Trend of Fiscal Expenditure's Economic Effect
-- Experience from China

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ABSTRACT
Based on the panel data of Chinese mainland's 31 province from 1978 to 2020, this paper studies the economic effects of government fiscal expenditure. The results show that: first, fiscal expenditure crowds out consumption, promotes investment and growth. Second, with the continuous increase of fiscal expenditure, the economic effect shows a dynamic trendency. The crowding out effect of fiscal expenditure on consumption is undulating, firstly enhanced, then weaken, and then enhanced again. The inducing effect on investment first increases and then decreases, showing an inverted U-shape, while its promoting effect on growth continues to increase during the sample period.

Keywords: Fiscal Expenditure, Consumption, Investment, Growth, Crowding out Effect, Trend Research

1. INTRODUCTION

As an important method for the government to exercise macro-control, fiscal expenditure mainly plays a "discretionary" role in smoothing economic fluctuations. It has different economic effects at different stages of economic development. Therefore, it is necessary to deeply analyze the actual effects of fiscal expenditure and pay attention to the cross temporal differences. This paper mainly studies the changing impact of Chinese government fiscal expenditure on consumption, investment and growth since the reform and opening up, and forecasts the possible trend. The possible contributions of this paper include: First, we examine the economic effects of government fiscal expenditure in a changing perspective, which is dynamic and systematic. Second, it is more practical to use the high-power term of fiscal expenditure to estimate its variable elasticity coefficient. This research is helpful to analyze the discretionary effect of fiscal expenditure, and is of positive significance to optimize fiscal policy and adjust the supply structure. The rest of this paper is arranged as follows: literature review, research design, empirical test, summarize and suggestions.

2. LITERATURE REVIEW

Classical economics holds that increasing fiscal expenditure can influence demand when effective demand is insufficient, and expand output through multiplier effect. Also, fiscal expenditure directly reduce residents' disposable income through taxation and government debt, inhibit residents' consumption, and intensify capital market competition, resulting in rising interest rates and crowding out investment. Other scholars confirmed that fiscal expenditure can help form public capital and directly increased output as a production factor. The situation in China is quite special. First, the interest rate transmission mechanism is blocked due to the interest rate regulation and low degree of credit marketization[1]. Also, consumption tendency in China is relatively low, and effective demand is insufficient[2]. As a result, China's economy has been highly dependent on fiscal expenditure for a long time, and the crowding out effect is weak, so we bypass the interest rate transmission mechanism.

The related empirical results were different. The temporal discrepancy is an important reason, which is also the focus of this paper. Musgrave's growth theory of development stage pointed out that in the early stage of economic development, fiscal expenditure is irreplaceable, shows strong externalities and marginal effect; With sustained economic development, the marginal effect of fiscal expenditure and its proportion in GDP tend to decrease; When the economy gradually enters a mature stage, they will again increase due to the requirements of updating infrastructure and improving social welfare. Fiscal expenditure led to private investment in the short term, but not in the medium term, which was based on 25 years of cross-border data[3]. Nicholas (2000) found that Greek fiscal expenditure was

conducive to investment from 1948 to 1980, but performed the opposite from 1981 to 1996[4]. Narayan (2004) reached a similar conclusion based on Fiji's data from 1950 to 1975 and from 1976 to 2001[5]. The long-term growth effect of fiscal expenditure is weaker than that in the short term[6]. Chen (2017) [7] and Sharif & Bino (2019) [8] respectively proved that fiscal expenditure promotes short-term GDP growth in China, but it was not obvious or even showed a negative impact in the long term. To summarise, most scholars believed that the economic promotion effect of fiscal expenditure weakened over time, even inhibited investment and growth. However, Most studies drawed conclusions based on sample selection, and do not systematically explore the change trend.

3. RESEARCH DESIGN

3.1 variable design

Explanatory variable--fiscal expenditure(Fe): the per capita value of fiscal general public budget expenditure, and converts it into the price of 1978 by GDP deflator.

Explained variables: (1) investment(I): total fixed assets formation converted into 1978 price by fixed assets investment price index. (2) Consumption(C): calculate the per capita consumption of urban residents in *China Statistical Yearbook* and the per capita consumption of rural residents in *China Household*

Survey Yearbook according to the population weight, and convert it into the price in 1978 by consumer price index. (3)Output (GDP): regional GDP converted into 1978 price by GDP deflator.

Control variables: (1) labor (L): the proportion of employees in urban region. (2) Capital stock(K): the per capita value of the capital stock calculated by the perpetual inventory method. The capital stock of the ith province in period t meets: $K_{i,t} = \frac{nFCF}{IPI} + (1 - \delta) \times K_{i,t-1}$. Where nFCF is the total nominal fixed asset formation, IPI is the price index of fixed asset investment, and the depreciation rate is taken as 0.1096. (3)Economic development level (iGDP): actual per capita GDP. (4) Energy consumption(Ener): total energy consumption calculated by standard coal. (5) Industrial structure (Str): the proportion of the added value of the tertiary industry in GDP. (6) Money supply (M): nominal money supply M1. (7)Total population (Pop): the total population of the region at the end of the year.

