Study on the Economic Growth Effect of Education Investment in Shaanxi Province in the Process of Urbanization

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Abstract: Based on the econometric model, this paper is selected from the statistical yearbook of Shaanxi Province from 1986 to 2016. In the long-term utility model, urbanization and education investment have significant positive effects on economic growth. At the same time, it is limited by the interaction between labor quality and education input and urbanization. In the autoregressive lag utility model, under the influence of the previous period of economic growth, economic growth has negative and positive correlations between the two phases of the level of urbanization construction and the interaction between education investment and urbanization. Therefore, promoting balanced development of urbanization and education investment with the concept of coordination is crucial to the long-term stable growth of Shaanxi Province.

1. Introduction

With the 18th National Congress of the People's Republic of China's proposal of "advancing new urbanization with people at the core," China's urbanization construction must focus on both the increase in "quantity" and the "quality". While accelerating the process of urbanization, more attention should be paid to the improvement of human capital stock. At the same time, education plays a decisive role in the quality of human capital. Under the trend of urbanization, the imbalance of education investment between urban and rural areas has seriously restricted the long-term stable growth of China's economy.

The new urbanization is the only way for the development of modernization, an important driving force for economic and social development and an important livelihood project. At the end of 2016, the urbanization rate of Shaanxi's permanent population reached 55.34%, an increase of about 4 percentage points compared with that at the end of 2013, with an average annual growth of 1.34 percentage points, ranking first in the western region, higher than the national average growth rate of 1.22% in the same period. Then, under the background of the continuous advancement of urbanization and the increasing investment in education, how can Shaanxi's education investment play a role in motivating economic development. How can educational investment achieve better economic benefits, and does urbanization and educational investment have a significant promotion effect on economic growth? How can the economic growth effect of new-type urbanization at different stages be worthy of further study.

2. Literature Review

2.1 Urbanization and Economic Growth

Is there a correlation and internal laws between urbanization and economic growth? The American economist Lampard analyzed the data of the past 100 years and concluded that there was a very significant positive correlation between urban development and economic growth in the United States, and there was a great consistency between the degree of economic development and the urbanization stage. Han Bo, Xu Haixia and Wang Zhe have empirically tested 12 provinces in the west. Urbanization has a significant positive effect on economic growth, with an impact coefficient of 10.99618. Increase in science and education expenditure and population education have a positive effect on economic growth [1]. Xie Shujun and Chen Xia studied the education

investment and economic growth in Xinjiang through the coupling coordination model. They found that Xinjiang has gradually changed from the initial state of serious imbalance to the state of intermediate coordination, and the investment in education funds and human resources in Xinjiang can positively promote economic growth [2]. Zhang Zhiyong and Li Lianqing pointed out that there is a long-term and stable equilibrium relationship between the level of urbanization and economic growth in Shandong Province. In the short term, the pulling effect of urbanization on economic growth is stronger than that of economic growth on urbanization. The long-term impact of urbanization on economic growth is more significant, while the impact between the level of urbanization and economic growth is significantly different [3]. Based on Granger causality test, Lei Heng and Li Yingling found that financial investment in education is the cause of economic growth, and the conclusion is very stable [4]. The empirical analysis of Ma Zhongyu and Xiao Hongwei shows that every 1% increase in the urbanization rate can promote the economic growth of the region by 0.25%, but the spatial spillover effect on the economic growth of the adjacent regions is negative, bringing the economy of the adjacent regions to reduce by 0.49%. In the period of the 13th five year plan and in the medium and long term, it is urgent for regions to promote the construction of new-type urbanization in a coordinated manner, so as to play an important role of new-type urbanization in driving economic growth in the new normal [5].

