

The Impact Study of the Eight Central Province's Infrastructure Investment on Economic Growth

Mei Guoping^{*12}, Gan Jingyi¹²

¹School Of Information Management, Jiangxi University of financial and Economy, China

²Jiangxi Normal University, China

^{*1}mmmeggppp@sina.com; 2Jxufephd@126.com

Abstract- In this paper, we use the construction of infrastructure investment of the central region as the background, from the perspective of theoretical analysis and empirical research to demonstrate the role of economic growth and infrastructure investment, and discuss its mechanism of action for economic growth from the means of infrastructure investment amount, general volume of capital and human capital, we conclude that the infrastructure development has been effective in promoting social total output. In the final, with the characteristics of central region's development, we proposed the policy recommendations.

Keywords- Infrastructure; Economic Growth; OLS Correction Model

I. INTRODUCTION

Infrastructure is the basis of economic and social development, it is an important aspect to measure a region's investment environment, and also it can improve the living standards of urban and rural people's material and cultural protection. In general, the economically developed countries and regional infrastructure is relatively sound, and economically backward areas of infrastructure are relatively weak, it shows that the construction of infrastructure has become an important factor affecting the development of the national economy. The infrastructure construction is the implementation of the successful implementation of an important part of the strategy of central China, related to the central region of the long-term development strategy of Jiangxi Province. Therefore, a correct understanding of the status and role of infrastructure investment in regional economic and social development, the functional orientation of the urban development is the key to promote the central region economic development.

II. STUDY AT HOME AND ABROAD

Asehauer (1989) uses data of 1949-1985 years in the United States, it comes to the public capital output elasticity of 0.39, at the same time they point out that public investment spending is greater than the effect of public consumption expenditure to the private output, public investment spending has a strong positive impact on private output, rather than the production of public consumption expenditure can only be a small positive impact on private sector output; Herranz-Loncan, Alfonso (2007) uses a VAR approach to analyze the basis of Spain 1850-1935 year's effects of infrastructure investment on economic growth,

studies of regional infrastructure investment on economic growth significantly, but not a significant return on investment in developed countries. Domestic scholars of the Kingdom given to Lee to children (2000) using three methods to analyze the quantitative relationship between infrastructure investment and GDP growth, investment in infrastructure is an important factor to promote economic growth. Lin Minghua, Yong-Zhong Yang (2006) by constructing urban infrastructure and urban economic growth model, using 2002 data of the 18 prefecture-level city in Chengdu, Sichuan Province, the empirical analysis that urban infrastructure on urban economic growth. Luo Yan (2007), infrastructure investment to China and the formation of capital as an object, a systematic study of the characteristics of the size and structure of China's infrastructure investment, and an empirical analysis of the impact of infrastructure on economic growth from the perspective of total factor productivity analysis, studies the level of infrastructure to promote the growth of total factor productivity. Majing Fang, Hu Peng (2008), Guangxi Province, the data cointegration test and error correction model analysis of the obtained total amount of Guangxi Province, infrastructure investments plays a significant role in promoting economic growth, infrastructure investment obtained by model validation each additional 1% will drive the economic growth of 0.3438 percentage points. Cui Ying, Culture Difference (2009) Cointegration analysis model for quantitative analysis of the 55 years since 1952, construction of infrastructure investment and GDP growth, come to the construction of infrastructure can effectively promote economic growth.

III. INFRASTRUCTURE INVESTMENT AND ECONOMIC GROWTH'S RELATIONSHIP

A. The Concept of Infrastructure

Infrastructure Infrastructure refers to the provision of public services for the social production and living material and engineering facilities, it is used to guarantee the normal public service system of economic activities of the country or region. It is the general material conditions of social survival and development. In modern society, the economy is more developed, the higher the requirements for infrastructure; the improve infrastructure evolution plays a significant role in promoting economic activities and its spatial distribution patterns. The establishment and improvement of the infrastructure often takes a long time

and huge investments. To new and expansion projects, especially the major projects which is away from the city and bases, it need more to give priority to the development of the infrastructure in order to benefit as soon as possible after the completion of the project.

B. Infrastructure Capital Investment

In infrastructure investment in China, it is mainly dominated by the central and local finances, the research in the field of public economics, public investment in infrastructure capital occupies an important impact on the economy, public capital refers to investment in infrastructure or public sector fixed assets the formation of investment capital, under the conditions of a market economy and public finances, it often refers to the capital of the investment in infrastructure, public facilities, such as highways, airports, water systems, electricity, gas and telecommunications industry and other public sector investment in fixed assets capital formation. Therefore, our infrastructure capital investment in public capital investment is completed.

