Poverty Alleviation Programs, Fiscal Decentralization and Economic Growth: a General Equilibrium Model

Yue Lai[1*], Tian-zhu Cheng[1]

[1] *School of Finance and Economics, Guangxi University of Science and Technology, Liuzhou 545006, Guangxi Prov., P. R. China*

Received 1 October 2014, www.cmnt.lv

Abstract

How to measure and evaluate the effect of poverty alleviation program is an important issue. We should understand that the program expenditures and economic growth are reciprocally affected. The state-level government transfers payments aiming at poverty alleviation to local-level governments, which contribute to the output directly. On the opposite, inefficiency allocation of local public resources caused by distorting local decision-making will bring negative effects on economic growth. A general equilibrium model was established based on the framework of endogenous growth theories, to analyze these complicated effects. The conclusions showed that, as the proportion of poverty alleviation expenditure in the state-level governments increasing, the economic growth rate firstly increased, and then fell down ultimately. Numerical simulation also revealed a negative relationship between poverty alleviation proportion and fiscal decentralization rate. It is suggested that the efficiency improvement of local public resources allocation at practice would be urgent.

Keywords: Poverty Alleviation Programs; Fiscal Decentralization; Economic Growth; General Equilibrium Model

1 Introduction

Sine 1980's, Chinese governments started a plan to alleviate poverty by giving transfer payments from the state-level government to the local-level governments, attracting private investments to poor provinces, subsidizing specific industries in selected counties and areas. During the period of the "*Eight-Seven Plan*" in 1990's, the state had transferred 5 to 7 percent of annual budget to local governments for poverty alleviation efforts [1]. Then it was increased year by year, from 12.8 billion yuan in 2001 to 34.9 billion yuan in 2010, up to 204.4 billion yuan during the last decade of the 20th century. According to NBSPRC [2], the poorest counties in the central and west China had received nearly 50 million yuan respectively per year. These huge transfer payments aiming at poverty alleviation will still continue during a new round of program period, said from 2013 to 2017, with some new accompanied methods to increase personal incomes of the poor. Some papers evaluated the effects of this poverty alleviation program by estimating poverty reduction in China. It is estimated that, from 1994 to 2000, the average rural impoverished population decreased 500 to 800 million per year [3]. Under the current poverty standard, which is equivalent to 1 U.S. dollars a day, the impoverished population in rural areas accounted for 10.2 percent of the country's total rural population in 2014, 2.5 percentage points lower than in 2011. However, the poor population declined, but it was not completely the policy effect of poverty alleviation programs. Kraay [4] decomposed the factors associated with poverty alleviation. His empirical study showed that 70 percent of short-term poverty alleviation and 95 percent of long-term poverty declining were contributed by economic growth. That means the poverty alleviation expenditures would go through growth of the output for arriving at poverty declining.

There is inconsistence among studies on poverty alleviation programs and economic growth. Some empirical studies revealed positive relationships between poverty alleviation programs and economic growth [5,6]. Others noticed the negative effect of targeted poverty alleviation programs on efficiency because of local governments' lack of financial autonomy [7-9]. Our study begins from the microscopic effect of the poverty alleviation program on the local public resources allocation, which was exploded in section II. On one hand, the programs provided funds to local governments to provide public services or improve the income of the poor people, which will decrease the poverty population directly. On the other hand, the targeted poverty alleviation programs will distort the decision-making of local governments to bring about inefficiency, such as illegal use of targeted project funds reported by newspapers. Then, there are both positive and negative associations between poverty alleviation expenditures and economic growth. We established an endogenous growth model with considering inefficiency allocation of local public resources in section III. Our model could avoid the deviation and inconsistence problems produced by new-classical models [10]. In section IV, our comparative analysis showed that fiscal decentralization was important when we wanted to say how poverty alleviation programs influence economic growth. And a numerical simulation demonstrated a clearer relationship of this relationship on section V. Section VI concluded the paper.

