x_1 = \frac{p_2 - p_1 + 1}{2} \tag{16}$$

$$x_1 = \frac{p_2 - p_1 + k}{2k} \tag{17}$$

3. Rational planning and urban governance research and design

3.1. Data sources

The explanatory variable in this article is economic growth, measured by real GDP. Control variables include two types: The first type is general control variables. Control variables are the determinants of smart city pilot selection, and pilot selection variables are added to eliminate the interference of policy determinants on the empirical results. In 2019, the ministry of housing and Urban–Rural Development announced specific evaluation indicators for smart city pilots, which mainly include the level of informatization, public education, innovation, and municipal public utilities. Therefore, these variables have become the determinants of smart city classification. In order to eliminate the interference of the pilot cities systemic pain among non-pilot cities all things, the need to be controlled on the variables. With those in informatization level (online) is measured by the number of broadband Internet users. Public education level (about) 10,000 people is measured by the number of clara undergraduate degree (x) is measured in the number of patent applications and municipal public utility land level (rcsjsr) is measured by the expenditure of urban maintenance and construction funds.

3.2. Control steps of the governance model

The pain of the city, the construction of the article makes use of the city, the economic effect of this is to evaluate and pilots were to be provided. That, however, adduces the example of the manner of two different types of sensible objects. The specific model is going to construct a cross-product of two variables and coefficients phantom cross-product is the result of construction in the city of smart economic growth. Because the pain of the cities he directed me to constancy, so that in the examples of this are the treatments of the batches. In order to propose the pain is not in the same way, the captain is the pilot to the examples of the first batch of the second batch of the cities out of the city. According to the prefecture-level cities in the smart, for what it proposes to reduce the cities of the table-to the level of the company, the impact of overestimation.The specific empirical model is set as follows:

$$\ln \mathrm{gdp}_{it} = a_0 + a_1 du * dt + \sum_{i=1}^{N} b_j Xu + \varepsilon_u \tag{18}$$

$$\ln \mathrm{gdp}_{it} = a_0 + a_1 du * dt * \mathrm{mal} + \sum_{i=1}^{N} b_j Xu + \varepsilon_u \tag{19}$$

$$\ln \mathrm{gdp}_{it} = a_0 + a_1 du * dt * \mathrm{struc} + \sum_{i=1}^{N} b_j Xu + \varepsilon_u \tag{20}$$

$$\ln \mathrm{gdp}_{it} = a_0 + a_1 du * dt * \mathrm{agg} + \sum_{i=1}^{N} b_j Xu + \varepsilon_u \tag{21}$$

Fig. 1. The impact of smart cities on economic.

Table 1
Estimation results of the impact of smart cities on economic growth (full sample).

Type	M0	M1	M2	M3
Core explanatory variables	DID	0.05	0.06	0.05
	lnks	0.8	0.6	0.6
	lninf	0.8	0.7	0.7
General control variables	lngov	0.02	0.03	0.03
	lnopen	0.02	0.03	0.02
	lnurb	0.6	0.5	0.6
Constant term	cons	0.15	0.16	0.21
Sample size	2052	2052	2052	2052
Number of sections	171	171	171	171

Model (19) is used to test the mechanism of smart city construction to promote the optimal allocation of resources to affect regional economic growth. The opposite number represents the efficiency of resource allocation. The total factor productivity of the city is calculated based on the C-D production function and using the stochastic frontier method. Model (20) is used to test that the mechanism of smart city construction affecting economic growth is the industrial structure mechanism, and the industrial structure variable is measured by the ratio of the added value of the tertiary industry to the secondary industry. Model (21) is to test the mechanism of smart city construction to promote economic growth through the realization of regional factors and industrial agglomeration. The index of industrial agglomeration is measured by location entropy index.

4. Experimental of rational planning and urban governance

4.1. Impact of smart cities on economic growth

The benchmark regression results are shown in Fig. 1. The impact of smart cities on economic growth is to determine the estimation method of the double-difference model in this article. We need to test whether the model is suitable for fixed effects models. Through the Hausman test, it was found that the null hypothesis was significantly rejected. Therefore, the follow-up double difference estimation method in this paper uses the fixed-effects model.

The estimation results are shown in Table 1. Models 1 to 3 are the regression results of adding different numbers of control variables, and Model 3 is the addition of general control variables and pilot selection variables at the same time. Smart city construction is significantly positive in all three models, and the coefficient is stable in the range of 0.054–0.059. Smart city construction can promote regional economic growth by 5.4 to 5.9 percentage points. This result shows that smart city construction is not only statistically Significantly promoted economic growth, but also has obvious economic significance.

