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Abstract

Under partial fiscal decentralization, the transfer from the central government affects the local government's behavior. This paper examines the effect of transfers on the provision of local public goods in two asymmetrically-sized region models of monopolistic competition. Normally, the local government in a small region does not want to provide the local public goods because of low revenue. The transfer increases the incentive to provide it though it decreases the effect of tax revenue that depends on the regional economy.

The result depends on the type of transfer. First, the earmarked transfer stimulates the incentive to provide the local public goods. Similarly, the lump-sum transfer stimulates though the effect of manufacture dispersion decreases compared to the earmarked transfer case. The lump-sum transfer may not change the behavior of a small region's local government.

JEL classification: H71, H73, R12, R32

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1 Introduction

Many countries institute fiscal decentralization that allows local governments to control public spending and taxation. However, many local governments rely on transfers from the central government and are restricted in their control of tax revenue. Brueckner (2009) and Borge, Brueckner and Rattsø (2014) show that situation as partial fiscal decentralization. Compared to local government behavior under fiscal decentralization, the result under partial fiscal decentralization is different because of the transfer from the central government.

Under partial fiscal decentralization, the transfer from the central government affects the local government's behavior. Consider the regional provision of local public goods that residents of other regions can consume. Each local government can decide whether to provide it or not. When the local government does not provide it, residents must travel to other regions to consume it. In the choice of local public good provision, the transfer strengthens the incentives for the provision. Following Dur and Staal (2008), this paper analyzes two types of transfers: an earmarked transfer that provides per unit of some local public good and a lump-sum transfer that the local government can use freely. Normally, the earmarked transfer is efficient for increasing some local public good. However, for the local government, the lump-sum transfer is better because its use is not limited.

Moreover, the transfer changes the effect of tax revenue. If the tax revenue increases, the local government is more likely to provide the local public good. One reason why the local government does not provide it is the regional disparity in economic activity. This happens if firms agglomerate in one region. In an agglomerated region, the local government gets the larger tax revenue and provides it. In the other regions, the local government does not because the residents can utilize the agglomerated region's local public goods with a sufficiently large amount.

Some studies analyze the transfer in the regional model. Boadway and Tremblay (2006, 2010) analyze the national transfer that affects the imbalance that second-best allocation cannot be achieved. Brueckner (2009), Borge, Brueckner and Rattsø (2014) examine the transfer in the analysis of partial fiscal decentralization. In the field of new economic geography, Martin and Rogers (1995), Ihara (2008), Fenge, Ehrlich and Wrede (2009), Gruber and Marattin (2010) analyze the relationship between the agglomeration pattern and the regional policy. However, these studies do not consider the transfer from the central government. This paper analyzes the transfer policy in the field of new economic geography.

This paper studies the effect of transfers to local governments on the provision of local public goods. When regional revenue differences exist, the local government with low revenue does not provide it and wishes a free ride on other regions. The additional revenue

enhances its incentive to provide the good. First, the transfer increases the revenue and has that effect. Second, the industrial dispersion weakens the regional revenue differences and improves that incentive. The transfer decreases that effect if the revenue is large. This means that the transfer may weaken the effect of industrial dispersion. This paper analyzes these effects of the transfer.

This paper is organized as follows. Section 2 presents this paper's model. Section 3 shows the local government behavior. Section 4 analyzes the effect of transfers. Section 5 provides the conclusion.

2 The model

This paper's model follows Takatsuka (2014). Consider the economy in which two regions exists. The population in region i $(i = 1, 2)$ is L_i and $\bar{L} = L_1 + L_2$. It is assumed that $L_1 > L_2$. Individuals cannot migrate across regions. Each individual supplies one unit of labor.

The private sector consists of the manufacturing sector and the agricultural sector. Each sector requires labor in the production of goods and the transport cost to trade across regions. The manufacturing sector produces differentiated goods under the increasing returns to scale and monopolistic competition while the agricultural sector produces the agriculture good under the constant returns to scale and perfect competition.

