Universe Scientific Publishing

Research on the Influence of Educational Input on Economic Output

Feiyang Lv[1], Qifeng Ma [2], Jianxin Zhou Yang [3], Yifei Li [4]

1. School of Humanities and General Studies, Southwestern University of Finance and Economics, Chengdu 610000.
2. School of Philosophy and Law and Politics, Shanghai Normal University. Shanghai 200000.
3. School of Philosophy and Law and Politics, Shanghai Normal University.
4. School of Humanities and General Studies, Southwestern University of Finance and Economics.

Abstract: This article selects 22 years of data from 1998 to 2019 in my country to conduct stability test, co-integration test, Granger causality test and error correction model analysis on fiscal education expenditure, economic growth and fixed asset investment. As for the relationship between my country's fiscal education expenditure and economic growth, the results found that there is a long-term equilibrium relationship among fiscal education expenditure, economic growth and fixed asset investment. Economic growth and fixed asset investment growth are the Granger reasons for the changes in fiscal education expenditure. The impact of economic growth on fiscal education expenditure has a higher contribution rate in the later period. Although financial education expenditure can promote economic growth, its impact on economic growth is lagging behind.

Keywords: Financial Education Expenditure; Economic Growth; Error Correction Model

1. Introduction

Building a strong education country, cultivating innovative talents, and achieving economic growth and social development through innovation are the country's major plan. Expansion of investment in education is an important means to promote the development of education and realize the "rejuvenation of the country through science and education". my country has successively issued major policies such as "National Medium and Long-term Education Reform and Development Program (2010-2020)" and "China Education Modernization 2035", which greatly promoted the integration of science and education, environmental optimization and economic growth[1], but there is still an unreasonable education investment structure and lack of vitality in economic growth[2]. The reason is that the effect of education investment on economic growth is indirect. Only when education investment, human capital and economic growth are coordinated to form a virtuous circle effect, can production efficiency and economic benefits be further improved[3]. Therefore, an in-depth analysis of the relationship between education expenditure and economic growth requires close contact with regional heterogeneity and the basis of policy element[4]. Scholars at home and abroad analyze the role of education investment is to promote economic growth. Scholars generally believe that education investment has a positive effect on economic growth[5-11]. However, some scholars have also noticed some problems from educational investment in promoting economic growth. For example, Liu Youxin (2013)[12] found that my country's low utilization of educational resources has led to regional imbalances in education levels. Fang Chao and Luo

Yingzi (2016)[13] believe that educational expenditures have spatial spillover effects and feedback effects on education in the process of promoting economic growth. Ge Tao and Li Jinye (2018)[14] believe that education expenditure in the eastern region has a significant positive effect on economic growth, while the central region has an inhibitory effect on the contrary. Chen Xia and Liu Bin (2019)[15] researched that the positive impact of financial education investment on economic growth gradually weakened with the increase of regional economic growth. Su Hui and Liu Olympics (2019) [16] found that the number of secondary vocational education schools has a negative coefficient of elasticity for regional economic growth.

2. Research design

Educational economics believes that education itself generates economic benefits indirectly by acting on social and economic activities, thereby promoting economic growth. Based on the Cobb-Douglas production function, this paper adds financial education input elements based on the constant substitution elastic production function, and constructs a basic education production function that includes fixed capital, labor input, education input and economic growth, that is, fiscal education expenditure and the input-output model of economic growth is used to analyze the relationship between my country's fiscal education expenditure and economic growth. The model is as follows:

$$Y = AK^{\alpha}L^{\beta}E^{\gamma} \quad (1)$$

In model (1), Y is the explained variable, that is, GDP, which represents economic growth; A is the technical productivity parameter; E is the national fiscal expenditure on education, which represents education input; L is the number of employees, which represents labor input; K is Fixed asset investment means capital investment; α, β, and γ are the contribution shares of fixed capital investment, labor force and fiscal education expenditure to Y, respectively, α + β + γ = 1. Take the logarithm of model (1) to get:

$$LnY = LnA + \alpha LnK + \beta LnL + \gamma LnE \quad (2)$$

In order to further explore the relationship between the employment population base in the total education expenditure and economic growth, the concept of "per capita" is introduced, and the formula is further sorted to obtain ln y, ln k and ln edu.