2.2 Education Investment and Economic Growth

Foreign scholars believe that education has a significant contribution rate to economic development, of which Liberto, Pereira, Aubyn, Becher, and Homung [6-8] are the representatives. Yu Lingyun pointed out that in regions where the ratio of education investment is relatively low, physical capital investment is the main reason for driving economic growth, and the increase of non-government investment has a more obvious effect on human capital accumulation [9]. Zhou Yingzhang and Sun Qiji's education investment and actual economic growth are Granger causality, and there is a stable and balanced equilibrium relationship in the long term [10]. Zhang Yan and Zhang Ping elaborated the restrictive factors of the lag of urbanization in the western region, including environmental factors, population quantity and quality. It actively explores that the important ways to construct the urbanization system in the western region are the driving force of external forces, the cohesion of internal market environment, the extension force of rural areas and the guiding force of industrial structure optimization [11]. In combination with the characteristics of industrial structure and talent demand in different stages, Zhang Lin can increase education investment in a timely and appropriate way and in different levels and categories, so as to make the education investment in the western region play a more full role in promoting economic growth [12]. Xiao Xiaohong pointed out that the economic growth of Guizhou has promoted the development of education, which shows a two-way causal relationship. After 7 years of lag, the development of education has promoted the economic growth of Guizhou [13].

3. Variable Selection and Model Setting

3.1 Variable Selection

According to the national new urbanization plan (2014-2020), the indicators of new urbanization include the level of urbanization, basic public services, infrastructure, resources and environment. Considering the consistency of statistical caliber, this paper selects the urbanization rate to measure the level of new urbanization construction. Calculation method: urban population / total resident population. Comprehensive literature review economic growth indicators take the logarithm of GDP per capita as the proxy variable to reflect the stage of macroeconomic development. The sum of human, material and financial resources invested in education units. It is usually divided into two parts: education recurring costs and education capital construction costs. This article selects financial education expenditure as the index variable to measure education investment [14-15]. On the basis of theoretical models, Hu Angang and others confirmed that human capital investment, savings rate, and labor participation rate have significant promoting effects on economic growth,

and selected labor quality, savings rate, and labor participation rate as robust control variables [16].

3.2 Model Settings

1) Granger causality test

Let Y_t and X_t be independent stationary time series processes, and μ_1, μ_2 is white noise. consider:

$$X_t = c_1 + \sum_{j=1}^{p} \alpha_j X_{t-j} + \sum_{j=1}^{p} \beta_j Y_{t-j} + \mu_{1t} \quad \text{and} \quad X_t = c_1 + \sum_{j=1}^{p} \alpha_j X_{t-j} + \mu_{2t}$$

Statistics:

$$G = \frac{(RSS(p) - RSS(q,p))/q}{RSS(q,p)/(n-p-q-1)} \tag{1}$$

There is a non-causal relationship between the two sequences, and asymptotically obeys the $F(q, n-p-q-1)$ distribution under the condition of large samples, where $RSS(q,p)$, $RSS(p)$, n is the sum of the squared residuals and the sample size of the above two OLS estimates, respectively. If $G \geq F_\alpha(q, n-p-q-1)$, reject the null hypothesis $H_0 : \beta_j = 0 \ (\forall j)$ and accept the alternate hypothesis $H_1 : \beta_j \neq 0 \ (\exists j)$. That is, Y_t is the Granger cause of X_t [17-18].

2) Long-term equilibrium model

$$Y(t) = \beta_0 + \beta_1 Z_{1t} + \beta_2 Z_{2t} + \cdots + \beta_n Z_{nt} + \varepsilon_t \quad \varepsilon_t \sim N(0, \sigma^2) \tag{2}$$

3) Autoregressive distribution lag model
Autoregressive distribution lag model:

$$Y(t) = \beta_0 + \sum_{i=1}^{m} \delta_i Z(t-i) + \sum_{i=1}^{n} \gamma_i Y(t-i) + \varepsilon_t \quad \varepsilon_t \sim N(0, \sigma^2) \tag{3}$$

It reflects the long-term development trend of the interpreted variable, and also reflects the influence intensity of the long-term development trend of the interpreted variable, indicating that the control of the interpreted variable can be realized through the control of the interpreted variable [19].

4. Empirical Analysis

1) ADF test

Under the action of intercept and trend, the second-order difference of education investment is $ADF = -4.0253 < -3.8259$, which is a stationary sequence on the lag second-order confidence level of 0.05.

2) The causal relationship between GDP per capita and urbanization rate

$$G = \frac{(RSS(p) - RSS(q,p))/q}{RSS(q,p)/(n-p-q-1)} = 14.6275 > F_{0.05}(3,15) = 3.2874$$

so education investment is the Granger factor of per capita GDP. The per capita GDP and the causality test of various factors are the same, so we will not repeat them here.