In each region, the local government provides two local public goods, G_1 and G_2 .

Following Braid (2010), the local public good G_1 has the external effect. That is, the goods provided in one region can be utilized by the other region's individuals with the commuting cost. This paper assumes that the larger region (region 1) always provides the good.

Individuals in region i have the utility function:

$$U_i = \mu \log M_i + A_i + \frac{\gamma}{2} \left[\log G_{1i} + \log G_{2i}\right]$$

$$M_i = \left[\int_0^{n_1} x(k)^{\frac{\sigma-1}{\sigma}} dk + \int_0^{n_2} x(j)^{\frac{\sigma-1}{\sigma}} dj\right]^{\frac{\sigma}{1-\sigma}}$$

where $x(k)$ is the manufactured good and n_i is the variety of the goods produced in region i . A is the agriculture good. G_{1i} and G_{2i} are the local public goods provided in region i .

The budget constraint of individuals is

$$w_i = \int_0^{n_1} p(k)x(k)dk + \int_0^{n_2} p(j)x(j)dj + p_{Ai}A_i$$

where $p(k)$ and p_{Ai} are the prices of each good and w_i is the wage.

In the agricultural sector, one unit of labor produces one unit of agriculture goods. Then, the prices of the goods are

$$p_{A1} = w_1 \qquad p_{A2} = w_2$$

In the following, $w_2 = 1$ holds.

The agriculture good can be traded with the iceberg transport cost. That is, $\tau_A > 1$ units of good must be required to provide one unit of good in another region. In this paper it is assumed that region 1 always imports the agriculture good from region 2 even though it produces the good. It is possible because region 1 has the larger population and the larger market. Then, $w_1 = \tau_A w_2$ holds. This means that the wage in region 1 is larger than in the other region.

In the production of manufactured good $x(k)$, a fixed labor input f and a marginal labor input m are required. The ad valorem tax is imposed on the production. Then, the total cost of producing the good in region i is

$$fw_i + (mw_i + t_a p_{ii})x_{ii} + (mw_i\tau_M + t_a p_{ij})x_{ij}$$

where t_a is the tax rate, x_{ij} is the demand in region j and p_{ij} is that price. τ_M is the iceberg transport cost. From the individual behavior and the profit maximization,

$$\begin{aligned} p_{ii} &= \frac{mw_i\sigma}{(1-t_a)(\sigma-1)} \equiv p_i \\ p_{ij} &= \frac{mw_i\sigma\tau_M}{(1-t_a)(\sigma-1)} \equiv p_i\tau_M \end{aligned}$$

which are identical for all region i producers. In equilibrium, the profit is zero because producers are free to enter and exit. Then, the total output X_i and the labor input l_i are

$$X_i = \frac{f(\sigma-1)}{m} \equiv X \qquad l_i = f\sigma \equiv l$$

These are independent of the public policy.

The local government produces two local public goods. In the production, one unit of labor produces one unit of the good. From the symmetry of manufacturing producer, the local government's budget constraint is

$$t_a p_i n_i X_i = w_i(G_{1i} + G_{2i})$$

The next section analyzes the behavior of local governments.

From the model specification, the market clearing condition for manufactured goods and agriculture goods are as follows:

$$\begin{aligned} \frac{f(\sigma-1)}{m} &= \mu w_i \frac{p_i L_i}{{P_i}^{1-\sigma}} + \tau_M \mu p_j \frac{p_j {\tau_M}^{1-\sigma} L_j}{{P_j}^{1-\sigma}} \qquad (1) \\ P_i &= \left[n_i {p_i}^{1-\sigma} + n_j {\tau_M}^{1-\sigma} {p_j}^{1-\sigma} \right]^{\frac{1}{1-\sigma}} \end{aligned}$$

$$(1-\mu)L_1 = L_1 - n_1 l - G_{11} - G_{21} + IM \qquad (2)$$

$$(1-\mu)L_2 = L_2 - n_2 l - G_{12} - G_{22} - EX \qquad (3)$$

where P_i is the price index. IM is the import of agriculture good in region 1. Therefore, EX is the export of the goods in region 2 and $IM = EX$.