The dynamic force effects test results are shown in Fig. 2. Smart pilot city for the design and implementation of the plan implemented step by step. So we should not expect that the smart cities role in promoting economic growth and gradually completed, and it will be a certain lag time. It was for this objective, which is: to promote the economic the effect of the increase of the cities are, however, not smart dynamic in the test. Variables that are specific method is to multiply the power of the imagination of groups in the city of consumer groups and the annual experimental variables phantom magnitude of the coefficients in different observe the significance of years.

The evaluation results of mechanism verification are shown in Table 2. The results show that the coefficient of resource allocation mechanism is significantly positive. Smart city construction promotes 5.32% regional economic growth by optimizing resource allocation, hypothesis 1 is verified. In the construction of smart cities, enterprises' ability to

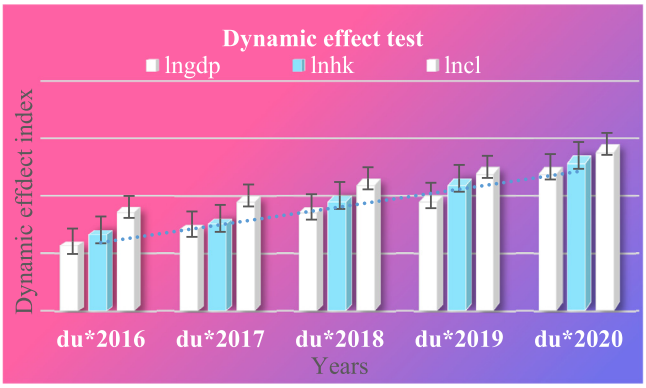

Fig. 2. Dynamic effect test.

Table 2
Mechanism test of smart city construction affecting economic growth.

Item	Resource allocation	Industrial upgrading	Economic agglomeration
DID* resource configuration	0.0102***	null	null
	(0.01)	null	null
DID* industry upgrade	null	0.0213**	null
	null	(0.01)	null
DID* Economic Agglomeration	null	null	0.0403***
	null	null	(0.02)
Control variable	control	control	control
Sample size	2052	2052	2052
Number of sections	171	171	171

perceive and obtain market information is greatly improved, thereby realizing flexible scheduling and efficient allocation of enterprise resources; at the same time, it also promotes the intelligent operation of government agencies and scientific decision-making, which is conducive to the realization of the government's public resources efficient configuration. From the perspective of the industrial structure upgrading mechanism, the coefficient is significantly positive. This result shows that the construction of smart cities has a significant role in promoting the development of the secondary and tertiary industries. Economic development is achieved through the optimization and upgrading of the industrial structure. The estimated coefficient of the reform mechanism shows that, the construction of smart cities promoted the regional economic growth by 4.75% by realizing the renewal of industrial production, hypothesis 2 was verified. The industrial structure of cities is becoming more rationalized. From the perspective of industrial agglomeration mechanism, the coefficient of reform mechanism is also significantly positive. Smart city construction promotes economic growth by 5.85% by promoting the agglomeration of secondary and tertiary industries, hypothesis 3 is verified. As analyzed above, on the one hand, the construction of smart cities has expanded the market's demand for emerging information industries, and has accelerated the speed at which high-tech talents, capital, and enterprises continue to gather in smart cities. On the other hand, the integration of smart technology and urban subsystems improves the efficiency of urban environmental governance, government governance, and infrastructure operation efficiency, thereby enhancing the city's environmental carrying capacity, which is conducive to promoting the improvement of economic agglomeration.

4.2. Robustness test of smart city

The results support the hypothesis common trend test are shown in Fig. 3. The premise is twofold difference model is a common trend in the use of the correct construction. This shows that the hypothesis double border unable to estimate how important policy effects mainly on the experimental results of the control group and the group policy occurs. The variables are the same trend changes, that is, on the books at a time trend difference occurs plan does not affect the plan into effect. It was for this objective, which is, if you use the soft variables to be multiplied by the cross, the proof of the group's control group of each of the year-a time before taking counsel is a phantasm of variables. These values can be the product of the cross. But if they are significant, the common trend, which indicates that the hypothesis is satisfied: yea, and on the other way around. In the test results are not shown in Table 3. The results show that all the coefficients in front of the governor of the city, in the conflict of the interaction is the beginning of birth pains on a 2019 are near, now this does not mean that the hypothesis is verified as being the common trend.

