E C O N O M I C S   B U L L E T I N

Vertical intergovernmental relationship and economic growth

Yutaro Murakami
Graduate School of Economics, Osaka University

Abstract

This paper constructs a multi−region endogenous growth model with productive government spending to examine vertical intergovernmental relationship. Specifically, we analyze the contribution of fiscal decentralization on the optimal tax rates of national and local taxes and on the economic growth rate. In this model, when the behavior of the governments is taken into consideration, the national tax rate results in an overtaxation and the local tax rate results in an undertaxation compared to the optimal tax rates. In this case, promoting fiscal decentralization increases economic growth. This result is consistent with Oates' claim and with the results of recent studies about the decentralization effect on economic growth.

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1 Introduction

As Oates (1993) claimed that "The basic economic case for fiscal decentralization is the enhancement of economic efficiency: $\cdots$ Although this proposition has been developed mainly in a static context, the thrust of the argument should also have some validity in a dynamic setting of economic growth", it is of main interest here of how fiscal decentralization affects economic welfare and growth. Actually, there have been many theoretical studies about the fiscal decentralization in a static model. Furthermore, since the latter half of the 1990s, there have been many studies about fiscal decentralization in a dynamic model. However, they are hardly any theoretical studies.

There are two representative studies, Davoodi and Zou (1998) and Xie et al. (1999), which theoretically analyze fiscal decentralization and economic growth.[1] They have extended Barro (1990) and have introduced two or more types of public spending into the production function.[2] They define the local government spending share as the indicator of fiscal decentralization, and show the existence of a growth maximizing share of local government spending.

However, their theoretical models are partially insufficient. First, they don't consider the behavior of each government. If the behavior of governments is considered, it can be verified whether the equilibrium solution corresponds to the optimal solution. Second, their theoretical results are partly inconsistent with the recent empirical results and Oates' claim that imply a positive relationship between fiscal decentralization and economic growth.[3] In fact, Davoodi and Zou (1998) pointed out that "Our measure of fiscal decentralization, which is the subnational government share of total government share, may not reflect the subnational government's autonomy in expenditure decision-making."

Therefore, the purpose of this paper is to develop a decentralization indicator and to investigate the relationship between fiscal decentralization and economic growth, considering the behavior of each government. Specifically, we extend Barro (1990) to a multi-region version and to a model that the central and local governments respectively impose different taxes.[4] We also consider a transfer from the central government to the local government, and define the financial dependency of the local government to the central government as an indicator of fiscal decentralization.

The remainder of this paper is organized as follows. The basic model is presented in Section 2. Section 3 shows the optimal tax rates. Section 4 examines the equilibrium tax rate as a result of each government's behav-

[1] Devarajan et al. (1996) has a similar model structure to them, although the sprits of them are different.

[2] Barro (1990) first formulated an endogenous growth model that incorporated public services as a productive input into private production. Since Barro (1990), many theoretical researchers have developed Barro's model (e.g., Barro and Sala-i-Martin (1992), Futagami et al. (1993), Glomm and Ravikmar (1994) and Turnovsky (1996)).

[3] There are many recent empirical studies that show the positive relationship between the fiscal decentralization and economic growth (e.g., Lin and Liu (2000), Akai and Sakata (2002), Stansel (2005), and Iimi (2005)).

[4] The model that extends Barro (1990) to two or multi-region is Murakami (2005a), etc.

ior and how promoting decentralization affects economic growth. Section 5 concludes the paper.

2 The Model

We present the basic structure of the model. There are n regions in this economy. The economy has a central government which supplies national public goods that enhance productivity. The local governments exist in each region one by one and supply local public goods that enhance productivity. We assume that capital and labor are both perfectly mobile.
Firms. Following Davoodi and Zou (1998), production function in each region takes the Cobb-Douglas form, that is

$$Y_i = K_i^{\alpha} G_i^{\beta} G^{\gamma}, \quad \alpha > 0, \ \beta > 0, \ \gamma > 0, \quad \alpha + \beta + \gamma = 1, \tag{1}$$

where Y_i is output in region i, K_i is physical capital, G_i is local government spending, and G is central government spending.[5] We normalize the labor population to one. α, β, and γ represent the elasticity of output to physical capital, local government spending, and central government spending, respectively.