C. The Role of Infrastructure Investment on Economic Growth

Infrastructure on economic growth is driven mainly by two ways: first, a direct role in promoting investment in infrastructure construction process in a variety of raw materials and labor, a direct stimulus to the demand for factors of production in the short term by increasing demand and promoting economic growth; by increasing infrastructure investment flows and stocks of scale, and the multiplier effect of infrastructure investment, cost-effective way to promote economic growth.

The investment multiplier theory is put forward by Keynes John Maynard Keynes in his book of Employment Interest and Money on the book, it described investment, consumption, income and employment on the existence of the amount of chain reaction in the national economy, it means to increase investment or income and employment of government spending would increase several times. The quantitative relationship between this objective is a response to the inherent relationship between the links of social reproduction, the various departments of the national economy, K is the investment multiplier, MPC is the marginal consumption tendencies, both variables proportional to the changes. The formula is:

$$K = \frac{\Delta Y}{\Delta I} = \frac{\Delta Y}{\Delta Y - \Delta C} = \frac{1}{1 - B}$$

Among them, changes of the investment are represented by ΔI , the income changes are represented by ΔY , changes in consumption are represented by ΔC , B represents the marginal propensity to consume MPC , in estimates of the actual data, the MPC is equal to the final consumption of the annual increment divided by the expenditure approach GDP annual increment. Keynes put forward the expansionary fiscal policy to stimulate demand and improve the output

value.

IV. THE STATUS OF THE CENTRAL REGION'S INFRASTRUCTURE INVESTMENT AND ECONOMIC DEVELOPMENT

Infrastructure investment is to provide basic facilities for the social production and life, such as energy, transport, post and telecommunications, and water conservancy facilities. Compared with other investments, it generally has a large-scale investment, long construction period, long payback period, the social priority in the economic benefits of public welfare, and the project strong characteristics. Investment in infrastructure is not aimed obtain direct economic benefits for the purpose, and thus the behavior of their investment compared with other investment behavior by the little impact of changes in interest rates, the interest rate elasticity of smaller.

This paper selects the central region as the object of study, including Shanxi, Anhui, Jiangxi, Henan, Hubei, Hunan, Inner Mongolia, and Heilongjiang, most of the selected areas are located in Chinese hinterland, these areas play an important role in connection with east and west area., considered from the perspective of China's overall development, the development of the central region of stability. The Chinese economy can be coordinated and healthy development. In this sense, speeding up the development of the central region is a major strategic initiative to improve national competitiveness, East meets West, North and South docking, and to promote the objective needs of the regional economic development. Central provinces and autonomous regions have different locations, personnel and resource advantages. Shanxi Province has more coal resource. Anhui has fresh water resource. Jiangxi Province is full of non-ferrous metal resources. Henan Province has abundant human resource.

Infrastructure development's speed and size of the scale of investment is closely related to the investment size and is a key factor affecting the development of infrastructure. Annual growth rate of China's infrastructure investment processes wavy growth in 2000 after a growth decline in the 1990s. After 2004, the growth rate tends to slow down year-on-year in developed eastern provinces. The central region of infrastructure growth rates are less than fixed assets annual growth rate of infrastructure construction speed, which shows a relatively slow trend.

V. THE EMPIRICAL RESEARCH OF THE ROLE OF INFRASTRUCTURE INVESTMENT ON ECONOMIC GROWTH

ΔI , the income changes are represented by ΔY , changes

A. Theoretical Model

ΔC , B represents the

This article will use the Cobb-Douglas production function to estimate the output elasticity of infrastructure investment in the central region. Model the introduction of labor input, capital and infrastructure capital investment, the provincial production function formula is:

$$Y_t = A_t L_t^a U_t^b K_t^c \quad (4.1)$$

which is the economic level of output Y central region, with the provinces GNP; L is labor input, human capital stock of the central region provinces; U non-infrastructure capital investment, to the central region of the provinces total capital stock; K for infrastructure capital investment, expressed in the central region provinces infrastructure capital stock; A production technical level; a, b, c the points table, said labor capital, the output elasticity of capital and infrastructure capital.

