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Research on the Influence of Infrastructure Investment on Real Economy Revitalization

Juan Shang[1], Jie Yuan[2]

[1, 2]Xidian University, School of Economics and Management, Xi Feng Road, Xinglong Section 266, Xi'an, Shaanxi Province, China

Abstract: ***After the reform and opening up, infrastructure investment has become an important symbol to measure the economic and social development, and the real economic level is the basis of a country's comprehensive national strength, so the study of economic and social development to study the impact of infrastructure investment on the real economy. Based on the data from 1991 to 2016, this paper uses the solow growth model to introduce the infrastructure and non - infrastructure capital stock into the C - D production function, and calculate the relevant elasticity coefficient by cointegration test. And further through the Granger causality test to measure the relationship between the change of capital stock and the effective growth of the real economy. The empirical results show that the elasticity coefficient of the capital stock in China is larger than that of the non-infrastructure capital stock, and the increase of the capital stock of the infrastructure is the Granger reason which leads to the effective growth of the real economy. This conclusion proves that the infrastructure investment For the promotion of effective growth of China's real economy play an important role in promoting.***

Keywords: infrastructure investment; real economy; Solow growth model; infrastructure capital stock; Granger causality test

1. Introduction

Since the reform and opening up, especially since 1978, the total real economy has grown by nearly 157 times, of which the annual growth rate has reached as high as 15.46%. By 2016, the total real economy in China has reached 22.77 trillion yuan. This phenomenon shows that our entity The economy is showing a trend of rapid growth. However, behind the rapid growth, there are obvious regional and phasic differences in the development of the real economy. In 2008, a watershed in the development of the real economy, the main driving force of China's real economic growth turned from the coastal areas to the inland areas. In recent years, the effective growth of the real economy in the inland areas has benefited mainly from the continuous increase in the amount of infrastructure investment and the diversification of infrastructure investment and financing modes. In our country, deepening the reform of infrastructure investment and financing system, increasing investment in infrastructure and promoting the adjustment, upgrading and transformation of the industrial structure will promote the sustainable development of China's real economy towards innovation-driven and endogenous growth. According to World Bank statistics in 1994, for developing countries, for every 1% increase in the stock of infrastructure capital, per capita GDP will increase by 1%. In the case of finance and real estate as a share of GDP, Under the circumstances, the increase of per capita GDP will promote the growth of the real economy. In other words, the growth of the stock of infrastructure capital will promote the growth of China's total economy. In the case of the same proportion of finance and real estate, the stock of infrastructure capital Growth can promote the revitalization of China's real economy. Therefore, the investment in infrastructure can promote the long-term steady growth of China's real economy. The "Opinions on Further Promoting the Healthy Development of the Capital Market" issued by the State Council in 2015 mentioned that the multi-layered capitalist market system of equity investment and financing, private equity investment and financing as well as debt investment and financing as infrastructure investment and financing methods Perfect, can promote China's real economy optimization and transformation and upgrading. Notice of Relevant Work on Promoting Asset-backed Securities of Government and Social Capital Cooperation (PPP) Projects in the Field of Traditional Infrastructure jointly issued by the National Development and Reform Commission and China Securities Regulatory Commission in 2016 In implementing the Notice of the Central Committee of the Communist Party of China Opinions on Deepening the Reform of Investment and Financing System "and the document" Guiding Opinions of the State Council on Encouraging Social Investment in the Key Areas of Innovation and Investment "issued by the State Council in 2014, at the same time, proposed to promote the financing of government and social capital cooperation (PPP) projects Innovative ways to better engage social capital. In particular, it emphasizes that the provincial-level NDRC should give priority to the leading enterprises in the industry as the major social capital participants, and should give priority to demonstrative PPP asset securitization in areas with stable investment and social benefits, encourage and support the "Belt and Road" Hebei Province, the coordinated development of Hebei Province, the construction of the Yangtze River Economic Belt, and the revitalization of a new round of industrial bases in Northeast China and other national industrial development projects.