By taking the price of the goods as a numeraire, from the profit maximization problem of competitive firms, the rent on capital r_i and the wage in region i are expressed as follows:

$$r_i = \alpha \frac{Y_i}{K_i}, \quad w_i = (1-\alpha) Y_i. \tag{2}$$

Households. We assume that many identical households exist in each region and that they provide their assets and one unit of labor inelastically. The objective function of the representative household in region i takes the constant relative risk aversion form:

$$\int_0^{\infty} \ln C_i e^{-\rho t} dt, \tag{3}$$

where C_i is the per capita consumption and ρ is the constant rate of time preference which is assumed to be a positive constant.

Due to perfect capital mobility, $r_i = r_j$ for all i, j must always hold excluding the cases of corner solutions. Thus, the flow budget constraint of the household is

$$\dot{A}_i = (1 - \tau_c - \tau_l)(r A_i + w_i) - C_i, \tag{4}$$

where A_i, τ_c and τ_l denote the asset per capita in region i, the flat-rate national tax, and the flat-rate local tax, respectively. Although τ_c and τ_l are

[5]We omit the time subscript throughout this paper, unless there is confusion.

supposed to be different each other, τ_l imposed in each region is equal from the assumption of the symmetry of regions.[6] Given the amount of initial holdings $A_i(0) > 0$, the representative household maximizes (3) subject to (4). By assuming that the household is endowed with perfect foresight, the optimal consumption path and the transversality condition are given by

$$\frac{\dot{C}_i}{C_i} = (1 - \tau_c - \tau_l)r - \rho, \quad \lim_{t\to\infty} \lambda_i(t)A_i(t)e^{-\rho t} = 0, \tag{5}$$

where λ is the co-state variable of A_i.

Governments. The central government collects taxes from individuals in every region, partially transfers them to the local government, and supplies productive national public goods. The local government collects taxes from individuals in the region, receives a transfer from the central government, and supplies productive local public goods. Assuming a balanced budget, the governments' budget constraints are expressed as

$$G = \tau_c \sum_{i=1}^{n} Y_i - \sum_{i=1}^{n} T_i, \quad G_i = \tau_l Y_i + T_i, \tag{6}$$

where T_i is the transfer from the central government to the local government. Assuming that the transfer takes the form of a proportion of the difference between a target revenue and the real revenue, T_i is

$$T_i = \theta(\bar{\tau}_l \bar{Y} - \tau_l Y_i), \tag{7}$$

where θ, $\bar{\tau}_l$, and $\bar{Y}$ respectively denote the financial dependency to the central government ($0 < \theta < 1$), a target local tax rate, and an average output that satisfies $\bar{Y} = \sum_{i=1}^{n} Y_i/n$.[7] We define θ as an indicator of fiscal decentralization.[8] The more θ approaches 0, the more fiscal decentralization is promoted because the financial dependency to the central government decreases. Moreover, we assume the condition $\bar{\tau}_l > \tau_l$ in equilibrium. This assumption means that the local government receives the transfer in equilibrium, i.e., a negative transfer (transfer from the local government to the central government) is not considered.

Equilibrium. Next let us consider the equilibrium prices. According to (1), (2), (6) and (7), the rent on capital and the wage in equilibrium are expressed as follows:[9]

$$r(\tau_c, \tau_l, \theta) = \alpha n^{\frac{\gamma}{\alpha}} [\tau_l + \theta(\bar{\tau}_l - \tau_l)]^{\frac{\beta}{\alpha}} [\tau_c - \theta(\bar{\tau}_l - \tau_l)]^{\frac{\gamma}{\alpha}}, \quad w_i = \frac{1-\alpha}{\alpha} r(\tau_c, \tau_l, \theta) K_i. \tag{8}$$

[6] Neither an inter-regional competition nor a horizontal fiscal transfer is considered in this text at all.