* ***Corresponding author's*** e-mail: lunalaiyue@163.com

2 Inefficiency of Local Public Resources Allocation

Theories of collective fiscal decisions [11] implied that governments were similar to rational individuals when they have to decide how much should be transferred from higher level governments to a lower one. If local governments always respond to local preferences and there are no restrictions on local expenditures, transfer payments would be efficiently allocated and it would be a Pareto improvement. While, targeted poverty alleviation payments are restricted on specific areas and with cumbersome restrictions on expenditure, deviation from local preferences may occur and produce inefficiency. Program funds may be abused for other more urgently needs in the short term, such as administrative expenses. Gamkhar & Oates [12] notices this phenomenon and called it 'the flypaper effect'.

At practice, there are three performances associated with the flypaper effect. Firstly, targeted poverty alleviation funds were restricted by the higher government and may not respond to local preferences, or may respond the preferences that were outdate because of policy lag. In China, province-level governments should applied to the state government for poverty alleviation transfers before a half or a whole year, and then allocated the program funds to city-level and county-level governments according to their approved projects. Some artificial projects and exaggerated project sums were reported by newspapers, because of transfer competition of lower-level governments, which would bring preference deviations further.

The second problem was brought by the budget constraints softening. Poverty alleviation transfers were received every year by specific poor counties, which would weaken those county-level governments' autonomy. Furthermore, since assistance maintained, there would be no reason to solve the problem of fiscal deficit. Those poor counties would be still poor.

The last problem related to intentional avoidance of similar expenditures. A provided targeted poverty alleviation programs means enough funds were ready for specific expenses and no need of more fiscal funds. Local governments would intentionally avoid similar expenditures when they could sign the checks by themselves. That would bring about the increasing of administrative expenses.

The above effects brought inefficiency of local public resources allocation, which may negatively associated with economic growth. Indeed, there may be two-way transmitting effects between poverty alleviation expenditures and economic growth. If local public services were inadequately provided because of the flypaper effect, a further demand of transfer payments would constant.

3The Basic Model

3.1 GOVERNMENT STRUCTURES

Our model has extended from Barro and Xie *etc* [13-15]. In a closed economy with only two-level governments, the state-level and the local-level, government expenditures are supposed to maximize the consumer welfare, which are divided consequently into those from the state-level government and from the local-level governments, *f* denoted the former and *S* the latter. The governments of two levels share the total tax, which is a proportion of the output and denoted by τ . A proportion of total tax, ϕ in equation (2), goes to the local-level government and the left goes to the state-level governments. This shared ratio of local-level government would be considered as fiscal decentralization ratio as well. Furthermore, a poverty alleviation payment will be given by the state-level government to the local-level government, as the proportion of state-level government expenditures, denoted by θ . Then a balanced budget requires

$$g = f + s = \tau y \tag{1}$$

The budget constraint of the state-level government is

$$f = (1-\theta)(1-\phi)\tau y \tag{2}$$

and of the local-level government is

$$s = [\phi + \theta(1-\phi)]\tau y \tag{3}$$

with $\phi \in [0,1]$, $\theta \in [0,1]$ satisfied.

3.2 THE BEHAVIOR OF CONSUMERS

An infinitely lived consumer consumes products and services provided by individuals and governments at a given time to maximize its lifetime utility. The consumer's lifetime utility function takes the form as

$$U = \int_0^\infty u(c, f, s)e^{-\rho t}dt \tag{4}$$

$u(c, f, s)$ in equation (4) is the instantaneous utility function of identical consumers. $0 < \rho < 1$ is the discount rate. For simplicity and without loss of generality, let

$$u(c) = \ln c + \sigma_1 \ln f + \sigma_2 \ln s \tag{5}$$

here σ_1 and σ_2 are nonnegative parameters.

Suppose the population and the technology are constant, production in the economy is a CES function of private investment *k* and government expenditure *g* as

$$y = f(k,g) = [\alpha k^{-\zeta} + \beta g^{-\zeta}]^{-1/\zeta} \tag{6}$$

In equation (6), α and β denote the contribution rate of private investment and total government expenditures to the output, respectively. And $\varsigma \geq -1$ is satisfied for guaranteeing the outcome of the model.