In this paper, it is assumed that $n_1, n_2 > 0$. That is, producers of the manufacturing sector exist in each region. From (1) , numbers of varieties in each region are

$$n_1 = \frac{\mu(1-t_a)}{f\sigma} \left[\frac{L_1}{1 - \frac{w_2}{w_1}\left(\frac{p_2}{p_1}\right)^{\sigma-1} \tau_M^{1-\sigma}} - \frac{L_2 \tau_M^{1-\sigma} \left(\frac{p_1}{p_2}\right)^{\sigma-1}}{1 - \frac{w_1}{w_2}\left(\frac{p_1}{p_2}\right)^{\sigma-1} \tau_M^{1-\sigma}} \right] \qquad (4)$$

$$n_2 = \frac{\mu(1-t_a)}{f\sigma} \left[\frac{L_2}{1 - \frac{w_1}{w_2}\left(\frac{p_1}{p_2}\right)^{\sigma-1} \tau_M^{1-\sigma}} - \frac{L_1 \tau_M^{1-\sigma} \left(\frac{p_2}{p_1}\right)^{\sigma-1}}{1 - \frac{w_2}{w_1}\left(\frac{p_2}{p_1}\right)^{\sigma-1} \tau_M^{1-\sigma}} \right] \qquad (5)$$

n_1 and n_2 are reduced by the tax rate, although n_1/n_2 is not changed. Moreover, these are unaffected by public expenditures G_{1i} and G_{2i} . From the above analysis, the relative number of varieties satisfies

$$\frac{n_1}{n_2} = \frac{\mu L_1 + IM}{\mu L_2 - EX} > \frac{L_1}{L_2}$$

This means that the share of numbers in region 1 is larger than the population share whenever region 1 imports the agriculture goods. The larger region attracts more manufacturing producers compared with the population share.

In the analysis of public policy, n_1 and n_2 are taken as parameters. If the tax rate does not change, the public policy does not affect these numbers. Therefore, the public sector takes n_1 and n_2 as given.

3 Local government behavior

This section examines the local government behavior. Each local government provides local public goods to maximize the individual utility in its own region. This model assumes that they behave under partial fiscal decentralization. It means that they cannot control freely local taxes to finance local public goods, though they can control these goods. In the model, the central government sets the tax rate and each local government takes it as given. From the previous section, the public expenditure does not affect the private sector. Therefore, each local government does not consider the private sector to

maximize the utility.

The local government's behavior is as follows:

$$\max_{G_{1i},\, G_{2i}} \log G_{1i} + \log G_{2i} = U_i(G)$$

$$s.t. \quad t_a p_i n_i X_i = w_i(G_{1i} + G_{2i})$$

In region 1, the local government always provides two local public goods. Then the amounts of these goods are

$$\begin{aligned} G_{11} &= \frac{t_a f \sigma}{2(1-t_a)} n_1 \\ G_{21} &= \frac{t_a f \sigma}{2(1-t_a)} n_1 \end{aligned}$$

In region 2, the local government can decide not to provide the local public good 1. Then, individuals in region 2 must commute to region 1 to consume the good. First, consider the case that the local government provides two local public goods. The amounts of these goods are

$$\begin{aligned} G_{12} &= \frac{t_a f \sigma}{2(1-t_a)} n_2 \\ G_{22} &= \frac{t_a f \sigma}{2(1-t_a)} n_2 \end{aligned}$$

The utility $U_2(G)$ is as follows:

$$U_2(G) = \log \frac{t_a f \sigma}{2(1-t_a)} n_2 + \log \frac{t_a f \sigma}{2(1-t_a)} n_2$$