[7] The equation (7) represents the transfer system which covers the deficiency of local tax resources. For example, Canada, Germany and Japan adopt the system similar to the equation (7).

[8] This indicator is similar to the autonomy indicator in Akai and Sakata (2002).

[9] For the detailed derivation of (8), see Appendix A.1.

Balanced Growth Path. We let g be the steady-growth rate on the balanced growth path. From (5) and (8), the steady-growth rate is characterized by

$$g(\tau_c, \tau_l, \theta) = (1 - \tau_c - \tau_l)r(\tau_c, \tau_l, \theta) - \rho. \tag{9}$$

In this model, the steady-growth rate depends on the national and local tax rates and the indicator of fiscal decentralization.

3 The Optimal tax rate

In this section, we consider the optimal tax policy of the governments. Although there are three policy variables of the governments, τ_c, τ_l and θ in this model, the indicator of fiscal decentralization θ is given to analyze the effect caused by promoting fiscal decentralization.

The optimal tax rates express the combination $(\tau_c,\ \tau_l)$ that satisfy the following problem.[10]

$$\frac{\partial g(\tau_c, \tau_l, \theta)}{\partial \tau_c} = 0, \quad \frac{\partial g(\tau_c, \tau_l, \theta)}{\partial \tau_l} = 0. \tag{10}$$

Thus, the optimal tax rates in this case, $(\tau_c^*,\ \tau_l^*)$, are given by[11]

$$(\tau_c^*,\ \tau_l^*) = \left(\gamma + \frac{\theta(\bar{\tau}_l - \beta)}{1-\theta},\ \frac{\beta - \bar{\tau}_l\theta}{1-\theta}\right). \tag{11}$$

To exclude the case that the transfer from the central government is negative, we need $\bar{\tau}_l > \tau_l^* \Leftrightarrow \bar{\tau}_l > \beta$.

According to (11), the optimal tax rates depend on θ. Furthermore, the optimal national tax rate is always positive. On the contrary, the optimal local tax rate may be negative depending on θ. Intuitively, if θ is large, there is a possibility that local public spending is excessively large because the transfer from the central government is large. In this case, the local government should give back to the individuals as a subsidy. The threshold value of θ whether the optimal local tax rate becomes negative is $\tilde{\theta} = \beta/\bar{\tau}_l$, that is, $\tau_l^* < 0$ if $\theta > \tilde{\theta}$ and $\tau_l^* > 0$ if $\theta < \tilde{\theta}$.

We now obtain the following proposition about the relationship between the optimal taxes and the indicator of fiscal decentralization.

Proposition 1. *The optimal tax rates of the national and local taxes depend on the indicator of fiscal decentralization. As fiscal decentralization promotes, the optimal tax rate of the national tax decreases and the optimal tax rate of the local tax increases.*

[10]Welfare maximizing policies correspond to growth maximizing policies in this model. See Murakami (2005b) for this proof.

[11]For the detailed derivation of (11), see Appendix A.2.

Proof. Differentiating (11) with respect to θ yields:

$$\frac{\partial \tau_c^*}{\partial \theta} = \frac{\bar{\tau}_l - \beta}{(1-\theta)^2} > 0, \quad \frac{\partial \tau_l^*}{\partial \theta} = \frac{\beta - \bar{\tau}_l}{(1-\theta)^2} < 0, \tag{12}$$

From (12), promoting fiscal decentralization (a decrease in θ) decreases the optimal national tax rate and increases the optimal local tax rate. □

An intuition of proposition 1 is as follows. In this model the optimal level of local and central public spending is achieved by local and national taxes and transfers from the central government. When fiscal decentralization is promoted, the local government increases the local tax rate to maintain the optimal level because the transfer from the central government has decreased. On the other hand, the central government decreases the national tax rate to maintain the optimal level because the transfer to the local governments has decreased.