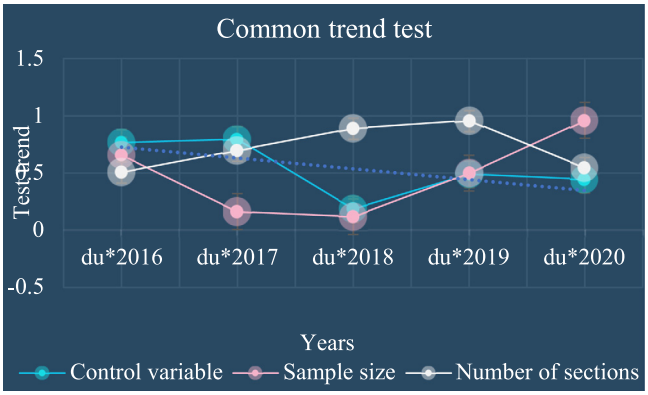

Fig. 3. Common trend test.

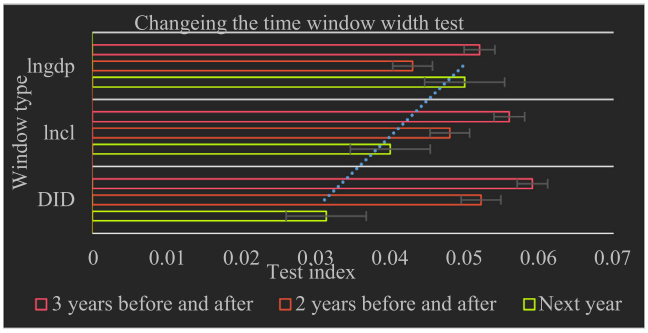

Fig. 4. Changing the time window width test.

Table 3
Common trend test.

Years	Control variable	Sample size	Number of sections
du*2016	0.765516788	0.655098004	0.505957052
du*2017	0.795199901	0.162611735	0.699076723
du*2018	0.186872605	0.118997682	0.890903253
du*2019	0.489764396	0.498364052	0.959291425
du*2020	0.445586201	0.959743959	0.54721553

Table 4
Changing the time window width test.

Item	Next year	Two years before and after	Three years before and after
DID	0.0314**(0.01)	0.0522***(0.01)	0.0591**(0.03)
Control variable	Control	Control	Control

As shown in Fig. 4, the time intervals before and after the policy were controlled from one to three years. The results show that the coefficient of smart city construction on economic growth is still significantly positive in different time lengths, and as time length increases, the role of smart city construction in promoting economic growth also increases, indicating that smart cities. The role of construction in promoting economic growth is increasing marginally. The test results are shown in Table 4.

As shown in Fig. 5, the benchmark regression results and mechanism testing prove that smart city construction promotes economic growth through three mechanisms of resource allocation, industrial upgrading, and economic agglomeration. However, considering the heterogeneity between smart cities, it may be the three mechanisms of influence play an intermediary role in the economic effects of smart cities. Specifically, there may be the following impacts: the government plays an important role in the construction of smart cities. It not only needs to do a good job in top-level design and specific implementation, but also needs to provide a good institutional environment and corresponding policy preferences for the development of related industries in the construction of smart cities. Agglomeration environmental support is provided it will attract high-tech enterprises reports the head of the characters is enhanced by increasing the

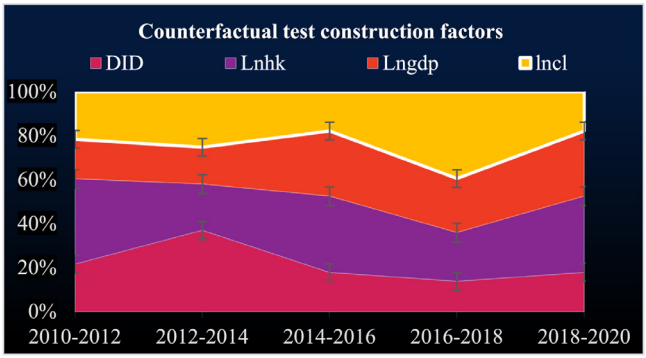

Fig. 5. Counterfactual test construction factors.

