

Fiscal Expenditure and Economic Growth in India: A Disaggregated Analysis

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Abstract: The research results show that the scale of Indian fiscal expenditure has a small positive effect on economic growth. The output effect of defense, interest and medical subsidy is negative, while the growth effect of education and old-age service is positive. The growth effect of administrative expenditure is positive in the short term and negative in the long term. The effect of economic service expenditure is not significant in the short term but positive in the long term.

Introduction

Throughout India's economic history since independence, it is not hard to find that India's economy has gone from stagnation to slow start, and then to rapid development, meanwhile India's fiscal expenditure scale also presents a low first, then high evolution trend, moreover, the change rhythm of the two has a high degree of synchronization. Therefore it has very important significance from the perspective of fiscal expenditure to study India's economic growth effect of fiscal expenditure, and to explore whether India's fiscal expenditure scale and structure is reasonable, and to analyze the pros and cons of India's fiscal expenditure policy. Based on the data of India from 1950-51 to 2016-17, this paper makes an empirical analysis, its structure is as follows. Section 1 is the introduction, while section 2 contains review, section 3 is for methods and data, while section 4 contains discussion of empirical results and discussion, Section 5 is for conclusion.

Literature Review

The neoclassical model established by Arrow & Kurz(1970) made pioneering research on the economic growth effect of fiscal expenditure,^[1] and then Baxter & King(1993),^[2] Carboni & Medda (2007) ^[3]and others continued to explore. The endogenous growth model constructed by Barro expands the research space of this issue. Rioja(2003) ^[4]and others further discussed it on the basis of the research results of Barro(1990).^[5] In addition, Gupta, Clements, et al.(2005)^[6]also conducted empirical research on this topic. From the existing literatures, there are more studies from the scale perspective than from the structural one, and most scholars think that the size of fiscal expenditure has a negative effect, education, capital, human capital and infrastructure expenditure usually have positive effects, defense, agricultural, medical and social security expenditure have negative effects.

From India, the research conclusions of p.srinivasan (2013), ^[7]KarabeeMedhi (2014)^[8]showed that there is only a one-way causal relationship between public expenditure and economic growth, that is, economic growth is the reason for the increase of fiscal expenditure, while fiscal expenditure had no significant growth effect. However L.N.Gangal & Ms.Gupta(2013)^[9] believed that fiscal expenditure has a positive effect, but economic growth didn't promote fiscal expenditure. Fan, Hazell & Thorat (2000)^[10] showed that the output efficiency of fiscal expenditure on agriculture was high, while the output effect of education and health expenditure was low. However, Ashni Parekh(2008) ^[11]believed that fiscal expenditure on agriculture had no positive effect, but expenditure on infrastructure and education could promote the increase of per capita output, the defense and R&D expenditure had no significant effect.

The above literatures have made beneficial exploration on the economic growth effect of India's fiscal expenditure, but there are still some shortcomings, such as, the research from structure is

relatively lacking, some conclusions from different literatures are still divergent, most literatures only analyze fiscal expenditure items independently, lacking of unity and completeness, etc.

Methods, Variables and Data

In this paper, vector auto regression model (Sims, 1980) is used to empirically test the economic growth effect of fiscal expenditure in India. Assuming:

$$Y_t = (y_{1t} \ y_{2t} \ \dots \ y_{Nt})^T \quad (1)$$

Eq.1 is the column vector of Nx1 order time series dependent variable, then the p-order VAR model is denoted as VAR(p):

$$Y_t = \mu + \sum_{i=1}^p \Pi_i Y_{t-i} + U_t = \mu + \Pi_1 Y_{t-1} + \Pi_2 Y_{t-2} + \dots + \Pi_p Y_{t-p} + U_t, U_t \sim IID(0, \Omega) \quad (2)$$

In eq.2, $\Pi_i (1, 2, \dots, p)$ is an N x N order parametric matrix.

$$U_t = (u_{1t} \ u_{2t} \ \dots \ u_{Nt})^T \quad (3)$$

Eq.3 is a random error column vector of order N X 1, μ is the trend item column vector of order Nx1, Ω is largest lag order number in the above model. The right-hand side of all equations in the model only contains the lag terms of endogenous variables, which are not related to U_t . OLS is used to estimate each equation in turn to ensure the consistency of parameter estimators.