2. Literature Review

Both the developed and the developing countries, the primary prerequisite for sustained economic growth is to increase investment in infrastructure, but how much infrastructure contributes to capital productivity and the level of total social output is now a hot issue in the international community Discussion topic. The main reason for the controversy is that different experts and scholars have different definitions of infrastructure. Therefore, to study the role of infrastructure investment in promoting the real economy, it is essential to first define the concept of infrastructure. In this paper, the main reference to the World Bank definition of infrastructure concept, the infrastructure is divided into economic

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infrastructure and social infrastructure, infrastructure investment research in this paper based on economic infrastructure, research on economic infrastructure for the real economy enhancement.

2.1 Real economy revitalization research

Li Wei, director of the State Council Development Research Center (2017), believes that there is a structural problem in our economy that the fictitious economy and the real economy are out of phase. The emergence of this issue has seriously hindered the development of new growth momentum and the promotion of the growth of new growth momentum , It is imperative to revitalize the real economy as the main objective of advancing supply-side structural reforms. At this point, speeding up the improvement of investment and financing by private funds for infrastructure will prompt governments at all levels to put financial innovations on the agenda, bring together various innovation systems and transform financial innovation into a fundamental impetus to the effective development of the real economy.

Lin Yufang and Wang Jinshui (2013) argue that the real economy is the foundation for creating social wealth, improving and protecting the livelihood material conditions, and is also an important support for enhancing economic and social competitiveness. In order to realize the revitalization of the real economy, we must first create a good infrastructure management environment for the real economy so that the real economy entities can broaden their space for development. Second, we can improve the efficiency of the financial industry by optimizing financial supportive industries and This will promote the transformation and upgrading of the financial real economy.

2.2 The contribution of infrastructure investment on the promotion of the real economy

According to Tian Jinchen (2013), we must further enhance the proportion of direct investment and financing by continuously deepening the reform of the infrastructure investment and financing system, establishing and improving a modern financial system that will promote sustained and steady macroeconomic development and rejuvenate the real economy. Give full play to the functions of direct financing instruments such as bonds, entrepreneurship and equity financing, and more effectively bring financial capital to the field of real economy and social funds to the areas of structural optimization and upgrading. This will provide the necessary and necessary support for the healthy and stable development of the real economy Protection.

Shi Yadong and Li Chuanyong (2010) argue that the traditional infrastructure investment and financing system has the following problems: the main body of investment and financing, the mode of investment and financing, the high proportion of direct government financing, and the low proportion of private direct financing. Through infrastructure investment and financing system, Reform to realize a new market-oriented investment and financing system, to achieve the diversification of investment and financing infrastructure, the diversification of investment modes, the legalization of government regulation and the socialization of intermediary agencies so as to provide an excellent and efficient infrastructure for the economic and social development of our country Service, so as to promote economic and social development as well as the real economy.

Yan Su (2012) argues that nowadays China is in an era of financial globalization. Under such a time background, the continuous improvement of infrastructure investment plays an extremely important role in economic development and decision-making. In our country, the improvement of infrastructure relies mainly on government funds. The introduction of private capital by the change of infrastructure system affects not only the government's revenue, but also the macroeconomic regulation and the distribution of income. Therefore, the effect of the reform of the infrastructure system plays a very important role in the sound development of the economy and the financial industry.

According to Shao Xuefeng and Wang Zhigang (2006), when enterprises invest and finance infrastructure, the transaction costs of different methods of investment and financing are different, resulting in different risks for enterprises to invest and raise funds. A wide range of infrastructure investment and financing methods can make up for the lack of information Symmetry generated by the negative effects, and to reduce the risk effect. Diversified infrastructure investment and financing can also increase the channels of external funds for infrastructure and provide financial support to further ensure the effective development of the real economy.

Liu Zhibiao (2017) argues that there is a major structural imbalance in the economic operation of our country. This issue is the major reason behind the sluggishness of China's real economy. We can improve the reform of infrastructure investment and financing system through financial innovation and increase the proportion of infrastructure investment in order to upgrade and update the traditional industries. The introduction of external funds can also give play to the important role of external funds in promoting the development of the real economy.