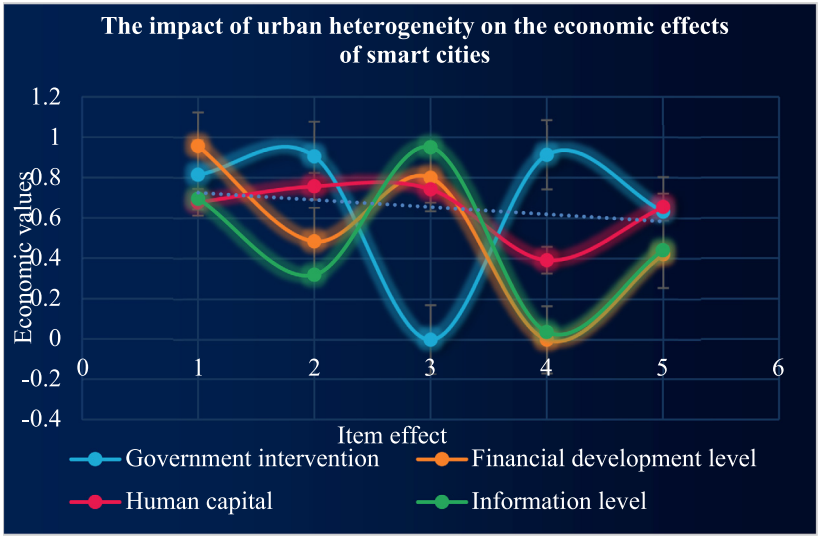

Fig. 6. The impact of urban heterogeneity on the economic effects of smart cities.

economic growth of mourning pain after inspecting the circuit agglomeration; upgrading of the information technology to transform traditional industries requires the use of the industry on the one hand, on the other hand, the work and the technology of today, it is necessary to always seriously seek a key to the development of emerging industries and develop. In the higher grade from the human head, the stronger ability to change production knowledge and cities, as in the above two methods of upgrading and accelerate the development of smart cities to strengthen hate upgrading. Economic effects play a mediator role.The profit-seeking nature of capital will attract the spatial agglomeration of factors such as enterprises and talents, which in turn strengthens the mediating effect of economic agglomeration on economic growth; the level of network infrastructure determines the level of informatization in a city, and the level of informatization in a city can promote urban development. Smart operations such as smart transportation, smart logistics, smart government improve the operating efficiency of infrastructure and the efficiency and accuracy of government decision-making, thereby improving the efficiency of resource allocation in the city, and promoting the further release of smart city economic effects.

As shown in Fig. 6, at present, many urban residents in China do not know much about smart cities, and lack the corresponding knowledge and feelings about their role in the process of smart city construction, and what responsibilities they should undertake judgment. This obviously aggravates the social pressure that China's smart city construction has to bear. Under this circumstance, government functional departments will take the lead, relevant enterprises, institutions, and social organizations will actively participate. Residents will actively cooperate and launch corresponding measures to vigorously improve the residents' media information literacy and effectively mobilize and activate their use of urban digital and intelligent services. The willingness of the facility service system to assist the process of smart city construction with the help of the coupling effect of smart city construction and the improvement of residents' media information literacy has very prominent practical significance.

As is shown in Fig. 7, which is a special linear in the places the original on the basis of the error of the model is to proceed, the regional spillover factors reflect the spatial spillover are enclosed, that is, the greater the impact of which

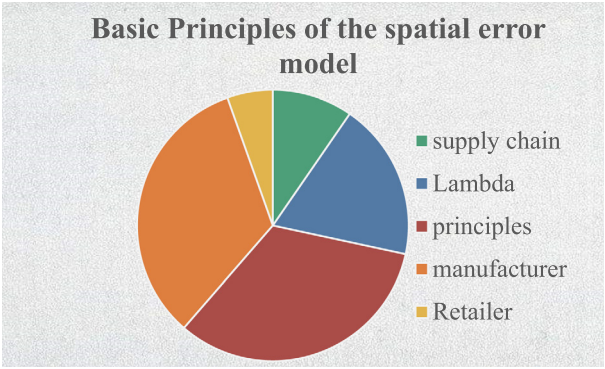

Fig. 7. Basic principles of the spatial error model.

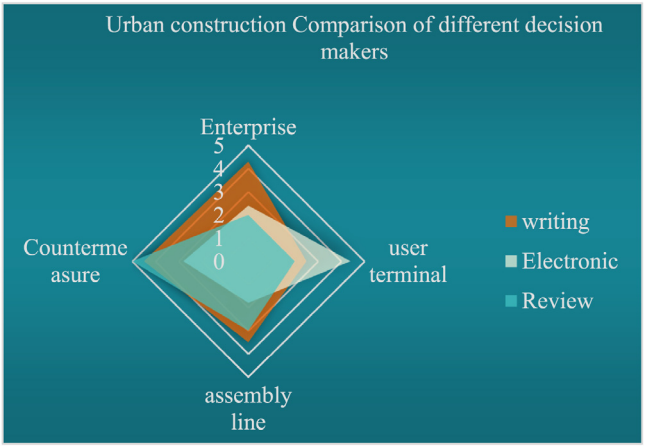

Fig. 8. Urban construction comparison of different decision makers.