The process of empirical test in this paper is divided into two steps. Firstly, a VAR model containing four variables including per capita GDP (GDP), total fiscal expenditure scale (GOV), capital formation (CAP) and real interest (RATE) was constructed to test the growth effect of fiscal expenditure scale, investment level and monetary policy from a horizontal perspective. Secondly, According to the functional classification, India's fiscal expenditure is divided into defense (DEF), education (EDU), health care (MED), fiscal subsidies (SUB), administrative expenses (ADM), interest (INT), economic services (ECO) and pension (PEN) for testing.

The GDP and various fiscal expenditure data are all from *the Indian Public Finance Statistics*, a publication of the Ministry of Finance of India over the years. Except the real interest rate, all other variables enter the model at their relative index. Real interest rates are subject to data published by the World Bank. The total fixed capital formation is subject to the Economic survey 2016-17 published by the Central Bureau of Statistics of India. The relevant data in this paper are time series composed of 67 samples from 1950-51 to 2016-17 in India.

Empirical Results and Discussion

ADF Test. The construction of VAR model and co-integration test all require the time series variable to be stable, ADF statistics are used to test the stationarity of time series data of 4 variables including GDP, GOV, CAP, RATE. As can be seen from table 1, 4 variables are all I(0) sequences.

Table 1. Results of ADF test

Variab le	Test Type (C,T,L)	ADF Statistic	Critical Value	Resul ts	Varia ble	Test Type (C,T,L)	ADF Statistic	Critical Value	Resul ts
GDP	(C,0,0)	-7.657572	-3.670170*	stable	CAP	(C,0,0)	-6.730353	-4.309824*	stable
GOV	(C,0,0)	-7.410037	-3.679322**	stable	RAT E	(C,0,0)	-4.544009	-4.296729*	stable

Note: Test Type (C,T,L) represents constant term, linear trend and lag respectively. *** (** and *) represents rejection of the null hypothesis (H0) at the significance level of 1%(5% and 10%).

Co-integration Test. The VAR model is constructed on the basis of GDP, GOV, CAP and RATE, and the equilibrium relationship among the four variables is co-integrated by Johansen method. According to the AIC criterion and rule of SC and minimum value method to determine the

VAR model structure, the optimal lag $\Omega = 1$, and through the relevant inspection (LM test) and normality (JB test), and the absolute value of 4 AR characteristic equation root is less than 1, showing that the 4-variables VAR model satisfy the stability condition. Subsequently, we conducted Johansen co-integration test, and the results show (Table 2) that there are two co-integration equations at the significance level of 5%, that is, there is a long-term equilibrium relationship between 4 variables.

Table 2. Co-integration test results based on GDP、GOV、CAP and RATE

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical value	Prob.**
None*	0.476624	61.41368	54.07904	0.0097
Atmost1*	0.447733	37.45784	35.19275	0.0280
Atmost2	0.219871	15.49005	20.26184	0.1996

It is convenient to clearly compare the influence degree of the three explanatory variables on GDP in the co-integration equation. In this paper, the above co-integration equation is standardized. The first standardized co-integration equation is as follows:

$$GDP_t = 5.608522GOV_t - 1.851062CAP_t + 0.019245RATE_t - 0.319066 \quad (4)$$

(1.27546) (0.66172) (0.02144) (0.15223)

By observing eq.4, we can find that, if GDP, GOV and RATE are all changed by 1%, GDP will be changed by 5.6, -1.85 and 0.019 percentage points respectively. it shows that India's fiscal expenditure scale has positive effect on economic growth, the capital formation can be not yet conducive to economic growth, the growth can't be sensitive to interest rate.

Causality Analysis. This paper uses Granger causality test to analyze the growth effect of fiscal expenditure scale in India(Table4). The test results show that at the significance level of 10%, there is a one-way causal relationship between GOV and GDP, that is, GOV is only the granger of GDP. This further confirms the above co-integration analysis conclusion, but this positive promotion cannot be exaggerated. Moreover, the null hypothesis that GDP is not the cause of GOV is true, indicating that India's fiscal expenditure is independent of economic growth, which can be consistent with the long-term planned economic development model.