$$\ln y = \alpha \ln edu + b \ln k + c \quad (3)$$

Among them, per capita output y is the ratio of my country's GDP (Y) to the number of employees L; per capita investment in fixed assets k is the ratio of fixed asset investment K to the number of employees L; per capita fiscal education expenditure edu is the national fiscal education expenditure E and the ratio of the number of employees L.

In order to better analyze economic policies and infer the structure of economic time series, for non-stationary dynamic multivariate time series analysis models, this paper applies the vector autoregressive model to model (3), then VAR model (model 4) and VECM The model (model 5) is expressed as follows:

$$\begin{bmatrix} \Delta \ln y_t \\ \Delta \ln k_t \\ \Delta \ln edu_t \end{bmatrix} = c + \mu_1 \begin{bmatrix} \Delta \ln y_{t-1} \\ \Delta \ln k_{t-1} \\ \Delta \ln edu_{t-1} \end{bmatrix} + \mu_2 \begin{bmatrix} \Delta \ln y_{t-2} \\ \Delta \ln k_{t-2} \\ \Delta \ln edu_{t-2} \end{bmatrix} + \varepsilon_t \quad (4)$$

$$\begin{bmatrix} \Delta \ln y_t \\ \Delta \ln k_t \\ \Delta \ln edu_t \end{bmatrix} = c + \partial_1 \begin{bmatrix} \Delta \ln y_{t-1} \\ \Delta \ln k_{t-1} \\ \Delta \ln edu_{t-1} \end{bmatrix} + \partial_2 \begin{bmatrix} \Delta \ln y_{t-2} \\ \Delta \ln k_{t-2} \\ \Delta \ln edu_{t-2} \end{bmatrix} + \delta ecm_{t-1} + \varepsilon_t \quad (5)$$

3. Empirical analysis

3.1 Stationarity test

Under the critical value of 5%, the ADF statistics of ln y, ln k and ln edu are greater than the critical value of 5%, and the corresponding P value is 5% larger. Accept the null hypothesis that the sequence has unit roots, that is, three sequences can be considered as a non-stationary sequence with unit roots. Similarly, ln y, ln k and ln edu are subjected to the first-order difference, and the corresponding ADF value is greater than the critical value of 5% and the P value is greater than 5%. The three sequences after the first-order difference It is a non-stationary series, after continuing the second-order difference, after testing, the ADF values of the three series are all less than the critical value of 5%, and the P value is less than the significance level of 5%, that is, lny, lnedu and lnk pass The stationarity test is a stationary series, so the three time series ln y, ln k and ln edu are second-order single integrals, indicating that there is a co-integration relationship between variables, and the next co-integration test can be performed.

3.2 Cointegration test

Table 1 on the next page shows that at the 5% confidence level, the trace test results show that the trace statistic of the null hypothesis "no cointegration relationship" 37.89101 is greater than the 5% critical value of 29.79707, and the P value is 0.0047 less than 5%, and the original hypothesis is rejected. Hypothesis, a model has at least one cointegration relationship. The original hypothesis "there is at least one cointegration relationship" trace statistic 10.67922 less than the 5% critical value of 15.49471, and the P value 0.2320 is greater than 5%, accepting the null hypothesis, that is, the model has at most one cointegration relationship. The results of Table 2 on the next page are the same as the results of the trace test. In summary, the Johansen cointegration test shows that at the 5% confidence level, there is a cointegration relationship between the variable series, and the model has a cointegration equation, that is, my country's per capita fiscal. There is a long-term stable equilibrium relationship among education expenditure, per capita investment in fixed assets and per capita output.