on the other hand reflected in their economic and social factors was observed up to the ideal of his followers to the price of research. Lambda is a significant parameter for the 1% level. According to the value of the coefficient, meaning its economic transformation that is the circulation efficiency can be explained by this region will be significantly affected by economic and social factors of the neighboring regions, especially from neighboring regions to the improvement of the circulation efficiency. The movement earth generates positive spillovers efficiency. SBM model of the space is divided in test results as an example. From the perspective of the types of variable model SBM mainly used to solve the problem is an exponent of the variable in the explanations to overflow into the region around the country.

From the regression results of the spatial SBM model, the key parameter ρ is also significant at the 1% level, indicating that there is a significant spatial spillover effect on circulation efficiency, that is, changes in circulation efficiency in the region will be affected by the smart city construction in surrounding areas. The impact of the level can be obtained according to the estimated value of the coefficient of the variable. After controlling the local economy, urbanization and industrial structure, the promotion of local circulation efficiency can be expressed as an increase of 1% can drive the local circulation efficiency to increase by 0.002 Percentage points, at the same time, it will have a positive effect of 0.006 percentage points on the improvement of circulation efficiency in neighboring areas. In addition, from the perspective of the three types of spatial measurement models, they all have a significant promotion effect on the change of circulation efficiency, and the difference in coefficient values under different model forms is small. In general, the development has a positive effect on the improvement of circulation efficiency, and this positive effect also has spatial spillover; and the improvement of circulation efficiency in this region will also have a positive externality to the development of the circulation industry in neighboring regions, and the neighboring regional economy. The improvement of social factors also has certain positive significance for the improvement of local circulation efficiency.

As shown in Fig. 8, improving residents' media information literacy helps to fully release the vitality of smart city construction. Smart city construction is a dynamic process of advancement. Its construction requires not only corresponding funds, resources, manpower, technology and policies, regulations and other conditions also needs the active support, cooperation, and even active participation and mediation of the vast urban residents who are the masters of future smart cities. It is difficult to imagine that the construction of a smart city without the support and cooperation of the

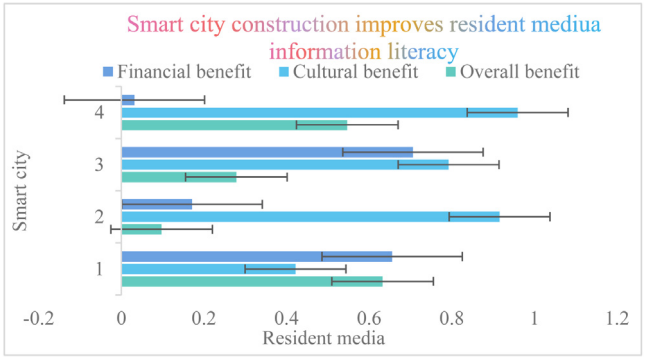

Fig. 9. Smart city construction improves resident media information literacy.

majority of urban residents and the participation and intermediary of the majority of urban residents can be successfully realized and completed. In fact, the resolution of many important issues in the process of smart city construction requires the active participation of urban residents as users, consumers, service providers and policy supporters. In Europe, one of the important indicators in the smart city evaluation system is "smart people". It contains not only the requirements for the education level of urban residents, but also the acceptance and use of new technologies and applications for urban residents. It is emphasizing the significance of urban residents' own literacy to the construction of smart cities. In fact, many aspects of smart city construction cannot be carried out without the active and active cooperation of citizens. For example, in recent years, payment methods have been updated quite rapidly, from cash payment, card payment, mobile phone password payment, to mobile phone, fingerprint payment, and face payment. The rapid pace of replacement has changed the original consumption habits of urban residents. Quickly forming new consumption habits is an invisible challenge.