At present, many policy proposals have included studies on infrastructure investment in the realm of rejuvenation of the real economy. However, there are still some industries in which there is a huge funding gap for infrastructure investment. Our country should raise funds needed for infrastructure construction and fill up At the same time, we must also focus on improving the efficiency of infrastructure investment, raising funds and raising efficiency in parallel, so as to jointly promote the rejuvenation of China's real economy.

3. The Establishment of the Model

Infrastructure investment efficiency is a measure of the relationship between infrastructure investment and real economic output. Zhang (2002) argues that it is reasonable to use the elasticity coefficient to measure the efficiency of investment. So far, almost all of the studies have used the elasticity coefficient to measure the investment efficiency. The larger the elasticity coefficient, the higher the efficiency of the

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investment. The selection of measures of the real economy, Li Qiang and Xu Corning (2013) and Zhang Lin (2014) think that we should measure the real economy by using the figures of other industries excluding the financial and real estate sectors. The measure adopted mainly by the financial As well as the real estate industry belongs to the category of virtual economy. Financial and real estate related indicators have been proposed in the real economy accounting, but no data on the financial sector and real estate industry have been put forward in the measurement of the employed population, infrastructure capital stock and non-infrastructure capital stock, mainly because the financial industry And the real estate industry there is the phenomenon of infrastructure spillover, so in the measurement did not remove the relevant variables in the financial industry and real estate.

Establish a Cobb-Douglas production function model that incorporates infrastructure stock variables, namely, the C-D production function. The expression of the model is:

$$Y_t = A_t K_t^{\alpha} L_t^{\beta} G_t^{\gamma} \quad (1)$$

e total real economy at a constant price level, which shows the total factor productivity, that is, the level of technology, which shows the total number of employed people and the stock of infrastructure capital at a constant price level, indicating no The stock of non-infrastructure capital at variable prices refers to the elasticity of non-infrastructure capital stocks, total employment, and infrastructure capital stock, respectively.
Take the logarithm of (1) to get (2), which is:

$$\ln Y_t = \ln A_t + \alpha \ln K_t + \beta \ln L_t + \gamma \ln G_t \quad (2)$$

In the selection of indicators, the total value of the non-infrastructure capital stock and infrastructure capital stock should be replaced by the total value of the research and experimental development funds instead of the total value of the real-world economy, and the total number of employed persons should be replaced by the perpetual inventory method .
Goldsmith (1951) first proposed the perpetual inventory method, which can take full advantage of long-term continuity and reliability of information, with any one year of information as the base year-by-year recursive calculation of the required capital stock . Perpetual inventory method of expression is:

$$K_t = K_{t-1}(1-\delta) + I_t \quad (3)$$

In the expression of perpetual inventory method, the investment, depreciation rate, the price index of investment goods and the value of base year capital stock need to be determined.

Infrastructure Investment (Current Prices) Due to the different statistical standards around 2001 and the present, accounting for infrastructure investment for 1990-2001 and infrastructure investment for 2001-2015 are separately accounted for. With reference to Jin Ge (2012) Accounting for Infrastructure Investment, Infrastructure Investment and Renewal Investment for Infrastructure Investment 1990-2001, 2001-2015 Investment in Infrastructure Utilization of Electricity, Gas and Water Production and Supply, Transport, Storage and Post Services, Information Transmission, Computer Service and software industry, water conservancy, environment and public facilities management industry in these four sectors of the total social investment in fixed assets accounting.

The price index of investment products is calculated by using the fixed asset investment price index (1990 = 100), using the fixed asset investment price index to calculate the investment implicit deflation index for 1990-2015 respectively. Calculate the actual investment in infrastructure and non-infrastructure to arrive at the final value. For the purpose of determining the depreciation rate, Peng Qinghui (2011) concluded from the literature that the weighted average depreciation rate of infrastructure capital was 10.29% and that of non-infrastructure capital was 14.71%. On the basis of data selection, the capital stock of infrastructure and non-infrastructure are calculated separately.