In our model, we consider local public resources inefficiency as an inefficiency variable *A*. According to Battese & Coelli (1995), inefficiency could be taken as the opposite of Pareto improvement, which usually caused by technical progress. Then we extended expression (6) as

$$y = f(k, f, s) = A[\alpha k^{-\zeta} + \beta f^{-\zeta} + \gamma s^{-\zeta}]^{-1/\zeta} \quad (7)$$

here, $\alpha + \beta + \gamma = 1$ guarantees an economy of constant returns to scale (CRS) and $\zeta \geq -1$ as well. It is noticed that variable A in expression (7) associated with the output at the similar but on the opposite way. That means, as A increases, the economy performs as declining returns to scale. We could consider this inefficiency variable as 'negative technology'.

3.3 THE BALANCED GROWTH PATH

Given expressions (1)- (7), we calculate the investment accumulation function as

$$\dot{k} = (1-\tau)y - c \quad (8)$$

Consumers will maximize his utility function (4) subject to the production function (7) and private investment growth constraints (8). Constructing relevant Hamilton function of this model as

$$H = u(c) + \lambda\dot{k} = (\ln c) + \lambda[(1-\tau)y - c] \quad (9)$$

subject to the three conditions:

$$c^{-1} = \lambda$$

$$\dot{\lambda} = \rho\lambda - \lambda A\alpha(1-\tau)(\alpha k^{-\zeta} + \beta f^{-\zeta} + \gamma s^{-\zeta})^{-(1+\zeta)/\zeta} k^{-\zeta-1}$$

$$\lim_{T\to\infty} K(T)\lambda(T) = 0 \quad (10)$$

Equations (9)-(10) will provide a constant growth rate on the balanced growth path, i.e. the steady-state growth rate, as

$$G = \frac{\dot{c}}{c} = A\alpha(1-\tau)\{\frac{\alpha\tau^{\zeta}}{\tau^{\zeta} - \{\beta[(1-\theta)(1-\phi)]^{-\zeta} + \gamma[\phi + \theta(1-\phi)]^{-\zeta}\}}\}^{(1+\zeta)/\zeta} - \rho \quad (11)$$

4. Impact of Poverty Alleviation Programs on Economic Growth

4.1 TRANSFER PAYMENTS FROM THE STATE-LEVEL GOVERNMENT TO THE LOCAL-LEVEL GOVERNMENT

For simplicity and without loss of generality, we used a Cob-Douglas production function to analyze the impacts of poverty alleviation programs on economic growth. That was equivalent as $\zeta \to 0$ in expression (6). Then we could simplify expression (11) as

$$G = A\alpha(1-\tau)\tau^{(1-\alpha)/\alpha}\{[(1-\theta)(1-\phi)]^{\beta} + [\phi + \theta(1-\phi)]^{\gamma}\}^{1/\alpha} - \rho \quad (12)$$

As mentioned above, θ denoted the proportion of poverty alleviation transfers in state-level government expenditures. Change this fiscal decentralization rate will have an impact on the steady-state growth rate G. Differentiating both parts of expression (12) with respect to θ and evaluating the resulting expression at $\partial G/\partial\theta = 0$ yields

$$\theta^* = [\frac{\gamma}{\beta}(1-\varphi)^{(\gamma-\beta)}(1-\theta^*)^{(1-\beta)}]^{1/(1-\gamma)} - \frac{\varphi}{(1-\varphi)} \quad (13)$$

Equation (13) demonstrates that the optimal proportion of poverty alleviation transfers in the state-level expenditures, denoted by θ, should be a function of fiscal decentralization rate, denoted by ϕ, between governments.

The impact of a change of poverty alleviation proportion has two opposite effects on the long-run economic growth. Increasing this proportion providing more local expenses, this increased the output as a result. On the other hand, increasing this proportion brought local public resources allocation inefficiency, the output went down. When the poverty alleviation proportion is small, a positive effect is greater, an increasing proportion would drive up the economic growth rate; while the proportion is large enough, a negative effect is greater, an increasing proportion would drive down the economic growth rate.

This impact effect are showed in Figure 1.When the poverty alleviation proportion decreases till $\theta < \theta^*$, The steady-state growth rate will also decreases; while when the proportion increases till $\theta > \theta^*$, the steady-state growth rate will still decreases.