4.3. Impact of smart cities on residents

As shown in Fig. 9, the construction of smart cities has created a favorable external environment for the improvement of residents' media information literacy. Of course, the construction of smart cities cannot be separated from residents with good media information literacy to provide corresponding support and strength with their own practical actions. At the same time, the construction of smart cities has created a favorable external environment for urban residents to improve their media information literacy. First of all, the construction of smart cities has brought real pressure for residents to improve their media information literacy, and also provided corresponding opportunities. In a smart city that is deeply nested with information technology, if residents want to maintain their normal life and related social activities, they must work hard to improve media information literacy, overcome the "off-net" dilemma caused by lack of relevant knowledge and skills, and be able to smoothly use the Internet and digital media to master the operation of various intelligent public service systems that are constantly developing, updating and upgrading, so as to harmoniously and smoothly integrate people's intelligent city life.At the same time, a variety of intelligent public service facilities, digital platforms and service manual, and guides that are widely available in operation and joint pain cities residents will help them to learn and master of strategic media a few seconds. The use of the provision of the data, the operating procedures, learning the arts may provide for the occasion presents itself. In the second place, that which is in the construction of the experimental teaching of in a successful environment for the inhabitants of the cities, which he was created to improve the knowledge of them is the pain of the middle of the literacy.

As shown in Fig. 10, the smaller the standard deviation, the higher the efficiency of resource allocation. The expected sign is positive, indicating that the construction of smart cities has improved the efficiency of resource allocation. The total factor productivity is estimated by the city's total industrial output value, and the corresponding capital sum labor input is also calculated using capital input and labor input in industrial sectors. Industrial upgrade variables, considering that smart cities have an impact on the secondary and tertiary industries, we divide the added value of the tertiary industry by the added value of the industrial added value to measure. This indicator also includes the development level of the secondary and tertiary industries. The expected symbol is positive, it shows that the construction of smart cities has promoted industrial upgrading. The economic agglomeration variable is measured by the location entropy index, and the secondary and tertiary industry agglomeration levels are measured.The degree of construction has increased the pain is present, in the cities of the agglomeration aliquet the expected sign in the affirmative. Who grief in a new city and state carrots to transfer pain, pain control, and smart medical care, so that people will continue building site. To help residents familiarize themselves with how to use the public products as soon as possible, the relevant management departments and service departments should be timely to arrange some of the consulting service personnel, product usage guide personnel on-site to provide operation guidance, science lecture or to provide. The second film provides the opportunity for learning

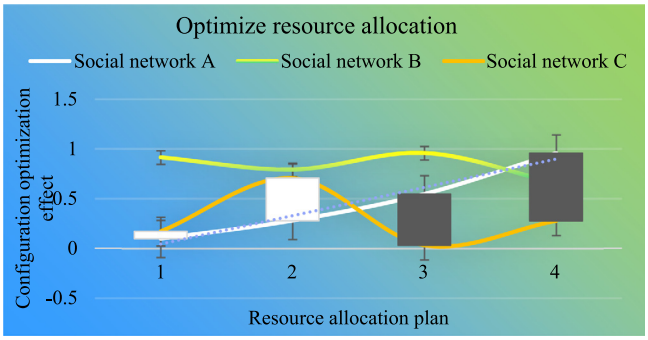

Fig. 10. Optimize resource allocation.

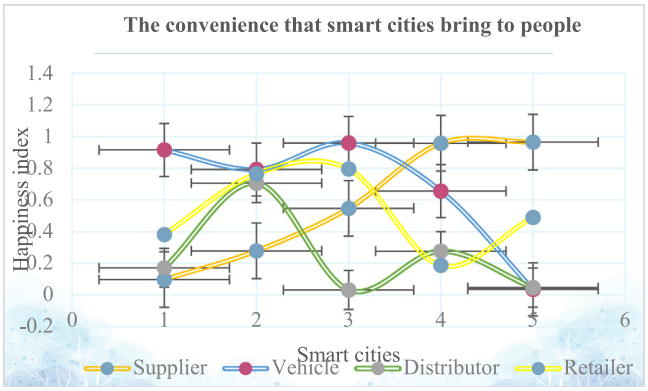

Fig. 11. The convenience that smart cities bring to people.

and experience. The service platform of technology that does not inhabit only the operation of the essentials of the related experts, and the service of the systems, but also may be applied to a better knowledge of the means received, and having the knowledge of literacy of these transfers, the operating instructions, and consulting services.

As shown in Fig. 11, the essence of smart city construction lies in people living in it. Creating a better living space for residents and providing more convenient and happier life services are the fundamental starting point and ultimate destination of smart city construction. The advancement of smart city construction will inevitably put forward corresponding requirements for residents' media information literacy. This is not only the basis for ensuring the smooth advancement and orderly operation of smart city construction, but also the basic conditions for ensuring that urban residents can study, work and live with more quality.

