



The Empirical Analysis on Role of Smart City Development in Promoting Social and Economic Growth

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Abstract. Based on Internet of things “wisdom city” based on the development of emerging information technology industry, such as operation system connected cities of all levels with wisdom, to achieve the production and the life convenient, the wisdom of the new urban development pattern, it can not only bring short-term economic growth, can also bring the progress of the society as a whole and economic all-round development. With the expansion of the construction of smart cities, it becomes very important to study whether the development of smart cities plays a driving role in economic growth. The purpose of this paper is to study the role of smart city development in promoting social and economic growth. This paper first expounds the smart city, and then, based on the empirical analysis of Cobb-Douglas production function, establishes an econometric model to promote economic growth by developing smart city, and obtains the output promoting elasticity index of smart city to economic growth by linear regression. The empirical results show that the construction of smart cities can indeed drive economic growth. This paper obtains that the sum of the coefficients of labor force, capital and smart city for the gross national product is greater than 1.

Keywords: Smart city · Social economy · Growth promotion · Empirical research

1 Introduction

Since the United States initiated the construction of the Information superhighway in 1992, the information technology industry has been developing rapidly in the world. Urban development is gradually combined with science and technology, opening the path of informationized urban development [1, 2]. And emerging in recent years, the development of information technology, promote city informatization and intelligence to a higher level, “wisdom city” came into being, and caused widespread concern in the countries all over the world and follow, including the United States, Britain, Sweden, Japan, South Korea and other countries and regions, both local conditions to develop the wisdom city development planning and construction, and some have reached a higher level [3, 4]. The World Bank has published a set of forecast data on the promotion of economic growth by smart cities. If the smart application coverage

rate of a million-sized city reaches over 75%, the economic output value of the city can be expanded by 3.5 times [5].

In recent years, China's economic growth has slowed down, and there is an urgent need for “structural adjustment and stable growth”. As one of the key projects in China's 12th Five-Year Plan, the construction of smart cities is being carried out nationwide like hot tea [6, 7]. It can not only drive the development of relevant information technology industry, but also promote the transformation of economic development mode to the technology and innovation to a certain extent, so as to promote economic growth and benefit people's livelihood [8, 9]. Therefore, with the help of economic means and from a narrow and intuitive perspective, this paper USES empirical analysis to explore the promotion effect of developing smart cities on economic growth, which is of great theoretical and practical significance [10].

This paper first expounds the smart city, and then, based on the empirical analysis of Cobb-Douglas production function, establishes an econometric model to promote economic growth by developing smart city, and obtains the output promoting elasticity index of smart city to economic growth by linear regression. The empirical results show that the construction of smart cities can indeed drive economic growth and conform to China's national conditions. Through experiments, this paper obtains that the sum of the coefficients of labor force, capital and smart city for THE GROSS national product is greater than 1.

2 Smart Cities and Economic Growth

2.1 Smart City

Wisdom city is the Internet of things, cloud computing, sensor network, such as large data information science and technology as the foundation, the urban infrastructure, environment, population, economy, culture, social system, which joins a highly integrated, wisdom, coordination of urban management network system, perception, based on the improvement of economic benefit, the improvement of the residents' life style, the optimization of environmental resources, ecological sustainable, the stability of the evolution of spiritual civilization, social harmony for the purpose of city informatization, modernization of higher stage. Wisdom city can achieve comprehensive sensor, the sensor by laying wisdom, such as equipment, to realize the collection of various components of city, monitoring, statistics and analysis: wisdom city can realize integrated in full, based on the Internet of things the city network, map, make decision-making more scientific and efficient; Smart cities can stimulate innovation and provide a smart foundation for the whole society, so as to provide continuous incentives for higher-level science and technology and innovation.

2.2 Empirical Research on the Promotion Effect of Smart City Development on Economic Growth

Since there is no unified research model on the promoting effect of smart city construction on economic growth up to now, this paper USES The Cobb-Douglas production function as the basis of the model:

$$Y = AF(L, K) = A_0 e^{\mu t} L^\alpha K^\beta \quad (1)$$

In the function, Y represents GDP of economic growth, L represents labor force, and K represents capital stock. $A_0 e^{\mu t}$ represents the level of technological progress; α, β, t are the output elasticity coefficients of labor factor, capital factor and technology factor respectively. Is the random disturbance term (≤ 1).

