

Research on the Relationship between Government Health Expenditure Structure and Economic Growth

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Abstract

Based on the time-series data from 1990 to 2018, this paper conducted a cointegration test and Granger causality test on the relationship between the four parts of government health expenditure and economic development. The empirical results show that the health services expenditure, medical security expenditure, and population and family planning affairs expenditure in China's government health expenditure all have a long-term co-integration relationship with economic growth, and are all Granger reasons for economic development. Among the four parts, the promotion effect of medical and health service expenditure on economic growth is the most obvious. Economic development improved the medical and health service expenditure and the medical security expenditure, while the population and family planning affairs expenditure did not increase. Therefore, it is necessary to optimize the government health expenditure structure, increase the proportion of medical and health affairs expenditure, and improve the medical security system.

Keywords

Government health expenditure structure; Economic growth; Co-integration test; Granger causality test.

1. Introduction

Public health expenditures are funds allocated by the government to the health care system for public health use in the form of financial allocations [1]. On the one hand, the government's increased financial expenditure in the field of medical services will reduce economic growth rate. On the other hand, it will improve the health of residents and improve labor efficiency. At the same time, medical security can replace some of the residents' preventive savings to increase consumption and promote the economy [2]. So what is the relationship between government health expenditure and economic growth? Do all its components contribute to economic growth? Studying these issues will undoubtedly have important guiding significance for optimizing the government's health expenditure structure and promoting the reform of the medical and health system.

With reference to the classification standards of the China Health and Health Statistical Yearbook, government health expenditures are divided into four parts: medical and health service expenditures, medical security expenditures, administrative management expenditures, and population and family planning expenditures. This article starts with the four components of health expenditure, explores the relationship between the structure of health expenditure and economic growth, and provides scientific and intuitive reference suggestions for the government to formulate health policies.

2. Literature review

Scholars have conducted a lot of research on the relationship between government health expenditure and economic growth. Taking Hainan Province as an example, Liu Chunping and Zhu Juan et al. used co-integration test, Granger causality test and error correction model to examine the possibility of the relationship between public health expenditure and economic development, and offered results that public health expenditure in Hainan province could promote economic growth [3] Zhong Xiaomin

and Yang Liumei conducted empirical research by establishing a two-way fixed-effect model, showing that government health expenditure can positively affect economic growth [4]; Guo Ping, Liu Lefan, and Xiao Haixiang discussed the relationship between government health expenditure and economic growth under the framework of an endogenous growth model, and found that government health expenditure has a positive impact on economic growth [5]. Wang Qin and Wang Zhijun used the panel data of 180 countries to present evidence that the positive externality of the medical security system has a positive effect on economic development [6]; Through Lasso regression and panel threshold model, Tao Chunhai and Wang Yuxiao justified that only the government's medical security expenditure has a significant impact on economic growth, while other components of government's health expenditure have no significant impact on economic growth [7].

From the previous literature, most scholars have focused on investigating the impact of government health expenditure on economic growth, but there were few studies on the relationship between government health expenditure structure and economic growth, with research methods limited to Lasso regression and panel threshold model. Based on this, this article will empirically examine the dynamic relationship between the four components of government health expenditure and economic growth through the co-integration test and Granger causality test using the time series data from 1990 to 2018, and proposed policy recommendations.

3. Empirical analysis

3.1 Data sources

In this study, from four aspects of medical and health service expenditures, medical security expenditures, administrative management expenditures, and population and family planning affairs expenditures, we respectively examine the linkage impact between them and economic growth. We use a large sample of China, over a long time period, while including recent data (1990–2018). The data comes from the "China Health Statistics Yearbook" and contains five variables: national economic development level (GDP), medical and health service expenditure (ASE), medical Guarantee data (AGE), administrative expenditure (AAE) and population and family planning affairs expenditure (APFPE), all data are deflated using the GDP deflator index based on 1978. To eliminate possible heteroscedasticity, the logarithmic form of each variable is used.