Second, consider the case that the local government does not provide the local public good 1. For consuming region 1's local public good 1, individuals in region 2 must burden

the iceberg transport cost τ_G . Then, the utility $U_2(G)'$ is

$$U_2(G)' = \log \frac{G_{11}}{\tau_G} + \log G_{22}$$

The amount of local public good 2 and the utility are

$$\begin{aligned} G_{22} &= \frac{t_a f \sigma}{(1-t_a)} n_2 \\ U_2(G)' &= \log \frac{t_a f \sigma}{2(1-t_a)} \frac{n_1}{\tau_G} + \log \frac{t_a f \sigma}{(1-t_a)} n_2 \end{aligned}$$

The utility difference in two cases is

$$U_2(G) - U_2(G)' = \log \frac{\tau_G}{2} \frac{n_2}{n_1} \tag{6}$$

From (6) , the following proposition holds:

Proposition 1 If $n_1/n_2 > \tau_G/2$, the local government in region 2 does not provide the local public good 1. Then, region 2 free-rides the local public good in region 1. Conversely, if $n_1/n_2 < \tau_G/2$, the local government in region 2 provides it.

When more manufacturing producers agglomerate in region 1, the local government in region 2 wants to free-ride region 1's local public good.

To evaluate the equilibrium efficiency, consider the second-best behavior that maximizes the welfare $L_1U_1(G) + L_2U_2(G)$ where t_a is given. When region 2 provides the

local public good 2, the second-best values of local public goods are

$$\begin{aligned} G_{11} &= G_{21} = \frac{t_a f \sigma}{2(1-t_a)} n_1 \frac{\left(1 + \frac{w_2}{w_1}\frac{n_2}{n_1}\right) L_1}{L_1 + L_2} \\ G_{12} &= G_{22} = \frac{t_a f \sigma}{2(1-t_a)} n_2 \frac{\left(\frac{w_1}{w_2}\frac{n_1}{n_2} + 1\right) L_2}{L_1 + L_2} \end{aligned}$$

With the comparison of equilibrium outcome, region 1's local government overprovides local public goods and region 2's underprovides them. The welfare is

$$W = L_1 \log \frac{L_1^2 t_a^2 [p_1 n_1 X_1 + p_2 n_2 X_2]^2}{4 w_1^2 [L_1 + L_2]^2} + L_2 \log \frac{L_2^2 t_a^2 [p_1 n_1 X_1 + p_2 n_2 X_2]^2}{4 w_2^2 [L_1 + L_2]^2} \tag{7}$$

When region 2 does not provide the local public good 1, the second-best provision of local public goods are

$$\begin{aligned} G_{11} &= \frac{t_a f \sigma}{2(1-t_a)} n_1 \left(1 + \frac{w_2}{w_1}\frac{n_2}{n_1}\right) \\ G_{21} &= \frac{t_a f \sigma}{2(1-t_a)} n_1 \frac{\left(1 + \frac{w_2}{w_1}\frac{n_2}{n_1}\right) L_1}{L_1 + L_2} \\ G_{22} &= \frac{t_a f \sigma}{2(1-t_a)} n_2 \frac{\left(\frac{w_1}{w_2}\frac{n_1}{n_2} + 1\right) L_2}{L_1 + L_2} \end{aligned}$$

Comparing the equilibrium provision, the local public good 1 is underprovided in equilibrium. The region 1's local public good 2 is overprovided. In region 2, it is underprovided if $(w_1 n_1)/(w_2 n_2)$ is sufficiently large. This happens when the manufacturing sector agglomerates in region 1. Otherwise, it is overprovided if $(w_1 n_1)/(w_2 n_2)$ is sufficiently small. In the second-best, the welfare is

$$W' = L_1 \log \frac{L_1 t_a^2 [p_1 n_1 X_1 + p_2 n_2 X_2]^2}{4 w_1^2 [L_1 + L_2]^2} + L_2 \log \frac{L_2 t_a^2 [p_1 n_1 X_1 + p_2 n_2 X_2]^2}{4 w_1 w_2 \tau_G [L_1 + L_2]^2} \tag{8}$$

From (7) and (8) , $\bar{\tau}_G$ is derived that satisfies

$$W - W' = L_1 \log \frac{L_1}{L_1 + L_2} + L_2 \log \left(\frac{L_2}{L_1 + L_2} \frac{w_1}{w_2} \bar{\tau}_G \right) = 0$$

Then, the following proposition holds:

Proposition 2 When $\tau_G > \bar{\tau}_G$, it is the second-best optimum that region 2 provides the local public good 1. Otherwise, when $\tau_G < \bar{\tau}_G$, region 2 does not.