	ADF	Confidence level	Lag period	Stability	G	F	Result
Per capita GDP ($\log(GDP)$)	-4.8083	0.05	2	Stable	/	/	/
Education investment ($\log(Edu)$)	-4.0253	0.05	2	Stable	14.6275	$F(3,15)$	Because
Urbanization rate (Uc)	-6.3864	0.01	2	Stable	7.0326	$F(3,15)$	Because
Labor attendance rate (Lp)	-13.245	0.05	2	Stable	1.8603	$F(3,31)$	Non

							cause
Labor quality (Llp)	-4.2503	0.05	1	Stable	6.0266	$F(3,15)$	Because
Storage rate (Cp)	-7.6285	0.01	2	Stable	1.6028	$F(3,15)$	Non cause
Interaction between education investment and urbanization (Edc)	-3.029	0.05	1	Stable	10.6760	$F(3,15)$	Because

3) Empirical analysis of GDP and Edu, Edc, Uc and Llp interaction

In order to further explain the relationship between the five GDP and Edu, Edc, Uc and Llp, according to the Granger causality between the five GDP and Edu, Edc, Uc and Llp, an appropriate lag order is selected to establish a quantitative relationship to determine the respective measurement models [17-18].

(1) GDP, Edu, Edc, Uc and Llp long-term equilibrium model

$$\log(GDP)_t = -23.64193 + 2.043099\log(Edu) + 76.707052Uc_t - 0.617213Llp_t - 4.49217Edc_t$$

$R^2 = 0.997143$, $D.W. = 1.57$, $Loglikelihood = 31.8786$, $AIC = -3.162188$, $SC = -2.917126$, $T = [-8.563073, 9.316627, 7.674782, -2.429183, -7.364562]$.

(2) GDP, Uc and Edc autoregressive distribution lag average model
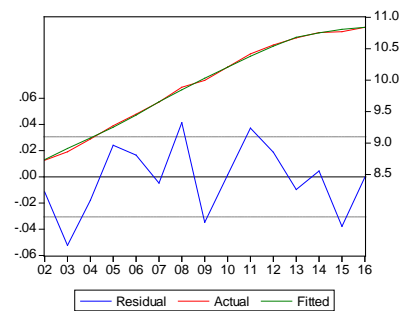
$$\log(GDP)_t = 1.116139\log(GDP)_{t-1} - 4.083003Uc_{t-2} + 0.104579Edc_t - 0.997462MA(1)$$

$R^2 = 0.998270$, $D.W. = 1.965574$,
$Loglikelihood = 33.36791, AIC = -3.915721, SC = -3.726908$,
$T = [81.10854, -3.978445, 2.414651, -5.189152]$

The actual value, fitted value and residual sequence of model (1) and (2) are shown in Figure 1:
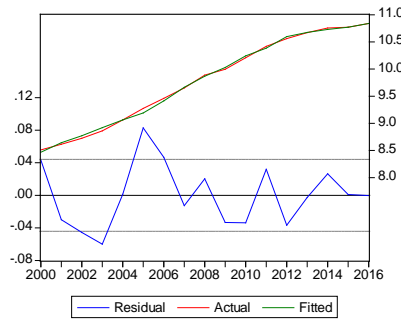
Long-term equilibrium model of Edu, Edc, Uc and Llp

Lag average model of autoregressive distribution of GDP, Uc and Edc

Note: the data used above (excluding generated data) is the standardized data of the original data. Data source: Shaanxi Provincial Bureau of statistics, Shaanxi Provincial statistical yearbook 2000-2019, Shaanxi Provincial demographic (and employment) statistical yearbook 2000-2019.

5. Conclusion

Based on Granger causality theory, long-term equilibrium model, and econometric theory of autoregressive distribution lag model, this article reveals the per capita GDP (log(GDP)), education

investment (log(Edu)), urbanization rate (Uc), labor quality (Llp), and education input of Shaanxi Province Development and control relationship with the five urbanization interaction terms (Edc). The conclusions are as follows: (1) in the long-term equilibrium model, urbanization rate and education investment have a positive correlation with per capita GDP. For every unit of GDP growth per capita, it will increase the 76.707052 unit change of Cheng Zhenghua's rate, and also affect the 2.043099 unit change of education investment. (2) The autoregressive lag model shows that under the control of the last period, the per capita GDP of the current period has negative and positive correlation with the two periods of urbanization construction level and the interaction between education investment and urbanization.

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