Number of cointegration equations	Eigenvalues	5% threshold	P
None*	0.761	29.797	0.004
At most1	0.428	15.494	0.232
At most2	0.002	3.841	0.839

Table 1. Trace test result.

Number of cointegration equations	Eigenvalues	Maximum eigenvalue statistics	5% threshold	P
None*	0.761	37.891	29.797	0.004
At most1	0.428	10.678	15.494	0.232
At most2	0.002	0.041	3.841	0.839

Table 2. Maximum characteristic root test resultGranger

3.3 Causality test

In the Granger causality test between ln y and ln edu, the results show that the F statistic of the null hypothesis "ln y is not the Granger cause of ln edu" is 4.53983, and its concomitant probability of 0.0287 is less than the critical value 5%, so the original hypothesis is rejected. Assuming that ln y is considered to be the Granger cause of ln edu, it means that economic growth is the Granger cause of changes in fiscal education expenditure. Same as above, at a significant level of 5%, the null hypothesis cannot be rejected "ln edu is not the Granger of ln y" "Cause" means that fiscal education expenditure is not the cause of changes in economic growth. Therefore, between economic growth and fiscal education expenditure, there is only one-way Granger causality between economic growth and fiscal education

expenditure. Similarly, there is no Granger causality between economic growth and fixed capital investment, but there is a one-way Granger causality between fixed capital investment and fiscal education expenditure. This article believes that ln k is the Granger reason for ln edu, which means that fixed capital investment is the Granger reason for changes in fiscal education expenditure. This test result is consistent with economic theory. If the country increases capital investment to promote economic growth, the total national fiscal expenditure will increase, and fiscal education expenditure will also increase.

3.4 Error correction model analysis

Error correction model analysis can reflect the correction mechanism of short-term deviation from long-term equilibrium on the basis of reflecting that the model has long-term equilibrium. It can be seen from the cointegration equation that the model constructed by the three time series of ln y, ln k and ln edu has a co-integration relationship. The error correction model is shown in formula (6). The goodness of fit of the model R2 is 0.6491, 0.9250, 0.8608, F statistic is significant, AIC=-10.66, AC=-9.32, indicating that the model fitting result is better with the lag length.

$$\begin{bmatrix} \Delta \ln y_t \\ \Delta \ln k_t \\ \Delta \ln edu_t \end{bmatrix} = \begin{bmatrix} 0.065 \\ -0.042 \\ 0.092 \end{bmatrix} + \begin{bmatrix} -0.530 & 0.816 & 0.435 \\ 0.935 & 0.547 & 0.266 \\ 2.00 & 2.230 & 1.640 \end{bmatrix} \begin{bmatrix} \Delta \ln y_{t-1} \\ \Delta \ln k_{t-1} \\ \Delta \ln edu_{t-1} \end{bmatrix}$$
$$+ \begin{bmatrix} 1.263 & 0.286 & 0.152 \\ -0.857 & 0.246 & 0.079 \\ -3.021 & 0.263 & 0.0318 \end{bmatrix} \begin{bmatrix} \Delta \ln y_{t-2} \\ \Delta \ln k_{t-2} \\ \Delta \ln edu_{t-2} \end{bmatrix} + \begin{bmatrix} 1.009 \\ -0.864 \\ 2.980 \end{bmatrix} ecm_{t-1} + \varepsilon_t$$

The error correction model shows that my country's fiscal education expenditure and fixed capital investment, and economic growth have a significant influence to the relationship between fiscal education expenditure and economic growth, which are positively correlated. Δ ln yt is the error correction model of the explained variable. It shows that per capita fiscal education expenditure and per capita investment in fixed assets have a positive impact on short-term per capita output. Among them, my country's economic growth is related to the short-term fiscal. The elasticities are 0.435 and 0.152, respectively, and the short-term elasticities of fixed capital investment with lag 1 and 2 lags are 0.816 and 0.286 respectively. From the estimated value, the adjustment coefficient 1.009 indicates that when the short-term fluctuation range deviates from the equilibrium state under long-term conditions, a slower positive adjustment speed of 1.009 will be used to restore the unbalanced state to the equilibrium state. On the whole, there is a long-term equilibrium relationship among economic growth, fixed capital investment and fiscal education investment, and the lagging period of per capita fiscal education expenditure and per capita investment in fixed assets exert a short-term positive impact on economic growth.