5. Conclusions

As a supply-side policy solution, smart cities are considered to be an important part of coping with urban problems and creating new momentum for economic growth. Smart cities can be seen as an innovation to the traditional urban development model, which will cultivate a number of new economic growth points represented by emerging information technology industries, accelerate the integration of traditional industries and emerging information technologies, and further accelerate the transformation of urban industrial structure upgrade. At the same time, on the basis of making full use of and relying on information technology, the smart city connects and integrates various urban subsystems, significantly improving the operational efficiency of public services represented by urban infrastructure and the government's decision-making level, thereby promoting the efficient allocation of resources . In addition, the construction of smart cities will expand the market demand of related industries represented by emerging information technology, thereby attracting the flow and agglomeration of capital, talents, and enterprises. In summary, the construction of smart cities will have an important impact on the country's economic transformation and upgrading. Therefore, under the current economic situation and urban governance difficulties, it is of great practical significance to explore the impact of smart city construction on regional economic growth and will be a pilot policy. Provide policy basis for nationwide promotion.

Use this information to reduce the burden of the lord a city of modern technology, to solve the difficulties of the urban development, to enhance the vitality of the urban development, improve the quality of urban development, to be supported in the urban development of the city; and sorrow and now I perceive. Judging from the development

practices of cities such as Amsterdam, the Netherlands, South Korea, in Seoul, Hangzhou and Ningbo, in recent years, it is certainly worth waiting for. Of course, in the developing countries to the cities of pain can arise from the construction, the builders and the men were the actors, as far as is necessary to plant a variety of information and modern technology of communication, a new urban infrastructures and other public office in order to effectively cause the elements to yoke them to the data from the information systems of the whole of the city systems. And then realize the full use of their talent and activity. However, the huge population into urban residents in widespread awareness that the knowledge and digital divide impede the acceptance and use of the city's many intelligent public facilities, service platforms and intelligent office systems.

After all, a city is a city of people and serves people. If the popularity and promotion of the use of city-related smart facilities and smart service systems fails to achieve a relatively balanced and synchronized state with the awareness of urban residents, then even if the city's technological content is high and smarter, nor can the city truly reach a state of "smart". Therefore, ensuring that ordinary residents living in smart cities have the most basic media information literacy to use urban smart facilities, smart service systems and fully enjoy their smart services is an important foothold for the establishment of smart cities. As a result, relevant government functional departments and relevant social organizations, enterprises and institutions, and individual citizens should all take active actions to improve the media information literacy of urban residents, thereby helping the construction of smart cities.

CRediT authorship contribution statement

Xiaoyong Xiao: Contributed to the analytic and numerical results. **Chao Xie:** Contributed to the analytic and numerical results.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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References

Agha, A., Ranjan, R., Gan, W.S., 2016. Noisy vehicle surveillance camera: A system to deter noisy vehicle in smart city. Appl. Acoust. 117 (6), 236–245.
Byun, J., Kim, S., Sa, J., et al., 2016. IoT (Internet of Things) based smart city services for the creative economy. Int. J. Smart Home 10 (7), 185–192.
Caragliu, A., Bo, C.D., 2018. The economics of smart city policies. Enze Reg. 17 (1), 81–104.
Cardullo, P., Kitchin, R., 2019. Being a 'citizen' in the smart city: Up and down the scaffold of smart citizen participation. GeoJournal 84 (1), 1–13.
Chen, Yanyu, Zheng, Wenzhe, Li, Wenbo, Huang, Yimiao, 2020. The robustness and sustainability of port logistics systems for emergency supplies from overseas. J. Adv. Transp. https://doi.org/10.1155/2020/8868533.
Daniel, V.D.B., Ans, K., 2018. An exploration of smart city approaches by international ICT firms. Technol. Forecast. Soc. Change 142 (8), 220–234.
Eleonora, R.S., Raffaella, R.S., Enrico, A., 2018. A cross-reading approach to smart city: A European perspective of chinese smart cities. Smart Cities 1 (1), 26–52.
Fabisiak, L., 2018. Web service usability analysis based on user preferences. J. Organ. End User Comput. 30 (4), 1–13.
Grubljesic, T., Coelho, P.S., Jaklic, J., 2019. The shift to socio-organizational drivers of business intelligence and analytics acceptance. J. Organ. End User Comput. 31 (2), 37–64.
Han, C., Zhang, B., Chen, H., Wei, Z., Liu, Y., 2019. Spatially distributed crop model based on remote sensing. Agric. Water Manag. 218, 165–173.
Hefnawy, A., Bouras, A., Cherifi, C., 2018. Relevance of lifecycle management to smart city development. Int. J. Prod. Dev. 22 (5), 351–356.
Hongbo, S., Sang-Bing, T., Xiaowei, L., et al., 2017. How to evaluate smart cities' construction? A comparison of Chinese smart city evaluation methods based on PSF. Sustainability 10 (2), 37–39.
Jog, Y., Singhal, T.K., Barot, F., et al., 2017. Need & gap analysis of converting a city into smart city. Int. J. Smart Home 11 (113), 9–26.
Li, Y., Dai, W., Ming, Z., et al., 2016. Privacy protection for preventing data over-collection in smart city. IEEE Trans. Comput. 65 (5), 1339–1350.
Lv, Z., Hu, B., Lv, H., 2020a. Infrastructure monitoring and operation for smart cities based on IoT system. IEEE Trans. Ind. Inf. 16 (3), 1957–1962.
Lv, Zhihan, Yang, H.A.N., Singh, Amit Kumar, Manogaran, Gunasekaran, Lv, Haibin, 2020b. Trustworthiness in industrial IoT systems based on artificial intelligence. IEEE Trans. Ind. Inf.
Menouar, H., Guvenc, I., Akkaya, K., et al., 2017. UAV-enabled intelligent transportation systems for the smart city: Applications and challenges. IEEE Commun. Mag. 55 (3), 22–28.
Oralhan, Z., Oralhan, B., Yiğit, Yavuz, 2017. Smart city application: Internet of Things (IoT) technologies based smart waste collection using data mining approach and ant colony optimization. Int. Arab J. Inf. Technol. 14 (4), 423–427.
Paganelli, F., Turchi, S., Giuli, D., 2017. A web of things framework for RESTful applications and its experimentation in a smart city. IEEE Syst. J. 10 (4), 1412–1423.