3.2 research data

3.2.1 data source and processing

We selects 1978~2020 panel data from 31 provincial regions in Chinese mainland. All data are from China Statistical Yearbook, Compilation of Statistical Data of 50 Years of New China and China Household Survey Yearbook.

Table 1. descriptive statistics(¥billion,ton)

Type	Variable	Symbol	Mean	Std. Dev.	Min	Max
Explained Variables	Investment	I	521.671	984.671	0.122	6090.28
	consumption	C	263.626	423.996	0.520	3392.43
	output	GDP	818.965	1424.393	1.391	11051.3
Explanatory Variables	Fiscal expenditure	FE	4.240	7.081	0.0208	67.983
Control Variables	labor	L	0.519	0.0761	0.300	1.065
	Capital stock	K	50.109	0.683	335.477	50.108
	Economic development level	iGDP	19.176	25.683	0.548	168.202
	Energy consumption($\times 10^3$)	Ener	72447.85	72639.12	584.377	391249
	industrial structure	Str	0.317	0.167	0.0435	0.938
	Money supply	M	14286.74	18626.07	85.945	62560.0
	total population($\times 10^3$)	Pop	25885.34	1790.02	11617	25885.34

3.3 measurement model

We estimate the overall impact of fiscal expenditure on consumption, investment and growth through model (1). Due to the exponential growth of economic variables, we take the natural logarithm of all variables.

$$lnY_{it} = \beta_0 + \beta_1 lnFE_{it} + \sum lnX_{it} + \mu_i + \nu_t + \varepsilon_{it} \quad (1)$$

Where, subscripts i and t represent the province and the year; μ_i and ν_i represent the unobservable regional and time effect; Y_{it} is the explained variable; FE_{it} is the fiscal expenditure; ε_{it} is random disturbance term; β_j is

the coefficient, indicating the elasticity; X_{it} represents the set of control variables.

In addition, in order to reflect the cross temporal differences in the effect of fiscal expenditure, we further brings the high-power term of fiscal expenditure into the model and centralizes it, as model(2).

$$lnY_{it} = \beta_0 + \beta_1 lnFI_{it} + \beta_2 (lnFE_{it})^2 + \beta_3 (lnFE_{it})^3 + \sum lnX_{it} + \mu_i + \nu_t + \varepsilon_{it} \quad (2)$$

3.4 model setting test

3.4.1 data stability test

Since n > t , we conducted Fisher test on the data, which results showed that four types of tests for all variables rejected the unit root hypothesis(p<0.001).

3.4.2 panel data model selection

F test rejects the mixed regression model, and the data have both individual effect and time effect. Hausman test supports the fixed effect model. Therefore, the double fixed effect model is adopted in this paper.

3.4.3 data endogeneity processing

There are two-way effects between the variables, measurement errors and omitted variables are always ineluctable as well, all of which will lead to endogenous explanatory variables, so instrumental variable regression is needed. We use GMM method and select the 1 & 2 order lags and differential lags of explanatory variables as instrumental variables.

4. EMPIRICAL RESULTS

Columns 1, 3 and 5 of Table 2 show the overall impact of China's government fiscal expenditure on investment, consumption and growth, and columns 2, 4 and 6 show the results after introducing the high power terms of fiscal expenditure. The table is followed by model determination coefficient, Hansen test statistics and Kleibergen Paap Wald F test statistics. The deviation of weak instrumental variable is less than 10%. The p value of robust Hansen test is between 0.1 and 0.5, indicating that the instrumental variables are valid.

