

Dynamic Analysis of Endogenous Growth Models with Fiscal Decentralization and Local Government Debt

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Abstract. The government debt issues have received extensive attention around the world. Basing on endogenous growth theory, this study uses the Hamilton function method to obtain the explicit solution of fiscal revenue decentralization, fiscal expenditure decentralization, and local government debt. Through partial derivative, our findings demonstrate the following: fiscal revenue decentralization has a negative effect on local government debt; fiscal expenditure decentralization has a positive effect on local government debt. Finally, policies and recommendations are proposed.

Introduction

After the tax reform was carried out in 1994, China has taken a step towards a more formal and rational fiscal system, financial constraints of central government have been lifted [7]. The mismatch of financial and administrative powers can easily lead to financial constraints and debt growth of local government and therefore the match of these powers is one of the important means to solve the local government debt crisis, and also have received high priority from the Chinese central government. The central government clearly puts forward the establishment of a system in which the government's administrative authority is commensurate with its spending responsibility a top priority for deepening the reformation of tax system in the reformation of tax system program. Accordingly, this study introduces local government debt into the theoretical model to deeply discuss the relationship between local government debt and fiscal decentralization, which is compatible with the urgent need of the realistic development.

The conclusions of overseas studies about the relationship between fiscal decentralization and local government debt are divided into the two views: fiscal decentralization leads to the decline of the budget deficit [1, 2], and fiscal decentralization leads to the expansion of the fiscal deficit scale [3, 4]. Research conclusions of the positive relationship between fiscal decentralization and local government debt are found in a few Chinese scholars' studies. For example, [5] find a higher the degree of fiscal decentralization means a greater local government debts scale. [6] also find a higher the degree of fiscal decentralization means a greater per capita city construction investment debt scale. There are many domestic scholars' researches about the causes of local government debts. Much of the literature has found the mismatch of fiscal power and administrative authority of local government is the main reason for the formation of local government debt. For a research of the results concerning these issues, see [7, 8]. Others believe that the mismatch of fiscal power and administrative authority fails to explain the expansion of the fiscal deficit scale. The representative

researchers are [9, 10]. Existing academic research mainly focuses on empirical researches, but the research about the relationship between fiscal decentralization and local government debt combined with endogenous growth model is still lacking.

Comparing to the previous literature, the innovation of this paper lies in this aspect: the study obtains the explicit solution of fiscal decentralization and local government debt through the Hamilton function method under the framework of endogenous growth theory.

Models

Fiscal revenue decentralization and local government debt

The production function is composed of the stock of material capital k and government expenditure g . The production function is of Cobb Douglas type. The production function y is

$$y = f(k, g) = Ak^a g^b. \quad (1)$$

Where A denotes the technical progress rate, a, b denote the elasticity coefficient of physical capital and government expenditure, and $a + b = 1$.

Suppose factor markets are perfectly competed. From Eq. 1, we can get conditions of profit maximization:

$$\begin{cases} r = Aak^{a-1}g^{1-a} \\ w = A(1-a)k^a g^{-a} \end{cases} \quad (2)$$

Where r is the rate of return, w is the real wage.

We assume U is discounted total utility, $U(c_t, g_t)$ denotes the instantaneous utility function of benefits each time, C denotes the representative households' consumption. r denotes the rate of time preference, which is a constant. Consumers unlimited life utility maximizes their lifetime, thus the maximized utility function is

$$\Omega = \max \int_0^{\infty} e^{-r(t)} U(c, g) dt. \quad (3)$$

Where $U(c, g) = \frac{c^{1-s} - 1}{1-s} + \frac{g^{1-s} - 1}{1-s}$, s denotes the coefficient of relative risk aversion.

The dynamic accumulation equation of physical capital is

$$\dot{k} = rk + w - c - g. \quad (4)$$

Government budget constraint is

$$\dot{b} = rb + g - T. \quad (5)$$

Where b denotes local government debt stock, T indicates fiscal revenue. This study refers to the research of [11]: local government revenue is adopted from tax and transfer payments z from the central government. We assume that the local government's tax revenue is mainly from physical capital k . There is no personal income tax consideration, the tax revenue sharing rate of local and central government is x , namely, fiscal revenue decentralization. From this local government revenue can be expressed as $xk + z$. From Eq. 5, we have

$$\dot{b} = rb + g - xk - z. \quad (6)$$

In summary, the representative households' decision problem is a dynamic optimization problem based on the consumption level. The optimal growth problem is

$$\left\{ \begin{array}{l} \max \int_0^{+\infty} U(c, g) e^{-rt} dt \\ s.t. \quad \dot{k} = rk + w - c - g \\ \quad \quad \dot{b} = rb + g - xk - z \end{array} \right. \quad (7)$$