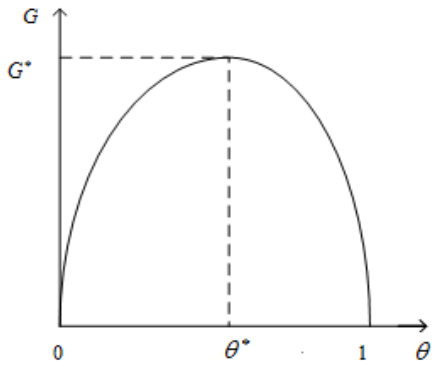

FIGURE 1 The impact of poverty alleviation proportion on economic growth

4.2 THE TRANSFER PAYMENTS BETWEEN LOCAL--LEVEL GOVERNMENTS

Besides the longitudinal transfers from the state-level government to the local-level governments, there are transfers aiming at poverty alleviation between local governments. Usually, provinces in the East China with higher level of economic growth should give a sum of aids to those poor provinces in the central or west China. We showed this compact on economic growth by extending our basic model to an economy including a state-level government and two local-level governments. One of the local governments is located in the rich area and the other is located in a poor one. We denoted the government

expenditures as *f* for the state-level governments, s_1 for the rich local government, and s_2 for the poor one. Then we

$$y = f(k, f, s) = A[\alpha k^{-\zeta} + \beta f^{-\zeta} + \gamma_1 s_1^{-\zeta} + \gamma_2 s_2^{-\zeta}]^{-1/\zeta} \quad (14)$$

In expression (14), $\alpha + \beta + \gamma_1 + \gamma_2 = 1$ is still satisfied to guarantee an economy of constant returns to scale and $\zeta \geq -1$ as well. A balanced budget requires

$$g = f + s_1 + s_2 = \tau y \quad (15)$$

$$f = (1-\theta)(1-\phi_1-\phi_2)\tau y \quad (16)$$

$$s_1 = \phi_1(1-\varepsilon)\tau y \quad (17)$$

$$s_2 = [\phi_2 + \theta(1-\phi_1-\phi_2) + \varepsilon\phi_1]\tau y \quad (18)$$

As the above, θ denotes as fiscal decentralization ratio. ϕ_1 and ϕ_2, denote the fiscal decentralization ratio change expression (7) to

of the rich local-level government and the poor one respectively. Another parameter here, ε, with $\varepsilon \in (0,1)$ satisfied, denotes the proportion of the aid transfers aiming at poverty alleviation from the rich local-level government to the poor one. Giving the consumer's utility function still as expression (4) and (5), constructing relevant Hamilton function and simply calculation showed the steady-state economic growth is as

$$G' = \frac{\dot{c}}{c} = A\alpha(1-\tau)\{\frac{\alpha\tau^{\zeta}}{\tau^{\zeta} - \{*\}}\}^{(1+\zeta)/\zeta} - \rho, \quad (19)$$

here the expression (19) satisfies

$$\{*\} = \beta[(1-\theta)(1-\phi_1-\phi_2)]^{-\zeta} + \gamma_1[\phi_1(1-\varepsilon)]^{-\zeta} + \gamma_2[\phi_2 + \theta(1-\phi_1-\phi_2) + \varepsilon\phi_1]^{-\zeta} \quad (20)$$

With the simplicity of using Cob-Douglas production function, differentiating both parts of expression (19) with respect to ε and evaluating the resulting expression at $\partial G/\partial\varepsilon = 0$ yields

$$\varepsilon^{\bullet} = (\frac{\gamma_2}{\gamma_1})^{1/(1-\gamma_2)}[\phi_1(1-\varepsilon^*)]^{(1-\gamma_1)/(1-\gamma_2)} - \phi_2 - \theta(1-\phi) \quad (21)$$

Equation (21) expresses the optimal proportion of aid transfer funds from rich local-level government to the poor one, which was the function of variable θ, ϕ , ϕ_1 and ϕ_2. A more careful consideration of equation (21) shows that, if the government expenditure contribution of the poor province, denoted as γ_2, was less than that of the rich province, denoted as γ_1, and if the fiscal decentralization rates are the same, that means $\phi_1 = \phi_2$ in equation (21), the optimal proportion of the aid transfer funds would be negative. Under the condition of a negative optimal proportion, steady-state economic growth will decrease as ε increases. At practice, there is highly probable that poor provinces contribute less than rich provinces; funds transferred from an efficient area to an inefficient area would drive down economic growth.