Table 2. Economic effect of fiscal expenditure

Variable	Impact on investment		Impact on consumption		Impact on growth	
	lnFE	(lnFE)2	lnFE	(lnFE)2	lnFE	(lnFE)2
lnFE	0.123*	0.0794	-0.144***	-0.116***	0.391***	0.395***
	(0.0627)	(0.0612)	(0.0443)	(0.0444)	(0.0220)	(0.0210)
$(lnFE)^2$		-0.0137***		0.00261		0.0130***
		(0.00383)		(0.00183)		(0.00119)
$(lnFE)^3$				-0.00270***		
				(0.000579)		
lniGDP	0.712***	0.816***	0.653***	0.640***		
	(0.0792)	(0.0855)	(0.0542)	(0.0565)		
lnk	0.177***	0.199***	0.167***	0.152***	0.230***	0.184***
	(0.0589)	(0.0578)	(0.0361)	(0.0361)	(0.0164)	(0.0163)
lnl	0.517***	0.485***	-0.0929	-0.0602	0.246***	0.257***
	(0.113)	(0.113)	(0.0725)	(0.0712)	(0.0492)	(0.0473)
lnm	0.620***	0.524***	0.354***	0.310***	0.108***	0.185***
	(0.0571)	(0.0678)	(0.0316)	(0.0364)	(0.0237)	(0.0232)
lnener	0.206***	0.143***	0.0463*	0.0590**	0.0433**	0.0965***
	(0.0442)	(0.0448)	(0.0241)	(0.0240)	(0.0171)	(0.0173)
lnstr	0.159**	0.118*	0.396***	0.434***	-0.284***	-0.216***
	(0.0639)	(0.0619)	(0.0277)	(0.0270)	(0.0181)	(0.0187)
N	1240	1240	1240	1240	1240	1240
Adj-R^2	0.986	0.987	0.989	0.990	0.994	0.995
Hansen' P	5.281	3.984	4.445	5.053	2.872	2.893
K-P W' F	362.207	320.555	373.938	330.209	983.010	966.998

Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01

4.1 impact on investment

Column 1 show that fiscal expenditure has a significant inducing effect on investment, which means that fiscal expenditure has a strong positive externality, reduces investment costs, improves investment returns, and offsets the crowding out effect of taxes and government bonds. Every 1% increase in fiscal expenditure can boost investmen by 0.123%. The second column introduces the high-power term of fiscal expenditure into the model. The coefficient of fiscal expenditure quadratic term is significantly less than 0 at the level of 0.001, while the cubic and above terms are not significant. This means that with the continuous expansion of fiscal expenditure, the inducing effect of fiscal expenditure on investment continues to weaken, which shows an inverted U. The variable elasticity coefficient of fiscal expenditure to investment is:

$$\frac{\partial \text{PI}}{\partial \text{FE}} \cdot \frac{\text{FE}}{\text{PI}} = 0.0794 - 0.0174\ln\text{FE}$$
(3)

4.2 impact on consumption

Column 3 shows that fiscal expenditure crowds out consumption. Both tax and debt will reduce residents' disposable income and curb consumption. Every 1% increase in fiscal expenditure will crowd out 0.144% of consumption. In column 4, the third power coefficient of fiscal expenditure is significantly less than 0, while the fourth power and above are not significant, which means that the crowding out effect on consumption will experience an increasing-weakening-increasing trend. In the early stage of economic development, resources are scarce, Engel's Coefficient is high, and infrastructure is insufficient. The proportion of fiscal expenditure in output is high, and the crowding out effect on consumption continues to increase. With the accumulation of economic resources and accelerating development, the growth rate of fiscal expenditure is lower than that of output, social wealth and residents' disposable income can grow rapidly, and the crowding out effect is weakened. After the economy grows into a stable stage, the scarcity of public goods decreases, the output growth slows down, and the crowding effect of fiscal expenditure on Residents' disposable income expands. The variable elasticity coefficient is:

$$\frac{\partial \text{C}}{\partial \text{FE}} \cdot \frac{\text{FE}}{\text{C}} = 0.00522\ln\text{FE} - 0.00810(\ln\text{FE})^2 - 0.116$$
(4)

4.3 impact on economic growth

Column 5 shows that Chinese government's fiscal expenditure significantly promoted economic growth, the output elasticity is 0.391. In column 6, the quadratic coefficient of fiscal expenditure is significantly positive, indicating that the growth effect of fiscal expenditure is increasing. The variable elasticity coefficient is:

$$\frac{\partial \text{GDP}}{\partial \text{FE}} \cdot \frac{\text{FE}}{\text{GDP}} = 0.395 + 0.0260\ln\text{FE}$$
(5)

Among the control variables, the elasticity of per capita GDP to investment and consumption is significantly positive, indicating that there is an upward spiral between growth and investment or consumption. Capital stock directly determines the supply level and has a significant positive impact on growth. The improvement of employment rate is of great significance to investment and economic growth, but has no significant impact on consumption. Money supply can promotes investment, consumption and growth, which is stronger on investment than that on consumption. Industrial structure optimization is conducive to investment and consumption, but it is

negatively correlated with growth. The contribution of energy consumption to growth is weak.

5. CONCLUSIONS

This paper shows that with the continuous growth of fiscal expenditure, its economic effect varies: the crowding out effect on consumption experiences an enhancing -weakening-enhancing change. The inducing effect on investment first increases and then decreases, while its promoting effect on output growth continues to increase. Thus, government should size up the situation and formulate a discretionary fiscal expenditure plan according to the economic development stage and actual demand. As the production effect of fiscal expenditure is continues to strengthen, while its investment effect is decreasing now, Chinese government should maintain an orderly growth in fiscal expenditure and reduce the proportion of productive investment. Also, variable coefficient model is more suitable than constant coefficient model in related research, and the dynamic perspective should be taken.

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