Table 3. Granger causality test results (lags=1)

Null hypothesis	F-statistic	P values
GDP is not granger cause of GOV	0.04898	0.8261
GOV is not the granger of GDP	2.91087	0.0966
GDP is not the granger cause of \hat{CAP}	0.68057	0.4148
\hat{CAP} is not the granger cause of GDP	0.01843	0.8928

Defense Expenditure. [□] We construct a VAR model of GDP, GOV, CAP, RATE and DEF variables, and conduct Johansen co-integration test. The result shows that between DEF and GDP there is a long-term and stable equilibrium relationship (Table 4). The results of impulse response analysis about the VAR model of GDP,GOV,CAP,RATE and DEF shows, when we give a positive shock to DEF, GDP is 0 on phase 1, then turns from 0 to negative, and starts to weaken after reaching the maximum value on phase 2 and converges to 0 on phase 4 (Fig. 1). The phase suggests that India's defensive spending is depressing rather than boosting economic output. Fig. 2 shows, a positive impact on GDP will lead to a 2% increase of DEF in the first phase and then a rapid convergence to zero in the second phase, indicating that India's GDP has a positive effect on DEF.

^①Due to the limitation of space, this paper does not test the economic growth effect of administrative expenditure (ADM), interest (INT), economic construction (ECO) and pension service (PEN), and only reports its test conclusion: administrative expenditure has a positive effect on economic growth in the short term and a large negative effect in the long term. The economic growth effect of national debt interest expenditure is significant negative effect. The economic growth effect of economic construction expenditure is not significant in the short term but positive in the long term. Pension service expenditure has a positive effect on economic growth.

Table 4. Co-integration test results based on 4 VAR modles

Model Type	Hypothesized No. of CE(s)	EigenValue	Trace Statistic	0.05CriticalValue	Prob.**
VAR model with variable DEF	None*	0.590333	89.85217	76.97277	0.0037
	Atmost1*	0.469262	56.83294	54.07904	0.0278
VAR model with variable EDU	None*	0.530042	87.18348	76.97277	0.0068
	Atmost1*	0.469789	59.24437	54.07904	0.0161
VAR model with variable MED	None*	0.611282	91.08455	76.97277	0.0028
	Atmost1*	0.466003	56.12319	54.07904	0.0325
VAR model with variable SUB	None*	0.552430	88.02955	69.81889	0.0009
	Atmost1*	0.478328	58.28440	47.85613	0.0039

Education Expenditure. we built an unconstrained VAR model on GDP GOV CAP RATE and EDU variable. The co-integration test shows that there is a long-term co-integration relationship between India's GDP and EDU, which indicates that there is a correlation between India's education expenditure and economic growth (Table4). The impulse response analysis of the above unconstrained VAR shows (Fig. 3), the economic output effect of EDU in the first stage is 0, then turns from 0 to positive, reaches the maximum positive effect of 0.1% in the second stage, but reaches the peak negative effect of -0.1% in the third stage, and converge to 0 in the seventh stage. This phase characteristic not only confirms the economic thought of many schools of economics since Adam Smith that education can promote economic growth, but also coincides with the rapid development of Indian IT industry, biomedical industry, financial industry and high education. Figure 4 shows that India's economic growth has a positive effect on its education fiscal expenditure, indicating that the Indian government attaches great importance to national education.