We next analyze the relationship between the indicator of fiscal decentralization and economic growth. Substituting (11) into (5), we obtain

$$g[\tau_c^*(\theta),\ \tau_l^*(\theta)] = (1-\gamma-\beta)\alpha\beta^{\frac{\beta}{\alpha}}\gamma^{\frac{\gamma}{\alpha}} - \rho. \tag{13}$$

In (13), the steady growth rate is independent of the indicator of fiscal decentralization θ in the case that optimal tax rates are imposed. In other words, promoting fiscal decentralization doesn't affect economic growth in this case because the tax rates can be set by considering a change in θ.

4 The Behavior of Governments

In this section, we examine an equilibrium in which the behavior of central and local governments is taken into consideration. In the previous section, we didn't consider the behavior of governments. Therefore, it is very important to investigate whether the equilibrium tax rates correspond to the optimal tax rates.

Next we formulate the objective functions of the governments. The objective function of the local government is to maximize the utility function in the region given the budget constraint of the central government, that is,

$$\max_{\tau_l}\ g(\tau_c, \tau_l, \theta : G = \bar{G}). \tag{14}$$

The constraint of the local government means that each local government doesn't consider the effect to the budget of the central government because the number of the local governments is large. In other words, they think that the influence that their tax policies have on the budget of the central government is insignificant.[12]

[12] Due to this assumption, the policy of local government doesn't depend on that of the other local governments. Hence, the equilibrium tax rate doesn't change whether the local governments can coordinate in choosing τ_l or not. As mentioned above, we doesn't consider the horizontal intergovernmental relationship, so-called "tax competition".

On the other hand, the maximization problem of the central government can be formulated as follows:[13]

$$\max_{\tau_c} \; g(\tau_c, \tau_l, \theta). \tag{15}$$

We define the equilibrium tax rates as $(\tilde{\tau}_c,\ \tilde{\tau}_l)$, then we obtain:[14]

$$(\tilde{\tau}_c,\ \tilde{\tau}_l) = \left(1 + \frac{\bar{\tau}_l \theta}{1-\theta} - \frac{\alpha+\beta}{1-\beta\theta},\ \frac{\beta}{1-\beta\theta} - \frac{\bar{\tau}_l\theta}{1-\theta}\right). \tag{16}$$

From the relation between the optimal tax rates and the equilibrium tax rates, we can state the following proposition.

Proposition 2. *In the case that the behavior of each government is taken into consideration, the equilibrium national tax rate is excessively large, and the equilibrium local tax rate is excessively small compared to that of the optimal tax rates.*

Proof. We compare $(\tilde{\tau}_c,\ \tilde{\tau}_l)$ with $(\tau_c^*,\ \tau_l^*)$. First, from (11) and (16), we obtain the following relation with respect to the local tax:

$$\tau_l^* - \tilde{\tau}_l = \frac{\beta\theta(1-\beta)}{(1-\theta)(1-\beta\theta)} > 0.$$

Thus, the local tax rate is excessively small compared to the optimal tax rate. Next, we have the following relation with respect to the national tax:

$$\tau_c^* - \tilde{\tau}_c = \frac{-\beta\theta(\alpha\theta+\gamma)}{(1-\theta)(1-\beta\theta)} < 0.$$

Thus, the national tax rate is excessively large compared to the optimal tax rate.