Table 1: Augmented Dickey-Fuller Unit Root Test Results

Variable	ADF test statistic	Inspection form (c,t,k)	Prob.	Inference
GDP	-2.77186	(c,t,1)	0.2187	不平稳
ASE	-2.66112	(c,t,0)	0.2587	不平稳
AGE	-2.04993	(c,t,1)	0.549	不平稳
AAE	-3.17024	(c,t,1)	0.1114	不平稳
APFPE	0.868767	(c,t,0)	0.9996	不平稳
Δ GDP	-2.4501	(c,t,0)	0.3479	不平稳
Δ ASE	-2.62088	(c,t,2)	0.2748	不平稳
Δ AGE	-2.77326	(c,t,0)	0.2182	不平稳
Δ AAE	-3.78747	(c,0,1)	0.0084	平稳
Δ APFPE	-2.34875	(c,t,0)	0.3958	不平稳
Δ^2 LnGDP	-5.910240	(0,0,0)	0.0000	平稳
Δ^2 LnASE	-11.44911	(0,0,0)	0.0000	平稳
Δ^2 LnAGE	-7.053384	(0,0,0)	0.0000	平稳
Δ^2 LnAPFPE	-4.46926	(c,t,4)	0.0094	平稳

Note 1: Δ is the first difference operator, Δ^2 is the second difference operator;

Note 2: In the inspection form (c,t,k), c means that the test equation includes intercept, t means test equation includes trend, and k means the number of lag periods.

3.2 Unit root test

The time series destroys the random sampling assumption, and the time series data must be stable to avoid false regressions [8], so this paper uses the Augmented Dickey-Fuller Unit Root Test method to determine whether the sequence is stable. The test results are shown in Table 1:

After testing, we can find that: at the 5% significance level, the LnAAE sequence is a non-stationary variable, which is stable at the first difference level; the original sequence of LnGDP, LnASE, LnAGE, LnAPFPE and the sequence at the first difference level are all non-stationary variables while the sequence at the second difference level is stable. Therefore, LnAAE is a I (2) process, and LnGDP, LnASE, LnAGE, and LnAPFPE are I (2) processes.

3.3 Cointegration test

According to the result of unit root test, LnAAE and other sequences are not integrally of the same order, so it is impossible to have a co-integration relationship. LnGDP, LnASE, LnAGE and LnAPFPE are integral sequences of the same order, which can be further tested for co-integration. In this study, the Johansen co-integration test method [9] was used to conduct co-integration test for LnASE and LnGDP, LnAGE and LnGDP, LnAPFPE and LnGDP, respectively. The test results are shown in Table 2.

Table 2: Johansen co-integration test results

Cointegration cases	Hypothesized	Trace Statistic	Prob.	Max-Eigen Statistic	Prob.
Between LnGDP and LnAGE	None	16.67545	0.0331	15.4245	0.0326
	At most 1	1.250952	0.2634	1.25095	0.2634
Between LnGDP and LnASE	None	17.31292	0.0263	16.4546	0.0222
	At most 1	0.858349	0.3542	0.85835	0.3542
Between LnGDP and LnAPFPE	None	21.68248	0.0051	18.5156	0.01
	At most 1	3.166893	0.0751	3.16689	0.0751

It can be found that the variable LnGDP has a long-term stable co-integration relationship with LnAGE, LnASE and LnAPFPE at the significance level of 5%, meaning that there is the presence of a long-run equilibrium relationship. The co-integration equation is

$$\text{LnGDP} = 0.453557 * \text{LnAGE} \\ (0.03849)$$

$$\text{LnGDP} = 0.688957 * \text{LnASE} \\ (0.04900)$$

$$\text{LnGDP} = 0.593946 * \text{LnAPFPE} \\ (0.02698)$$

From the results of the co-integration equation, the expenditure on medical security, medical and health services, population and family planning affairs has a positive long-term equilibrium relationship with economic growth. Among them, the biggest impact on economic growth is the expenditure on medical and health services. What's more, whether there are causal relationship remains to be tested next.

3.4 Granger causality test

Granger causality test studies whether the past behaviors of two variables affect each other's current behaviors. The Granger causality test for the variables LnGDP and LnAGE, LnASE, LnAPFPE is as follows, the results are shown in Tables 3~5:

We can infer from Table 3 that medical security expenditure is the granger cause of economic growth when it lags 5-6 periods, indicating that the promotion effect of medical security expenditure on

economic growth is not obvious in the short term but significant in the long term. The reason is that the government increases the investment in medical security and improves the treatment of residents' medical security, which not only helps to improve residents' physical quality and improve labor production efficiency, but also can reduce residents' worries at home to a greater extent, reduce some residents' preventive savings and expand domestic demand, thus driving economic development. These effects are manifested through continuous accumulation, and they cannot bring about rapid economic growth in the short term. On the other hand, economic growth is the granger cause of medical security expenditure when it lags 5-6 periods, indicating that economic growth can increase medical security expenditure, that is, with economic growth, the government will increase the investment in medical security.