4. Empirical Analysis

This article selects the annual data for the last 21 years of 1991-2016, which are analyzed chronologically. The annual data come from the National Statistical Yearbook, China Statistical Yearbook on Fixed Assets, and Wande Database. The measurement data are calculated based on the original data and the relevant formulas.

4.1 Unit root test

In order to avoid the false regression of data in the process of regression, we first test the stationarity of the five variables, ie total real economy, total factor productivity, total employed population, infrastructure capital stock and non-infrastructure capital stock. The results of the stationarity test are as follows:

Table 1: Stationary ADF test

Variable	T Value	Critical Value (10%)	P Value	Conclusion
Y	-3.149547	-2.632604	0.0356	Stable
A	-0.315417	-2.632604	0.9092	Unstable
L	-8.707704	-2.632604	0.0000	Stable
G	-1.119088	-2.632604	0.6918	Unstable
K	-1.395532	-2.632604	0.5681	Unstable
DY	-1.940123	-2.635542	0.0395	Stable
DA	-3.855215	-2.635542	0.0077	Stable
DL	-1.661574	-1.608793	0.0904	Stable
DG	-5.091442	-2.635542	0.0004	Stable
DK	-3.372527	-2.635542	0.0225	Stable
Y2	-2.353400	-2.638752	0.0026	Stable
A2	-7.137654	-2.638752	0.0000	Stable
L2	-5.291269	-2.638752	0.0003	Stable
G2	-6.122748	-2.642242	0.0001	Stable
K2	-7.236764	-2.638752	0.0000	Stable

The results of Table 1 show that under the significance level of 10%, the original sequence of the total variable real economy and the total number of employed population is the null hypothesis of rejecting the existence of a unit root, that is, the original sequence of these two variables is a stationary time series , While the original sequence of three variables of total factor productivity, infrastructure capital stock and non-infrastructure capital stock is the null hypothesis of denying the existence of one unit root, that is, the original sequence of three variables is a non-stationary time series. At the significance level of 10%, the first-order differential time

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series of all variables reject the null hypothesis that there is a unit root, that is, the first-order differential time series of all variables are stationary time series. At the 1% significance level, the second-order differential time series of all variables reject the null hypothesis that there exists a unit root, that is, the second-order differential time series of all variables are stationary time series.

4.2 Cointegration test

According to the solow growth model constructed above, this paper carries on the regression analysis of the related variables, according to the results, we can get the following expression:

$$\ln Y_t = \ln(-28.3991) - 0.317471\ln A_t + 3.507227\ln L_t + 0.146565\ln G_t + 0.120268\ln K_t \quad (4)$$

(-3.687337) (-5.247032) (4.984076) (4.650170) (2.822725)

Equation (4) shows that all variables are significant at a 5% significance level, where the coefficients are positive in line with the theoretical analysis that the changes in the capital stock of infrastructure and non-infrastructure are correlated with the real economy A positive coefficient, where the coefficient of G is greater than the coefficient of K, suggests that the contribution of infrastructure capital stock to the real economy is greater than the contribution of non-infrastructure capital stock to the real economy.

4.3 Granger causality test

Regression analysis shows that there is a correlation between the capital stock of infrastructure facilities and the non-infrastructure capital stock and the total real economy at a 5% level of significance, but it is not certain that there is a relationship between the stock of infrastructure capital and the real economy relationship. Therefore, we further test the causal relationship between the capital stock of infrastructure and the real economy through Granger causality test. The results displayed by using Eviews8.0 are as follows:

Table 2: Granger Causality Test

The original hypothesis	F statistic	P statistic	The original hypothesis
G is not Granger reason of Y	6.3233	0.0079	Reject
Granger reason why Y is not G	0.6155	0.5508	Accepted

Among them, the increase of infrastructure capital stock is the Granger cause of the real economy growth, which further proves the correlation between the capital stock of infrastructure and the real economy.