□

Proposition 2 shows that the equilibrium tax rates don't correspond to the optimal tax rates. This distortion occurs from the fact that the local government doesn't consider the budget constraint of the central government and the transfer depends on the tax revenues of the local government. Although an increase of the local tax brings benefits in an increase in the central public spending through a decrease in the transfer, the local government undervalues the benefits of a tax increase. On the other hand, although the behavior of the central government has no distortion, the national tax rate

[13]The solution doesn't change even if the central government considers the budget constraint of the local government or takes it as given because the budget constraint of the local government is unaffected by the change in the national tax.

[14]For the detailed derivation of (16), see Appendix A.3.

is excessively large due to the excessively small rate of the local tax because the national and local taxes are substitutes.[15]

We next investigate the steady growth rate in the equilibrium tax rates. Substituting (16) into (5), we obtain

$$g[\tilde{\tau}_c(\theta),\ \tilde{\tau}_l(\theta)] = \frac{\alpha^2}{(1-\beta\theta)^{\frac{1}{\alpha}}}[\beta(1-\theta)]^{\frac{\beta}{\alpha}}\gamma^{\frac{\gamma}{\alpha}} - \rho. \tag{17}$$

The steady growth rate depends on θ, this differs from the case with the optimal tax rates. In addition, the following proposition about fiscal decentralization and the steady growth rate can be derived.

Proposition 3. *In the case where the behavior of each government is taken into consideration, promoting fiscal decentralization enhances the steady growth rate.*

Proof. To inspect the relationship between θ and the steady growth rate, differentiating (17) with respect to θ yields:

$$\frac{g[\partial\tilde{\tau}_c(\theta),\ \tilde{\tau}_l(\theta)]}{\partial\theta} = \frac{\alpha\beta^{1+\frac{\beta}{\alpha}}\gamma^{\frac{\gamma}{\alpha}}}{(1-\beta\theta)^{\frac{1}{\alpha}+1}}(1-\theta)^{\frac{\beta}{\alpha}-1}\theta(\beta-1) < 0.$$

This result shows a negative relationship between θ and $g(\cdot)$, that is, promoting fiscal decentralization enhances the steady growth rate.

□

The intuition of proposition 3 is that the larger θ is, the larger the distortion that lowers economic growth. We also analyze the relationship between θ and a deviation from the optimal taxes. Differentiating the deviation with respect to θ derives:

$$\frac{\partial|\tau_l^* - \tilde{\tau}_l|}{\partial\theta} > 0, \quad \frac{\partial|\tau_c^* - \tilde{\tau}_c|}{\partial\theta} > 0.$$

Thus, the higher θ is, the larger the deviation from the optimal taxes is.

5 Concluding Remarks

This paper constructs a multi-region endogenous growth model with productive government spending to examine vertical intergovernmental relationships. However, the model in this paper seems to be insufficient in the following points. First, we exclude the horizontal intergovernmental relationship. In general, promoting fiscal decentralization causes tax competition. Second, we treat fiscal decentralization of the tax revenue side only. Therefore, we need to consider fiscal decentralization on the government spending side, e.g. asymmetric information. Thirdly, we focus only on one indicator here, fiscal dependency. It is important to focus on other indicators which are used by empirical studies. These issues are for future research.

[15]The substitute relationship between the national and local taxes is presented in (10). See Murakami (2005b) for more details.

A Appendix

A.1 Derivation of (8)

Substituting (6) and (7) into (1), we get

$$
\begin{aligned}
Y_i &= K_i^{\alpha}[\tau_l Y_i + \theta(\bar{\tau}_l \bar{Y} - \tau_l Y_i)]^{\beta} \left[\tau_c \sum_{i=1}^{n} Y_i - \sum_{i=1}^{n} \theta(\bar{\tau}_l \bar{Y} - \tau_l Y_i)\right]^{\gamma} && \text{(A.1)}\\
&= K_i^{\alpha} Y_i^{\beta} \left(\sum_{i=1}^{n} Y_i\right)^{\gamma} \left[\tau_l + \theta\left(\bar{\tau}_l \frac{\bar{Y}}{Y_i} - \tau_l\right)\right]^{\beta} [\tau_c - \theta\,(\bar{\tau}_l - \tau_l)]^{\gamma}, && \text{(A.2)}
\end{aligned}
$$