4. Conclusions

This article focuses on my country's fiscal education expenditure and GDP to conduct stationarity test, cointegration test, Granger causality test and variance decomposition, and establishing an error correction model. The research found that: first, by observing the variable time series graph, it can be seen that ln y and ln edu have a relatively obvious trend of the same change over time, that is, my country's fiscal education expenditure and GDP develop in the same trend. ADF unit root test Shows that the three time series ln y, ln k and ln edu are second-order single integers. Second, the results of the co-integration test show that there is a long-term stable equilibrium relationship among per capita fiscal education expenditure, per capita output and per capita investment in fixed assets. Third, the Granger causality test results show that economic growth and fixed asset investment are the Granger causes of changes in fiscal education expenditures. The test results are consistent with economic theory. If the country vigorously promotes social and economic development and increases investment in fixed assets, national financial education expenditure will also

increase accordingly. Fourth, by constructing an error correction model, it can be seen that my country's fiscal education expenditure has a significant role in promoting the country's economic growth in the 22 years from 1998 to 2019. And when short-term fluctuations deviate from the long-term equilibrium state, it will be 1.009 The positive adjustment speed slowly shifts from an unbalanced state to an equilibrium state.

References

1. Zheng L. Exploration of interactive teaching in the information technology environment. Tianjin Education 2019; (22).
2. Yin Y. Educational hierarchical structure of china's fiscal expenditure and its improvement. Financial Research 2013; (2).
3. Yang J, Gong L, Zhang Q. The formation of human capital and its impact on economic growth--an endogenous growth model including education and health investment and its test. Management World; 2006; (5).
4. Zhu J, Hu Y. Government education expenditure, human capital heterogeneity and regional economic growth. Statistics and Decision 2008; (6).
5. Judson R. Economic growth and investment in education:how allocation matters. Journal of Economic Growth 2005; 3(4).
6. Malumfashi A. Education expenditure and economic growth in nigeria:co-intergration and correction technique. International Journal of Research in Commerce, Economics and Management 2012; 2(8).
7. Wang J. Research on the dynamic relationship between inner Mongolia's financial investment in science and technology and economic growth. Scientific Management Research 2015; 33(5).
8. Liu X. Research on the relationship between regional economic growth and financial science and education investment. Statistics and Decision 2016; (23).
9. Wang D, Chen L, Zhang Y. The contribution of the improvement of my country's education level to economic growth—and the impact of the public sector wage premium on the rate of return on education in my country. Finance and Trade Economics 2017; 38(9).
10. Zhang A, Gao C. The impact of educational expansion and human capital on economic growth in ethnic regions. Ethnic Studies 2019; (3).
11. Fang F, Zhang X. Analysis of the matching between my country's higher vocational education and economic development. Jiangsu Higher Education2019; (6).
12. Liu Y. Research on the relationship between China's fiscal educational expenditure and economic growth. Statistics and Decision 2013; (11).
13. Fang C, Luo Y. Research on the impact of educational human capital and its spillover effects on China's economic growth: a spatial econometric analysis based on the Lucas model. Education and Economy 2016; (4).
14. Ge T, Li J Research on the economic growth effect of urbanization and education investment. Industrial Technology Economy 2018; 37(2).
15. Chen X, Liu B. Analysis of the impact of higher education investment on economic growth-based on the perspective of investment heterogeneity. Contemporary Education Forum 2019; (4).
16. Su H, Liu Olympic. An empirical study on the effect of secondary vocational education on regional economic growth-based on panel data of Xinjiang's five economic zones. Vocational Education Research 2019; (4).