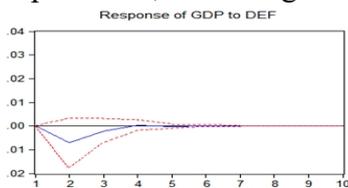


Figure 1 Resp. of gdp to def edu

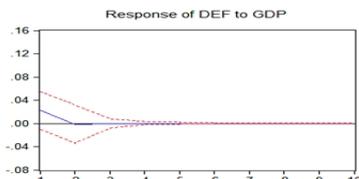


Figure 2 Resp. of def to gdp

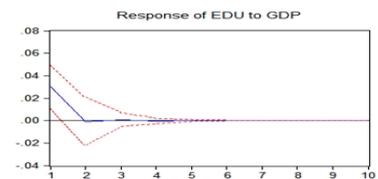


Figure 3 Resp. of gdp to

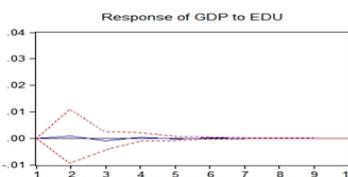


Figure 4 Resp. of edu to gdp

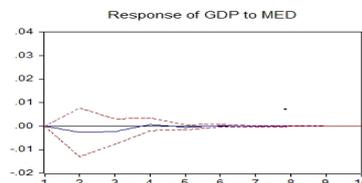


Figure 5 Resp. of gdp to med

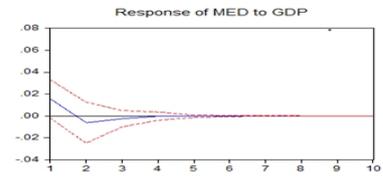


Figure 6 Resp. of med to

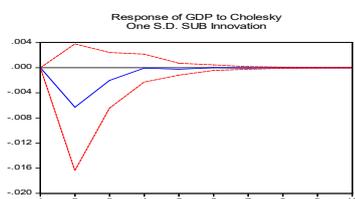


Figure 7 Resp.of gdp to sub

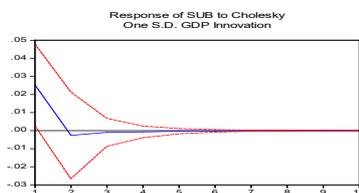


Figure 8 Resp.of sub to gdp

Medical Expenses. In order to examine the economic growth effect of public expenditure on medical services in India, an unconstrained VAR model on GDP CAP GOV RATE and MED is constructed, Johansen co-integration test is conducted on the model, and the results show that there is a long-term stable relationship between GDP and MED in India (Table 4). Based on the above unconstrained VAR, an impulse response analysis is made on the relationship between GDP and MED (Fig.5). The phase diagram shows that the economic growth effect of fiscal health expenditure is small, whether positive or negative. Therefore, given that India's medical and health conditions are still poor and backward, the government should not only increase financial investment in medical care, but also pay more attention to optimizing the design of medical service system and improving the management level. In addition, Fig.6 shows that the Indian government has done what it can to build the national health care system under the condition of insufficient national financial resources.

Financial Subsidies. In order to examine the correlation between fiscal subsidies and economic growth in India, a VAR model including GDP CAP GOV RATE and SUB is constructed. Johansen co-integration test is conducted on the above model showing there is a stable correlation between SUB and economic GDP (Table 4). Next, an impulse response analysis on the VAR model shows (Fig.7), when we give subsidy spending a positive impact, the output elasticity of GDP is 0 in the first stage, then turning into a negative effect, the negative effect reaches a maximum of 0.6% on the phase 2, the negative effect begins to decay on the phase 4, at last its effect converges to zero until 6. It is not difficult to see that the positive impact of fiscal subsidies on economic growth in India is negative and large, which exactly confirms the fact that fiscal subsidies in India are often criticized by academic and political circles because of politicians' abuse, inefficient management and misallocation of resources. An analysis of the impulse response of subsidy expenditure to economic growth (Fig.8) shows that, despite the large negative effects of subsidies, the government has increased subsidies as the economy has grown, either because of building inclusive societies or the votes of politicians.

Conclusion

First, the scale of India's fiscal expenditure has a positive effect on economic growth, so, once India's economy growth gets faster, it is reasonable to increase government expenditure. interest expenditure, subsidies expenditure, health services expenditure and economic construction expenditure have negative output effects, but should be treated differently. Excessive defense expenditures, which drain limited financial resources and run counter to current world themes, can be scaled down appropriately. Interest expenditure hinders economic growth and creates intergenerational inequality, the way is to reduce debt by boosting growth and raising taxes. Subsidies distort the market economy and restrict economic growth, it is necessary to establish a reasonable subsidy system. Medical services and infrastructure are weak links, the strategy is to increase investment and strengthen management. The output effect of education and pension expenditure is positive, because education has plays an important role in human capital formation, in addition to continuing to increase investment in education, more attention should be paid to basic education in India. Moreover the government should increase spending on old-age services to help build a welfare society. It is well known that the administrative efficiency of India is not high all the time, therefore the conclusion of short-term positive effect of administrative expenditure is the best explanation of the "lubricant" theory of corruption, ^[12]but in the long run, corruption is the sand in the wheels of the economy development.

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