According to the assumption of symmetric regions, the condition $\sum_{i=1}^{n} Y_i = nY_i$ holds. Substituting this into (A.2), we obtain

$$
Y_i = n^{\frac{\gamma}{\alpha}}[\tau_l + \theta(\bar{\tau}_l - \tau_l)]^{\frac{\beta}{\alpha}}[\tau_c - \theta(\bar{\tau}_l - \tau_l)]^{\frac{\gamma}{\alpha}} K_i. \qquad \text{(A.3)}
$$

Equation (A.3) is the same reduced form as the AK model. Substituting this into (2), we derive (8).

A.2 Derivation of (11)

We solve (10). The optimal condition with respect to the national tax is

$$
(1 - \tau_c - \tau_l)\gamma = \alpha[\tau_c - \theta(\bar{\tau}_l - \tau_l)]. \qquad \text{(A.4)}
$$

The optimal condition with respect to the local tax is

$$
\begin{aligned}
&(1 - \tau_c - \tau_l)\{(1-\theta)\beta[\tau_c - \theta(\bar{\tau}_l - \tau_l)] + \gamma\theta[\tau_l + \theta(\bar{\tau}_l - \tau_l)]\}\\
&\qquad = \alpha[\tau_l + \theta(\bar{\tau}_l - \tau_l)][\tau_c - \theta(\bar{\tau}_l - \tau_l)]. && \text{(A.5)}
\end{aligned}
$$

Substituting (A.4) into (A.5), we obtain,

$$
\beta[\tau_c - \theta(\bar{\tau}_l - \tau_l)] = \gamma[\tau_l + \theta(\bar{\tau}_l - \tau_l)]. \qquad \text{(A.6)}
$$

Because the optimal taxes ($\tau_c,\ \tau_l$) satisfy (A.4) and (A.6), solving (A.6) with respect to τ_c, and substituting this into (A.4), the following equations can be derived:

$$
\begin{aligned}
\gamma &= (\alpha+\gamma)\left[\frac{(1-\theta)\gamma - \beta\theta}{\beta}\tau_l + \frac{\beta+\gamma}{\beta}\bar{\tau}_l\theta\right] + (\alpha\theta+\gamma)\tau_l - \alpha\bar{\tau}_l\theta\\
\tau_l &= \frac{\beta\gamma + \alpha\beta\bar{\tau}_l\theta - (\alpha+\gamma)(\beta+\gamma)\bar{\tau}_l\theta}{(\alpha+\gamma)[(1-\theta)\gamma - \beta\theta] + \alpha\beta\theta + \beta\gamma}\\
&= \frac{\beta\gamma + \alpha\beta\bar{\tau}_l\theta - (\alpha\beta+\gamma)\bar{\tau}_l\theta}{\gamma - \theta(\alpha+\gamma)\gamma - \beta\gamma\theta}\\
&= \frac{\beta - \bar{\tau}_l\theta}{1-\theta}. && \text{(A.7)}
\end{aligned}
$$

Then, substituting (A.7) into (A.4), we obtain,

$$\begin{aligned} \tau_c &= \frac{(\beta - \bar{\tau}_l \theta)[(1-\theta)\gamma - \beta\theta] + (1-\theta)(\beta+\gamma)\bar{\tau}_l\theta}{\beta(1-\theta)} \\ &= \gamma + \frac{\theta(\bar{\tau}_l - \beta)}{1-\theta}. \end{aligned} \tag{A.8}$$

A.3 Derivation of (16)

The condition of the equilibrium national tax rate, (15), is the same as (A.4). On the contrary, the condition of the equilibrium local tax rate, (14), is

$$\beta(1-\theta) = (1-\theta)(\alpha+\beta)\tau_l + \beta(1-\theta)\tau_c + \alpha\bar{\tau}_l\theta. \tag{A.9}$$