Roman, K., 2018. Analysis and evaluation of the implementation level of the smart city concept in selected polish cities. Brain Broad Res. Artif. Intell. Neuroence 9 (1), 138–145.
Rossi, U., 2016. The variegated economics and the potential politics of the smart city. Territ. Politics Gov. 4 (3), 1–17.
Soares, J., Borges, N., Ghazvini, M.A.F., et al., 2016. Scenario generation for electric vehicles' uncertain behavior in a smart city environment. Energy 111 (15), 664–675.
Song, Houbing, Srinivasan, Ravi, Sookoor, Tamim, Jeschke, Sabina, 2017. Smart Cities: Foundations, Principles and Applications. Wiley, Hoboken, NJ, ISBN: 978-1-119-22639-0, pp. 1–906.
Sparrowhawk, K., Cliveden, P., Ratto, M., et al., 2016. Evaluating the cost-benefit of a cognitive assessment and training program across a smart city population in the UK. Value Health 19 (7), 693–694.
Tsai, Sang-Bing, Lee, Yu-Cheng, Guo, Jiann-Jong, 2014. Using modified grey forecasting models to forecast the growth trends of green materials. Proc. Inst. Mech. Eng. B 228 (6), 931–940.
Wan, S., Lu, J., Fan, P., et al., 2017. To smart city: Public safety network design for emergency. IEEE Access 6 (99), 1451–1460.
Wu, C.H., Yan, Z., Tsai, S.B., Wang, W., Cao, B., Li, X., 2020. An empirical study on sales performance effect and pricing strategy for E-commerce: From the perspective of mobile information. Mob. Inf. Syst. 7561807, 8.
Xiao, G., Cheng, Q., Zhang, C., 2019. Detecting travel modes from smartphone-based travel surveys with continuous hidden Markov models. Int. J. Distrib. Sens. Netw. 15 (4), 1–15.
Yeh, H., 2017. The effects of successful ICT-based smart city services: From citizens' perspectives. Gov. Inf. Q. 34 (3), 556–565.
Yigitcanlar, T., Kamruzzaman, M., 2018. Does smart city policy lead to sustainability of cities? Land Use Policy: Int. J. Cover. All Aspects Land Use 73 (3), 49–58.
Yu, P., Zhou, F., Zhang, X., Qiu, X., Kadoch, M., Cheriet, M., 2020. Deep learning-based resource allocation for 5G broadband TV service. IEEE Trans. Broadcast..
Yuan, Y.H., Tsao, S.H., Chyou, J.T., Tsai, S.B., 2020. An empirical study on effects of electronic word-of-mouth and internet risk avoidance on purchase intention - from the perspective of big data. Soft Comput. 24 (2020), 5713–5728.

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