4.3 LOCAL PUBLIC RESOURCES ALLOCATION INEFFICIENCY

Differentiating both parts of expression (11) with respect to *A* and holding $\tau \in [0,1]$ will be

$$\frac{\partial G}{\partial A} = \alpha(1-\tau)\{\frac{\alpha\tau^{\zeta}}{\tau^{\zeta} - \{\beta[(1-\theta)(1-\phi)]^{-\zeta} + \gamma[\phi + \theta(1-\phi)]^{-\zeta}\}}\}^{(1+\zeta)/\zeta} \quad (22)$$

Considering using Cob-Douglas production function to simplify the calculation, that was equivalent to let $\zeta \to 0$, the right hand sideof equation (22) will be

$$RHS = \alpha(1-\tau)\tau^{(1-\alpha)/\alpha}\{[(1-\theta)(1-\varphi)]^{\beta} + [\varphi + \theta(1-\varphi)]^{\gamma}\}^{1/\alpha} \quad (23)$$

A simply inspection will tell us that the expression (23) is nonnegative. That means the economic growth will increase when local public resources allocation decreases.

5 Numerical Simulation

We provided a numerical simulation in this section for looking this problem more clearly. Considering general conditions, we nominate the parameters in our basic model as $\alpha = 0.6$, $\beta = 0.2$ and $\gamma = 0.2$. Then we could demonstrate the relationship between the poverty alleviation proportion of the state-level government and the fiscal decentralization rate. A simple calculation of equation (12) show that

$$\theta^* = \frac{1}{2}(1 - \frac{\varphi}{1-\varphi}) \quad (24)$$

Figure 2 demonstrates the decreasing relationship between poverty alleviation proportion, denoted as θ, and fiscal decentralization rate, denoted as ϕ. The horizontal axis demonstrates the fiscal decentralization rate, and the vertical axis demonstrates the optimal poverty alleviation proportion. Our simulation pointed out that, with the nomination of parameters, the optimal poverty alleviation proportion should decrease as fiscal decentralization rate increases. The extremely point would be zero, when the fiscal decentralization rate would be at a high level. As we mentioned above, the impact of a change of poverty

alleviation proportion has two opposite effects on the long-run economic growth. Increasing this proportion providing more local expenses, this increased the output as a result. On the other hand, increasing this proportion brought local public resources inefficiency, the output went down. When the state decentralized more to local governments, more poverty alleviation funds would bring a great degree of local public resources inefficiency. In another word, because of a greater negative effect caused by targeted poverty alleviation programs, the optimal proportion should be lower.

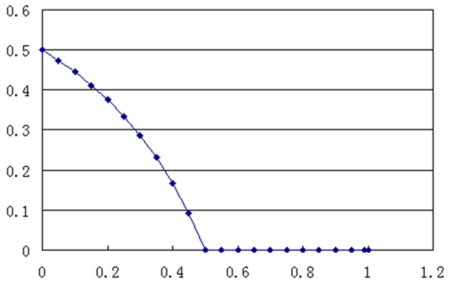

FIGURE 2 The relationship between poverty alleviation proportion and fiscal decentralization rate

6 Conclusions

In our basic model, two levels of governments contributed to the output, as well as poverty alleviation transfers from the state-level government to the local-level government going into a CES production function. Comparative static analysis showed that, on the balanced growth path, there was an "Inverted U-shaped" relationship between the poverty alleviation proportion in the state government expenditures and the long-run economic growth. Transfers between local governments for poverty alleviation would be negative to economic growth. And, local public resources allocation inefficiency would be measured as negative to economic growth. Meanwhile, our numerical simulation showed a decreasing relationship between poverty alleviation proportion and fiscal decentralization rate.