Smart city is built on the basis of industrialization, information technology and other technologies. Technology is the basis for the development of smart city, and the development of smart city constantly drives the progress of technology. And in order to facilitate the demonstration of the research on the role of smart cities in promoting economic growth, this paper transforms formula (1):

$$A(t) = A_0 e^{\mu t} = A_0 S^{\theta t} \quad (2)$$

S represents the construction and development level of a smart city. E represents the output elasticity of smart city construction; A_0 represents other factors of technological progress other than the level of smart city development. Formula (2) is substituted into formula (1) to obtain a production function including smart city factor, namely the model used in this paper to study the promotion effect of smart city development on economic growth:

$$Y = A_0 S^{\theta t} L^\alpha K^\beta \quad (3)$$

3 Experimental Design of Smart City to Promote Economic Growth

3.1 Data Acquisition

After obtaining the comprehensive index over the years of smart City development, according to the needs of the model and the principles and scope of data selection, the original data of other variables can be obtained from the statistical yearbook published by The Statistics Bureau of The People's Republic of China, as shown in Table 1:

3.2 Principles and Scope of Data Selection

The data of this paper mainly include the dependent variable – GROSS national product, independent variable – labor force, capital stock, and several major indicators of smart city. Since there is no specific statistics and measurement for smart cities in

Table 1. Raw data

Year	GDP	Social employment	Investment in fixed assets throughout society
2017	473140	76420	311485
2018	519470	76704	374694
2019	5688445	76977	446294

China, it is difficult to select the data, and some choices must be made according to the corresponding principles.

In the model, GDP Y , labor force L and capital stock K are respectively based on THE GDP, fixed asset investment and employed people published by the National Bureau of Statistics.

4 Analysis and Discussion of Experimental Results of Smart City Promoting Economic Growth

4.1 Analysis and Discussion of Experimental Results

From the results of regression analysis, it can be seen clearly that the labor force index, capital index and smart city composite index all pass the T-test with good significance, and the overall result also passes the F-test with good significance, and the goodness of fit (R^2) is very ideal. Therefore, we can think that the model and the regression analysis results are valid. From the coefficient term of regression results, it can be seen that from 2009 to 2013, the variable of smart city is positively correlated with GDP, and the output promotion elasticity of smart city to GDP is 2.109, that is, the progress of 1 smart city can bring 2.109 units of economic growth. At the same time, labor variables are also positively correlated with GDP, and their output elasticity is 2.054: as the third independent variable, capital variables are negatively correlated with GDP. In addition, it can be seen from the empirical analysis results that the sum of the coefficients of labor force, capital and smart city for the GROSS national product is greater than 1, indicating that China's economic growth is still in the stage of increasing scale. With the continuous construction and development of smart cities, China's economic growth will show a better trend. The regression analysis results are shown in Table 2 and Fig. 1.

4.2 Policy Suggestions

(1) Formulate feasible top-level planning.

Smart city planning is an innovative activity based on urban planning, urban status quo, and urban economic and social development planning. It is also a work that affects urban development. The planning of smart city needs to carry out in-depth research according to the historical form, geographical characteristics, current situation and the positioning of economic and social development of the city, so as to scientifically shape the smart positioning of the city. A smart city requires comprehensive planning, which

Table 2. Results of regression analysis

Variables	L	K	S	Constant C
Coefficient	2.054	-3.07	2.109	0
T value	29.089	-29.935	24.672	-0.328
T value significance test	0.007	0.021	0.026	0.798
F value	67176.73			
F value significance test	0.003			
R ²	0.9888			
D-W value	2.652			