When the transport cost decreases, it is optimum that region 2 does not produce the local public good because of the larger external effect.

4 Effect of transfer

This section analyzes whether the central government improves the provision of local public goods in each region. The central government does not redistribute across regions by the transfer. This means that the transfer does not resolve the regional differences directly. The model assumes that the transfer is financed by means of national tax. It assumes that the regional economy does not affect the national tax because its effect on the tax revenue is negligible. Therefore, the model ignores the analysis of central government revenue. In this section, two types of transfer are analyzed: the earmarked transfers that provide for per unit of some local public good and the lump-sum transfer that the local government can use freely.

4.1 Earmarked transfer

First, consider the case that the central government pays the transfer s for per unit local public good 1. Then, the budget constraint of region i's local government is

$$t_a p_i n_i X_i = (w_i - s)G_{1i} + w_i G_{2i}$$

From the maximization behavior of local government, the amounts of local public goods in region 1 are

$$\begin{aligned} G_{11} &= \frac{w_1 t_a f \sigma}{2(w_1 - s)(1 - t_a)} n_1 \\ G_{21} &= \frac{t_a f \sigma}{2(1 - t_a)} n_1 \end{aligned}$$

Comparing to section 3, the amount of local public good 1 increases because of the transfer.

In region 2, when the local government provides the public good 1, the amounts of local public goods are

$$\begin{aligned} G_{12} &= \frac{w_2 t_a f \sigma}{2(w_2 - s)(1 - t_a)} n_2 \\ G_{22} &= \frac{t_a f \sigma}{2(1 - t_a)} n_2 \end{aligned}$$

The utility $U_{2e}(G)$ is as follows:

$$U_{2e}(G) = \log \frac{w_2 (t_a f \sigma)^2 {n_2}^2}{4(w_2 - s)(1 - t_a)^2}$$

When the local government does not provide the local public good 1, the amount of local public good 2 is

$$G_{22} = \frac{t_a f \sigma}{(1 - t_a)} n_2$$

Similar to the model in section 3, the utility $U_{2e}(G)'$ is as follows:

$$U_{2e}(G)' = \log \frac{w_1 (t_a f \sigma)^2 n_1 n_2}{2\tau_G (w_1 - s)(1 - t_a)^2}$$

The utility difference is

$$U_{2e}(G) - U_{2e}(G)' = \log \frac{\tau_G n_2}{2n_1} \frac{w_2 (w_1 - s)}{w_1 (w_2 - s)} \tag{9}$$

When $(9) > 0$, the local government provides the local public good 1.

If $n_1/n_2 = \tau_G/2$ and the transfer does not exist, the local government is indifferent whether it provides the local public good 1 or not. In this section, if $n_1/n_2 = \tau_G/2$, $(9) > 0$ and the local government provides it. The transfer promotes its provision. From these results, the following proposition holds

Proposition 3 The earmarked transfer promotes the provision of local public goods.

The earmarked transfer resolves the free-rider problem. If the transfer is paid and the manufacturing sector disperses across the region, the local government in region 2 begins to provide the local public good and its amount is larger than the no-transfer case. However, overprovision is more severe in region 1.

4.2 Lump-sum transfer

Second, consider the effect of lump-sum transfer. The central government pays the lump-sum transfer T to each region's local government. Then, the budget constraint of region i 's local government is

$$t_a p_i n_i X_i + T = w_i(G_{1i} + G_{2i})$$

In region 1, public goods provision in equilibrium is

$$G_{11} = G_{21} = \frac{t_a f \sigma}{2(1-t_a)} n_1 + \frac{T}{2w_1}$$

The amount of public goods increases in the lump-sum transfer.