If $W = b + k$, $\dot{W} = rW + w - c - xk - z$. In Eq. 7, the pertinent Hamiltonian to be maximized by the social projector at each point of time is given by

$$H = U(c, g) + I(rW + w - c - xk - z). \quad (8)$$

In Eq. 8, I is the Hamilton multiplier. With the first-order optimality condition, we obtain

$$\left\{ \begin{array}{l} \frac{\partial H}{\partial c} = U'(c, g) - I = 0 \\ \frac{\partial H}{\partial W} = I r = I r - \mathbf{\&} \end{array} \right. \quad (9)$$

Using Eq. 9, we obtain the economic growth rate on the equilibrium path:

$$g_c = \frac{\dot{c}}{c} = \frac{r - r}{s}. \quad (10)$$

Using Eq. 6, we have

$$\frac{\dot{b}}{b} = r + \frac{g - xk - z}{b}. \quad (11)$$

Basing on balanced economy, we have $\frac{\dot{c}}{c} = \frac{\dot{b}}{b}$. Using Eqs. 10 and 11, we get

$$b = \frac{g - xk - z}{g_c - r}. \quad (12)$$

From Eq. 12, this study has built the basic theoretical framework of the effect of fiscal revenue decentralization on local government debt. According to the results of derivation, fiscal revenue decentralization has a negative effect on local government debt (when $g_c > r$) because it reflects the self-interest of local governments [12]. These local governments have a strong incentive to put financial resources into economic construction to obtain higher fiscal revenues resulting in ensuring that the revenue is higher than the expenditure, which leads to the decline of local government debt.

Fiscal expenditure decentralization and local government debt

According to the research of [13], the production function is composed of the stock of material

capital k , fiscal expenditure of central government f , and fiscal expenditure of local government s . The production function is of Cobb Douglas type. The production function y is

$$y = f(k, f, s) = Ak^a f^b s^g. \quad (13)$$

Where a, b, g denote the elasticity coefficient, and $a + b + g = 1$.

The new maximized utility function is

$$\Omega = \max \int_0^{\infty} e^{-r(t)} U(c, f, s) dt. \quad (14)$$

$$\text{Where } U(c, f, s) = \frac{c^{1-s} - 1}{1-s} + \frac{f^{1-s} - 1}{1-s} + \frac{s^{1-s} - 1}{1-s}.$$

The new government budget constraint is

$$\dot{b} = rb + s - T. \quad (15)$$

Through constructing Hamilton function, we can have the equilibrium growth rate of economic

$$g_c = \frac{\dot{c}}{c} = \frac{r - r}{s}. \quad (16)$$

Using Eqs.15 and 16, we have

$$b = \left[(1-s) a A \left(\frac{k}{g} \right)^{a-1} \left(\frac{f}{g} \right)^b \left(\frac{s}{g} \right)^g - r \right]^{-1} (s-T)s. \quad (17)$$

From Eq. 17, this study has constructed the basic theoretical framework of the effect of fiscal expenditure decentralization (s/g) on local government debt b . According to the results of derivation, fiscal revenue decentralization has a positive effect on local government debt (when $s > T$) because it reflects the altruistic effect of local governments on fiscal expenditure. These local governments consider livelihood issues. Their gain is limited by the premium, and financial deficit may occur. This brings about the rise of local government debt.

Conclusions and suggestions

This article studies the relationship between fiscal decentralization and local government debt under the framework of endogenous growth theory, and obtains the explicit solution of fiscal decentralization and local government debt through the Hamilton function method. Through the partial derivative, the authors find that fiscal revenue decentralization has a negative effect on local government debt; fiscal expenditure decentralization has a positive effect local government debt.

According to the empirical results, this paper puts forward the following policies and recommendations: First, the Chinese government should adjust and optimize the financial autonomy of the central government to the local government to improve China's decentralization system, which achieves the purpose of reducing local government debt. Second, Local governments of highly fiscal expenditure decentralization should put fiscal expenditure into infrastructure, and these of highly fiscal revenue decentralization should put fiscal expenditure into livelihood under the guidance of central government, thus promoting the decline of local government debt.

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