Model on both sides to take the singular form, the new production function formula is:

$$\ln Y_t = \ln A_t + a \ln L_t + b \ln U_t + c \ln K_t \quad (4.2)$$

Assumption 1: this article assumes that the production function of labor, capital and infrastructure capital investment constant returns to scale of the three elements, namely the constant returns to scale, $a + b + c = 1$, this time to get the formula:

$$\ln Y_t - \ln L_t = \ln A_t + b \ln(U_t - L_t) + c \ln(K_t - L_t) \quad (4.3)$$

Thus $\ln y_t = \ln A_t + b \ln(u_t) + c \ln(k_t)$,

Where y represents the output of unit labor input, u said that unit labor input has a capital stock, k is the unit labor have the infrastructure capital stock.

Assuming: Elements of the production function increasing returns to scale in addition to infrastructure elements, that is, the constant returns to scale $a + b = 1$,

At this time to get the formula:

$$\ln Y_t - \ln L_t = \ln A_t + b \ln(U_t - L_t) + c \ln(K_t) \quad (4.4)$$

Thus $\ln y_t = \ln A_t + b \ln(u_t) + c \ln(k_t)$

Where y is the unit of labor input and the output, u represents the unit of labor input and capital stock owned.

B. Data System

Y represents the output levels of the central region's economy, said that the provinces from 1995 to 2009 gross national product data, including the central region of the nine provinces, autonomous regions and historical data.

Provinces, autonomous regions's infrastructure capital stock data from the China Statistical Yearbook and China's fixed asset investment Statistical Yearbook on fixed asset investment, capital stock derived from the data from the China Statistical Yearbook, human capital data taken from the population data of each high school education.

C. Empirical Analysis

The results of this article take the OLS linear regression linear regression analysis, the 4.3-style:

TABLE I REGRESSION ANALYSIS

	Coefficient	Std. Error	t-Statistic	Prob.
C	1.134063	0.198099	5.724728	0.0001
X1	0.657559	0.145757	4.511346	0.0007
X2	0.141090	0.156215	0.903183	0.3842
R-squared	0.988661	Mean dependent var		0.471194
Adjusted R-squared	0.986771	S.D. dependent var		0.532955
S.E. of regression	0.061300	Akaike info criterion		-2.569233
Sum squared resid	0.045092	Schwarz criterion		-2.427623
Log likelihood	22.26925	Hannan-Quinn criter.		-2.570741
F-statistic	523.1333	Durbin-Watson stat		0.657470
Prob(F-statistic)	0.000000			

Y represents $\ln Y_t - \ln L_t$, x1, x2 represent $\ln(U_t - L_t)$, $\ln(K_t - L_t)$, Table 1 shows that the OLS estimates of the parameters are significantly, $F=523.1333$, The corresponding probability is very small, indicating that the equation in general is significant, $R^2 = 0.988661$, description of the equation to fit better, but these statistics are based on the residuals of the regression equation, if the residual existence of heteroscedasticity, these statistics data are not reliable below heteroscedasticity test, according to Durbin - Wa Erxun test results $D_w = 0.657470$, in the 5% significance level, $n=15$. In the 5% level of confidence, we conclude that $D_l = 0.95$, $D_u = 1.54$, it is felt that the model has autocorrelation. The proposed by Cochrane. Qratt, two-stage iterative method, the regression equation in the AR (1) and AR (2) two, so the sample space to adjust for the 1997-2009 year, corresponding to Equations (4.3) and (4.4).

TABEL II OLS REGRESSION RESULTS IN THE CONSTANT RETURNS TO SCALE

	Coefficient	Std. Error	t-Statistic	Prob.
C	1.323503	0.108878	12.15580	0.0000
X1	0.426339	0.109440	3.895625	0.0046
X2	0.339120	0.099371	3.412659	0.0092
AR(1)	-0.044813	0.409794	-0.109356	0.9156
AR(2)	-0.068833	0.494081	-0.139316	0.8926
R-squared	0.995082	Mean dependent var		0.574609
Adjusted R-squared	0.992623	S.D. dependent var		0.493339
S.E. of regression	0.042374	Akaike info criterion		-3.200841
Sum squared resid	0.014364	Schwarz criterion		-2.983553
Log likelihood	25.80547	Hannan-Quinn criter.		-3.245503
F-statistic	404.6423	Durbin-Watson stat		2.151532
Prob(F-statistic)	0.000000			
Inverted AR Roots	-.02+.26i	-.02-.26i		