Acknowledgment

This work was supported by the Guangxi Philosophy and Social Science Foundation (Approved No: 13BJY030): A Study on the Fiscal Supply Efficiency on Fundamental Public Health Services in Rural Guangxi Province and Guangxi Colleges and Universities Research Foundation (Approved No: 200103YB104): A Study on the County-level Economic Growth in China with Fiscal Incentives and Guangxi University of Science and Technology Research Foundation for Doctors (Approved No: 11S02).

References

[1] Wang, S. *etc*. 2004. The 'Eight-Seven Plan for Poverty Alleviation': National Strategy and Its Impact. *Proceedings of Poverty Conference in Shanghai.*
[2] National Bureau of Statistics of the People's Republic of China, 2009, *Report of Rural Poverty in China: 2008. Beijing: China Statistics Press.*
[3] Zhang, L 2007 *Policy Evolution of Poverty Alleviation and Development in China: 1949-2005*, Beijing: China Financial & Economic Publishing House
[4] Kraay, Aart. 2006 When is growth pro-poor? Evidence from a panel of countries *Journal of development economics* **80**(1), 198-227.
[5] Liu, D 2001 An Empirical Study on the Effect of the Poverty Alleviation through Development in China. *Management World* (6), 123-131.
[6] Park, A., & Wang S. 2010 Community-Based Development and Poverty Alleviation: An Evaluation of China's Poor Village Investment Program *Journal of Public Economics*, (94), 790-799.
[7] Audibert, M. 1997 Technical Inefficiency Effects among Paddy Farmers in the Villages of the 'Office du Niger', Mali, West Africa *Journal of Productivity Analysis* **8**(4), 379-394.
[8] Stine, W. 1994 Is Local Government Revenue Response to Federal Aid Symmetrical? Evidence from Pennsylvania County Governments in an Era of Retrenchment, *National Tax Journal*(47), 799-816.
[9] Chen, S. & Zhang, J. 2008 A Study on the Efficiency of local governments Expenditures in China: 1978-2005. *China Social Science* (4), 65-78.
[10]Pope, R. & Chavas J. 1994 Cost Functions under Production Uncertainty, *American Journal of Agricultural Economics*, (76), 196-204.
[11]Bradford, D. & Oates W. 1971 the Analysis of Revenue Sharing in a New Approach to Collective Fiscal Decisions *Quarterly Journal of Economics* **85**(3), 416-439.
[12]Gamkhar, S. & Oates W. 1996 Asymmetries in the Response to Increases and Decreases in Intergovernmental Grants: Some Empirical Findings *National Tax Journal* (49), 501-512.
[13]Barro,R. 1990 Government Spending in a Simple Model of Endogenous Growth *Journal of Political Economy* (98), 103-125.
[14]Xie, D., Zou, H. & Davoodi 1999 Fiscal Decentralization and Economic Growth in the United States, *Journal of Urban Economics* 45, 228-239.
[15] Gamkhar, Shama, and Anwar Shah. 2007 The Impact of Intergovernmental Fiscal Transfers: A Synthesis of the Conceptual and Empirical Literature", in Boadway, R. , and A. Shah(eds.), *Intergovernmental fiscal transfers: principles and practice*, 225-258.

Authors

< Yue Lai >, <1981.01>,< Liuzhou City, Guangxi Province, P.R. China >

Current position, grades: the lecturer title of School of Finance and Economics, Guangxi University of Science and Technology, P.R.China
University studies: received her B.A. in Finance from Wuhan University in China. She received her M.Ec. and Ph. D in Economics from Wuhan University in China.
Scientific interest: Her research interest fields include the Fiscal Decentralization Theory, the Incentive Theory
Publications: more than 15 papers published in various journals.
Experience: She has teaching experience of11 years, has completed two scientific research projects.

< Tian-zhu Cheng >, <1979.02>,< Huozhou City, Shanxi Province, P.R. China >

Current position, grades: the lecturer title of School of Finance and Economics, Guangxi University of Science and Technology, P.R.China
University studies: received his B.A of Law from University of Electronic Science and Technology of China. He received his Master of Law from China University of Political Science and Law.
Scientific interest: His research interest fields include Law and Economics, the Corruption Theory.
Publications: more than 15 papers published in various journals.
Experience: He has teaching experience of14 years, has completed two scientific research projects.