Table 3: Granger Causality Test results of Medical Security Expenditure and GDP

Null hypothesis	Lag period	Prob.	Conclusion
LnAGE does not granger cause LnGDP	1	0.4829	Accept
	2	0.9527	Accept
	3	0.3026	Accept
	4	0.2662	Accept
	5	0.0031	Reject
	6	0.0048	Reject
LnGDP does not granger cause LnAGE	1	0.0128	Reject
	2	0.001	Reject
	3	0.0007	Reject
	4	0.0018	Reject
	5	0.001	Reject
	6	0.0098	Reject

Table 4: Granger Causality Test results of Medical and Health Service Expenditure and GDP

Null hypothesis	Lag period	Prob.	Conclusion
LnASE does not granger cause LnGDP	1	0.5926	Accept
	2	0.5965	Accept
	3	0.4885	Accept
	4	0.6559	Accept
	5	0.0172	Reject
	6	0.001	Reject
LnGDP does not granger cause LnASE	1	0.0021	Reject
	2	0.0094	Reject
	3	0.0083	Reject
	4	0.0027	Reject
	5	0.001	Reject
	6	0.0175	Reject

It can be seen from Table 4 that medical and health services expenditure is the granger cause of economic development when it lags 5 to 6 periods, and economic development is the granger cause of medical and health services expenditure. Medical and health service expenditure is government allocations for health undertakings other than medical security, family planning affairs, and

administrative expenses, including Chinese medicine undertakings, capital construction funds, and medical research funds and so on. Increasing medical research funding can promote the improvement of medical technology level. The increase in medical expenses, traditional Chinese medicine expenses, and capital construction expenses will have a positive effect on improving the national medical level and ensuring the health of human capital. Although these effects cannot immediately affect economic development, their positive significance will continue to be reflected over time.

Table 5: Granger Causality Test results of Population and Family Planning Affairs Expenditure and GDP

Null hypothesis	Lag period	Prob.	Conclusion
LnAPFPE does not granger cause LnGDP	1	0.0036	Reject
	2	0.0032	Reject
	3	0.2332	Accept
	4	0.4032	Accept
	5	0.1904	Accept
	6	0.1177	Accept
LnGDP does not granger cause LnAPFPE	1	0.4407	Accept
	2	0.9121	Accept
	3	0.3127	Accept
	4	0.213	Accept
	5	0.2933	Accept

At a significance level of 1%, population and family planning expenditure is the granger cause of economic growth when it lags 1 to 2 periods, and economic growth is not the granger cause of population and family planning expenditure.

From 1990 to 2014, it was an important stage in the development of family planning in China. Under the national conditions at that time, the state attached great importance to the population and family planning. By increasing the financial support for population development, the government improved the reproductive health of residents and the quality of birth population, which played a positive role in economic development to a certain extent. Since 2015, due to the aging population in China, the government has adjusted the family planning policy, optimized the health expenditure structure, and made corresponding adjustments to the population and family planning expenditure, so as to adapt to the new needs of national development and make new contributions to economic development.

4. Conclusion and recommendation

Using statistical analysis data, this paper examines the co-integration and causal relationship between the four components of government health expenditure and economic development in China over 1990~2018. The results show that: firstly, among the four components of government health expenditure, except the expenditure on administrative services, there is a positive long-term equilibrium relationship with economic growth; Secondly, medical and health services expenditure, medical security expenditure and population and family planning affairs expenditure are the grange causes of economic growth. Thirdly, economic development has increased health services expenditure and medical security expenditure, while population and family planning affairs expenditure has not increased.

In order to accelerate the construction of health undertakings and promote economic development, the following measures are suggested.

First, invest more in public health. Health investment is not only a healthy consumption, but also is a kind of important health human capital investment. The government plays a role in the medical and

health field through fiscal transfers, supports and guides the social medical service, provides the basic guarantee for residents to maintain health, and provides basic guarantees for residents to maintain their health. After long-term accumulation, they effectively increase the stock and increment of healthy human capital [10], thereby promoting the economy development.

Second, optimize the structure of government health expenditures and further increase the proportion of medical and health services expenditure and medical security expenditure. It is suggested to attach importance to medical research and improve medical research capabilities. Health expenditure should be inclined to areas where health resources are scarce, especially to strengthen rural health care construction, and to promote equal access to health care for people in all regions. What's more, it is necessary to improve the medical security system, pay attention to disease prevention and encourage residents to participate in insurance to improve the quality of personal healthy life and promote stable development of the economy, society and individuals.

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