TABLE III OLS REGRESSION RESULTS IN INCREASING RETURNS TO SCALE

	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.167780	1.543037	-2.052951	0.0742
X1	0.442635	0.139904	3.163857	0.0133
X2	0.297215	0.131949	2.252488	0.0544
AR(1)	0.031114	0.438399	0.070971	0.9452
AR(2)	0.004750	0.543172	0.008745	0.9932
R-squared	0.994732	Mean dependent var		0.574609
Adjusted R-squared	0.992098	S.D. dependent var		0.493339
S.E. of regression	0.043854	Akaike info criterion		-3.132163
Sum squared resid	0.015386	Schwarz criterion		-2.914875
Log likelihood	25.35906	Hannan-Quinn criter.		-3.176826
F-statistic	377.6524	Durbin-Watson stat		2.150059
Prob(F-statistic)	0.000000			
Inverted AR Roots	.09	-.06		

The regression results are as follows:

Constant returns to scale:

$$Y_t = 3.7565L_t^{0.765459}U_t^{0.426339}K_t^{0.33912} \quad (4.5)$$

Increasing returns to scale:

$$Y_t = 0.0420967 L_t^{0.73985} U_t^{0.442635} K_t^{0.297215} \quad (4.6)$$

Based on the above regression analysis, the output elasticity of infrastructure capital in the central region between 1997 and 2009 to 0.2972, that is infrastructure capital investment for every 1% increase in total regional economic output increased by 0.2972%, the output elasticity of ordinary capital 0.4426, the output elasticity of labor input as 0.7398, so the central region of infrastructure capital has a significant economic growth effect, infrastructure capital for every 1% increase in total output increased by 0.2972%.

VI. THE POLICY RECOMMENDATIONS ON CONSTRUCTION OF INFRASTRUCTURE

A. Increase Investment in Infrastructure Construction in the Central Region of the Intensity and Scale

The country that promotes the rise of central planning under the guidance of the central region has a good location and resource advantages. Due to the long-standing lack of investment in infrastructure construction in the central region, the gap between the eastern coastal areas and central region are obvious, infrastructure construction has long lagged behind development of economic construction, infrastructure construction investment of resources can effectively stimulate the promotion of economic demand and supply, revitalize the region's economic needs through direct and indirect means to enable society to aggregate demand and aggregate supply increases, thus pulling overall economic development of the Government to increase investment in infrastructure construction in the central region intensity and scale more effectively promote employment, to economic sectors with strong support.

B. Play the Role of Infrastructure Investment in the Optimization of the Structure of Regional Development

To invest in some areas through infrastructure investment priorities, build the dotted lines combined with the spatial development pattern and strongly support the development of key areas and strive to play the radiation-driven and demonstration of the key areas in central China leading role. Make the most intensive in population, the most perfect of infrastructure, the most advantageous conditions for the development, the most tremendous growth potential along the Yangtze River, along the Beijing-Guangzhou, along the Beijing-Kowloon along

the the LongHai four economic zones and the Wuhan City Circle as central to the rise of the important growth pole to be strong support.

C. To Further Optimize the Investment Structure of the Infrastructure, Improve the Efficiency of the Construction of Infrastructure in Promoting Economic Development

Should focus on investment in major equipment, transport, electricity, gas, large-scale agricultural building base on infrastructure construction, promote and serve the infrastructure construction investment structure and economic development, support to drive the optimization of regional industrial structure upgrade..

REFERENCE

- [1] Tatom J A. Should government spending on capital goods be raised[J]. Federal Reserve Bank of St.Louis Review. 1991.
- [2] Wangdingguo, The quantitative analysis of Shanxi infrastructure investment on economic growth[J]. Journal of Shanxi University of Finance 2000(10).
- [3] The study of measure Infrastructure investment to promote economic growth[J], Statistical Research, 2001(10): 47-53.
- [4] Liuying, Wangwu. The measurement analysis of Infrastructure investment in Liaoning Province's to promote economic growth[J]. National Trade (economic theory), 2006(6).
- [5] Wangruofei, Wangjingjie. Infrastructure and economic growth in China: Based on VAR Method[J]. Word economy, 2007(3).
- [6] Luoyan. The impact analysis of China's infrastructure investment on economic growth[D]. Chongqing university, 2007.
- [7] LIU LW. Studies on promoting effect of infrastructure investment on economic growth[D]. Nanchang: Jiangxi university of Finance and Economics, 2003: 39-40.
- [8] Zong JF, LI J. The experimental analysis of infrastructure development and economic growth in China. Statistical Research, 2006(7): 20.

GuoPing.Mei, NanChang of Jiangxi province, PR.China, 1962, Doctoral tutor, research direction: the quantity of economic, Management decisions.

JingYi. Gan, GanZhou of Jiangxi province, PR.China, 1986, Ph.D candidate, research direction: the quantity of economic, Management decisions.