5. Conclusion and Policy recommendations

By incorporating infrastructure capital stock into Cobb-Douglas production function, this paper uses the solow growth model to estimate the contribution of infrastructure capital stock change to the real economy rejuvenation. According to relevant experts and scholars, research shows that in 1978-1989, the capital investment in infrastructure was relatively concentrated. Almost all of it was invested by the government and the construction of infrastructure. The single main body of investment tended to reduce the efficiency of the capital stock of infrastructure. It shows that the increase of capital stock in infrastructure does not increase efficiency of real economy. Between 1990 and 2015, China gradually established itself as a diversified infrastructure investment entity that adapts to the market economy system and diversified infrastructure investment methods. A diversified investment body and a diversified investment approach have all increased the infrastructure investment Way, with the increase of infrastructure investment, the increase of infrastructure capital stock enables the efficiency of infrastructure investment and financing to be raised.

Based on the results of the above empirical tests, we can see that the corresponding output value of infrastructure input during 1991-2016 is 0.153799 and the non-infrastructure input output value is 0.127748. Through the output efficiency, we can see that at present, the input-output efficiency of China's infrastructure is higher than the output efficiency of non-infrastructure, which shows that our country is in the stage of coordinated development of infrastructure investment and financing system and market economy system , And the infrastructure investment and financing system at this stage is an institutional mechanism with efficiency. It also shows that China's direction for increasing infrastructure investment and financing is correct and can play the role of stabilizing economic growth and rejuvenating the real economy .

The sustained and steady development of the real economy can not be separated from the investment in infrastructure. The investment and financing of infrastructure must be based on the effective growth of the real economy. Therefore, the sustained and steady growth of the real economy and the reform of the infrastructure investment and financing system are coordinated with each other. The social subjects including the government, enterprises and individual residents should pay attention to the effective growth of the real economy and the real economy. To speed up the process of structural reform on the supply side of the real economy and use various channels to consolidate the foundation of our real economy, all sectors of society should jointly push forward our country's real economy toward a faster and better direction. We hereby make the following policy recommendations:

5.1 Accelerate the construction of infrastructure investment and financing to comply with the real economy.

Sound infrastructure investment and financing system is the basis for effective growth of the real economy, but also the relevant entities to introduce foreign investment prerequisite. However, infrastructure investment and financing scale, long duration and strong external characteristics, different regions should be based on the development of the region, select the actual situation in the region for infrastructure investment and financing mode, strive for infrastructure investment and financing funds Allocate between industries and regions rationally and efficiently, try their best to avoid duplication and ineffective investment and financing funds, and promote the coordinated development of industries and regions. In addition, we should selectively expand investment in comprehensive services and environmental protection infrastructure in order to facilitate the development of our real economy in a more integrated and green manner.

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5.2 Adjust the industrial structure and promote the optimization of the real economy's industrial structure.

To adjust the industrial structure is an important means to solve the problem of overcapacity in the production of real enterprises. To resolve overcapacity is conducive to adjusting the stock of real economy and optimizing the real economy. In the context of the new economic normal, broadening the effective supply of real economy is the main content of the supply-side reform advocated at this stage. All regions should adjust their industrial policies in a timely manner according to the characteristics of the industrial development in the region and the suitability of the real economy and industry, Take Effective Policy and Measures to Promote the Optimization and Upgrading of Traditional Industries and the Cultivation and Development of New Industries.

5.3 Strengthen the knowledge and skills of occupational techniques and improve the quality of labor.

The development of any real economy requires labor input, and the quality of the labor force will have an impact on the efficiency of the real economy. In order to improve the quality of the workforce, first of all, the Ministry of Education of all regions can expand or narrow the enrollment of certain vocational and technical disciplines according to the actual needs of the development of the real economy in the region and improve the quality of teaching and cultivate a higher level of education through teacher training Talents. Second, the real enterprises in all regions can improve the level of human capital and improve the core competitiveness of real enterprises by improving their staff welfare. The improvement of labor quality can create greater efficiency in production and operation as well as economic efficiency in the real economy, and promote the development of the real economy.

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Author Profile

Juan Shang works as an associate professor in school of Economics and Management, XIDIAN University. Her specialization lies in Regional economic and financial innovation.

Jie Yuan is now pursuing Master degree since 2016 under the guidance of Prof. Shang. Her specialization area is Fiance.

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