Solving (A.9) with respect to τ_c, and substituting this into (A.4), we obtain

$$\begin{aligned} \gamma &= (\alpha+\gamma)\left[1 - \frac{\alpha\bar{\tau}_l\theta}{\beta(1-\theta)} - \frac{\alpha+\beta}{\beta}\tau_l\right] + (\alpha\theta+\gamma)\tau_l - \alpha\bar{\tau}_l\theta \\ \frac{\alpha(\beta\theta-1)}{\beta}\tau_l &= -\alpha + \alpha\bar{\tau}_l\theta\left[1 + \frac{\alpha+\gamma}{\beta(1-\theta)}\right] \\ \tau_l &= \frac{\beta}{1-\beta\theta} - \frac{\bar{\tau}_l\theta}{1-\theta}. \end{aligned} \tag{A.10}$$

Then, substituting (A.10) into (A.9), we obtain

$$\begin{aligned} \tau_c &= 1 - \frac{\alpha\bar{\tau}_l\theta}{\beta(1-\theta)} - \frac{\alpha+\beta}{\beta}\left[\frac{\beta}{1-\beta\theta} - \frac{\bar{\tau}_l\theta}{1-\theta}\right] \\ &= 1 + \frac{\bar{\tau}_l\theta}{1-\theta} - \frac{\alpha+\beta}{1-\beta\theta}. \end{aligned} \tag{A.11}$$

References

[1] Akai, N. and M. Sakata (2002) "Fiscal decentralization contributes to economic growth: evidence from state-level cross-sectional data for the United States", *Journal of Urban Economics 52, 93-108.*

[2] Barro, R.J. (1990) "Government spending in a simple model of endogenous growth", *Journal of Political Economy 98, 103-125.*

[3] Barro, R.J. and X. Sala-i-Martin (1992) "Public Finance in Models of Economic Growth", *Review of Economic Studies 59, 645-661.*

[4] Barro, R.J. and X. Sala-i-Martin (1995) *Economic Growth*, McGraw-Hill, New York.

[5] Davoodi, H. and H. Zou (1998) "Fiscal decentralization and economic growth: A cross-country study", *Journal of Urban Economics 43, 224-257.*

[6] Futagami, K., Y. Morita and A. Shibata (1993) "Dynamic analysis of an endogenous growth model with public capital", *Scandinavian Journal of Economics 95, 607-625.*

[7] Glomm, G. and B. Ravikumar (1994) "Public Investment in Infrastructure in a Simple Growth Model", *Journal of Economics Dynamics and Control 18, 1173-1187.*

[8] Iimi, A. (2005) "Decentralization and economic growth revisited: an empirical note", *Journal of Urban Economics 57, 449-461.*

[9] Murakami, Y. (2005a) "Regional redistribution policy and welfare in a two-region endogenous growth model", *Discussion Papers In Economics And Business, Osaka University, 05-07.*

[10] Murakami, Y. (2005b) "Vertical intergovernmental relationship and economic growth", *mimeo.*

[11] Oates, W. (1993) "Fiscal decentralization and economic development", *National Tax Journal,* ***XLVI****, 237-243.*

[12] Stansel, D. (2005) "Local decentralization and local economic growth: A cross-sectional examination of US metropolitan areas", *Journal of Urban Economics 57, 55-72.*

[13] Turnovsky, S.J. (1996) "Fiscal policy, adjustment costs, and endogenous growth", *Oxford Economic Papers 48, 361-381.*

[14] Xie, D., H. Zou and H. Davoodi (1999) "Fiscal decentralization and economic growth in the United States", *Journal of Urban Economics 45, 228-239.*

[15] Zhang, T. and H. Zou (1998) "Fiscal decentralization, public spending, and economic growth in China", *Journal of Public Economics 67, 221-240.*