In region 2, when the local government provides the public good 1, the amounts of local public goods are

$$G_{12} = G_{22} = \frac{t_a f \sigma}{2(1-t_a)} n_2 + \frac{T}{2w_2}$$

The utility $U_{2l}(G)$ is as follows:

$$U_{2l}(G) = \log \frac{{n_2}^2}{4} \left\{ \frac{t_a f \sigma}{2(1-t_a)} + \frac{T}{w_2 n_2} \right\}^2$$

When the local government does not provide the public good 1, the amount of local public good 2 is

$$G_{22} = \frac{t_a f \sigma}{1-t_a} + \frac{T}{w_2}$$

Similar to the previous analysis, the utility $U_{2e}(G)'$ is as follows:

$$U_{2e}(G)' = \log\left[\frac{n_1 n_2}{2\tau_G}\left\{\frac{t_a f\sigma}{1-t_a}+\frac{T}{w_1 n_1}\right\}\left\{\frac{t_a f\sigma}{1-t_a}+\frac{T}{w_2 n_2}\right\}\right]$$

The difference of these utilities is

$$U_{2l}(G) - U_{2l}(G)' = \log\left[\frac{\tau_G}{2}\frac{n_2}{n_1}\frac{\frac{t_a f\sigma}{1-t_a}+\frac{T}{w_2 n_2}}{\frac{t_a f\sigma}{1-t_a}+\frac{T}{w_1 n_1}}\right] \tag{10}$$

From $w_1 > w_2$ and $n_1 > n_2$, if $n_1/n_2 = \tau_G/2$, $(10) > 0$ and the local government provides the public good 1. Similar to the previous section, this means that the transfer promotes its provision. However, unlilke the earmarked transfer, this effect is not severe if n_2 is larger. These results give the following proposition.

Proposition 4 The lump-sum transfer promotes the provision of local public good 1 in region 2 though its effect is weakened if the manufacturing sector increases in region 2.

The lump-sum transfer resolves the free-rider problem though its effect is weaker than the earmarked transfer. Moreover, in region 1, the amount of each local public good is larger than the no-transfer case.

4.3 Discussion

Comparing between the two types of transfer, the following points are suggested. First, consider the case that the tax rate is sufficiently large. The earmarked transfer affects the incentive for providing the public good whereas the lump-sum transfer does not. The

lump-sum transfer does not change region 2's policy because the tax revenue is sufficiently large. Concerning the effect of the manufacturing sector dispersion on that incentive, both types of transfer do not affect it. Section 3 shows that when the manufacturing producers increase in region 2, the local government is more likely to provide the local public good 1. Both types of transfer retain that effect.

Second, consider the case in which the tax rate is sufficiently small. Both types of transfer stimulate the incentive for providing the public good, because the tax revenue is small. On the other hand, as for the effect of manufacturing sector dispersion on that incentive, the lump-sum transfer weakens that effect even though the earmarked transfer retains it. Because the tax revenue is small, the tax revenue from the manufacturing sector is small. Moreover, the existence of the lump-sum transfer weakens the effect of tax revenue on the policy. As the condition is not imposed on the local government about the use of lump-sum transfer, the local government in region 2 may retain the free-riding.

5 Conclusion

This paper examines the effect of transfers to local governments on the provision of local public good in a two asymmetrically sized regions model of monopolistic competition. Normally, the local government in a small region does not wish to provide the local public good because of low revenue. The transfer increases the incentive to provide it, though it decreases the effect of tax revenue that depends on the regional economy.

The result depends on the type of transfer. First, the earmarked transfer stimulates the incentive to provide the local public good. Similarly, the lump-sum transfer stimulates though the effect of manufacturing dispersion decreases compared to that of the earmarked transfer case. The lump-sum transfer may not change the behavior of a small region's local government.

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