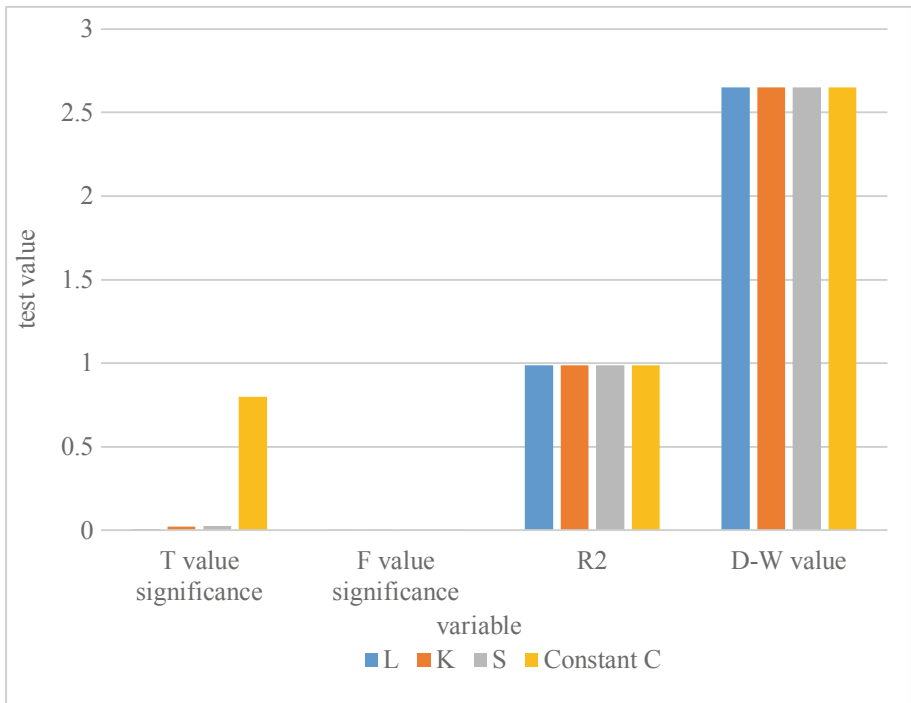


Fig. 1. Regression analysis results

covers not only information and communication infrastructure, urban information application system and urban information industry development, but also synchronously planning the system, mechanism and regulations for the construction and operation of a smart city.

(2) Focus on developing smart economy and industries.

First of all, the government should strengthen the guiding role of the industry, and provide necessary support for the Internet of Things, cloud computing, LTE and other new-generation information technologies to play a reasonable guiding role. Second

highlighting the science and technology innovation main body status of enterprises, most of the current our country science and technology innovation from the colleges and universities, scientific research institutions, such as the scientific research achievements conversion is relatively difficult, enterprises are facing consumers face market as the first line, their innovation and technological progress to better promote the development of their own, promote the development of industry. Thirdly, the patent protection mechanism should be improved to safeguard the rights and interests of innovators. At present, patent infringement occurs frequently in China, and the new-generation information technology industry is the disaster area of patent infringement. The protection of the rights and interests of innovators can help them make better innovations and promote industrial innovation.

(3) Strengthening information infrastructure.

It is necessary to establish a perfect and efficient big data processing center. The big data processing center is the brain of the whole city. Its degree of perfection and operation determines the efficiency of information processing and operation of a city. The big data processing center summarizes the data of the whole city, draws corresponding conclusions through intelligent calculation, and guides the coordinated operation of various systems to jointly complete the efficient operation of the whole city. Government websites and online offices are the trend of the development of smart government, which can greatly reduce the cost of management, convenient to meet the various administrative demands of citizens and enterprises. The laid of LTE base station, optical fiber, sensors such as backbone is the foundation of urban informatization wisdom is changed, the sensor will collect all kinds of information in the process of city operation, through the backbone of the neural network to data processing center, large data processing center processing opinion will communicate through backbone to the various systems, also between various systems through the backbone network communication and contact.

5 Conclusion

All in all, the city supported by information, knowledge and intellectual resources, access to information by using a transparent, fully, broad, security of information transmission, effective and scientific information processing and balanced and effectively improve the efficiency of urban operation and management, improve the urban public service level, and improve our urban leapfrogging development of innovative, orderliness and persistent, formation of low carbon city ecosystem, build a new form of urban development. According to the national plan, China's urbanization level will reach around 50 to 52% by 2020. The planning, construction, management and public service system of these large, medium and small cities will certainly put forward extensive and urgent demands for the application of information technology, so as to improve the management quality and rapid adaptability of cities. All of these must depend on the application and support of the research results of urban intelligent engineering. It can be expected that information-based investment will provide us with a stable and huge industrial space. When the whirlwind of smart city spreads in China,

the smart life that people look forward to will inevitably bring new business opportunities in the digital era.

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