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Local Public Spending**

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Abstract

This paper analyzes whether municipal consolidation decreases local public spending, using the local public goods model. First, the conditions under which municipal consolidation achieves efficient allocation are shown. Second, after such efficiency is realized, the allocation is analyzed to see whether it reduces local public expenditure.

If the cost function for local public goods per capita decreases with increase in population, the efficient municipal consolidation will increase local public expenditure because the amount of local public goods provided rises. Some studies expect that local public expenditure under such a cost function would decline. However, this paper shows that one effect of municipal consolidation is to expand local public services and not to reduce local public expenditure.

1   Introduction

This paper analyzes whether the municipal consolidation decreases the local public spending, using the local public goods model. Indeed, municipal consolidation is the means by which municipalities increase their population. Yet, the common expectation is that municipal consolidations decrease local public expenditure by achieving economies of scale. This is evident in the theoretical analysis by Alesina and Spolaore (1997) as well as in the empirical analysis by Duncombe and Yinger (1993) and Blume and Blume (2007). In Japan, Miyazaki (2018) explains that the objective of municipal consolidation is to reduce public expenditure through economies of scale.

However, municipal consolidation increases not only the population but also the land area through boundary reform. In the local public goods model, municipal consolidations mean that the number of jurisdictions declines through economic integration. In an efficient allocation scenario, this paper considers whether such economic integration actually occurs.

When municipal consolidations are realized through an efficient allocation of resources, do they really achieve economies of scale by reducing

expenditure on local public goods? Some studies suggest that the object

of municipal consolidation is to reduce local public expenditure. However,

other studies show that municipal consolidation resolves other problems.

For example, Bolton and Roland (1996) required it to improve productive

efficiency and eliminate fiscal competition. Ellingsen (1998) and Dur and

Staal (2008) suggest that it internalizes the externalities from public goods

provision. Furukawa (2014) states that it increases the variety of pub-

lic goods. Moreover, municipal consolidation may actually increase public

expenditure. For example, Edwards and Xiao (2009) state that regional

costs may increase because it creates additional demand for public ser-

vices. Buettner, Schwager, and Stegarescu (2004) empirically analyze the

positive relation between cost and population. This paper shows the con-

ditions under which municipal consolidation actually decreases local public

spending.

The objective of this paper is as follows: First, to determine the con-

ditions under which municipal consolidation is efficiently accomplished in

the allocation of public goods. In the regional economy, municipal con-

solidation means that the number of regions decreases through realizing

economic integration. This paper analyzes whether such integration really occurs. Second, to analyze that when municipal consolidation is realized through efficient allocation, whether it reduces local public expenditure.

This paper is organized as follows. Section 2 provides the model. Section 3 analyzes municipal mergers and the conditions under which they reduce local public spending. Section 4 concludes the paper.

2   The model

The model follows Buettner and Holm-Hadulla (2013). Consider an economy with two regions, $i = 1, 2$. The population in region i is n_i and the total population is $N = n_1 + n_2$. Each individual is provided with one unit of labor. Each region's land area is H_i and the total land area $H = H_1 + H_2$. The land is used for housing, which is distributed equally among individuals in each region. The amount of land consumed for housing per capita is H_i/n_i. In this economy, total population and total land area are given. Initially, the number of regions is also given. The total land area is freely distributed across these regions, which may be used to alter regional boundaries. In the following analysis, a central planner may implement municipal

consolidation, reducing the number of regions from two to one through regional integration. When such municipal consolidation arises, all land area and all population are allocated to that integrated region.

Individuals in region i obtain utility from the consumption of the private good x_i , land $h_i = H_i/n_i$ and local public goods z_i. The utility function is the following:

$$U_i = \log x_i + \log z_i + \log h_i$$

Private goods are identical across regions and are produced using labor as the only input. In region i, one unit of labor can produce β_i units of a private good. It is assumed that $\beta_1 > \beta_2$, that is, Region 1 is more productive than Region 2. Private goods are consumed and also used to produce local public goods. The amount of private goods used to produce g_i units of a local public good is $g_i{}^{\gamma}$. γ represents the degree of scale economies. The local public good may be utilized by residents located in the same region. The amount of the local public good consumed is $z_i = n_i^{-\delta} g_i$, where g_i is the amount of local public good provided in region i. When the local public good is pure, $\delta = 0$ and $z_i = g_i$. It is produced at

cost $C(z_i, n_i) = z_i{}^\gamma n_i{}^{\gamma\delta}$.

Efficient allocation is determined by the central planner who maximizes each representative resident's utility, such that he equalizes all residents' utilities in the economy. The resource constraint is as follows:

$$\beta_1 n_1 + \beta_2 n_2 = n_1 x_1 + n_2 x_2 + C(z_1, n_1) + C(z_2, n_2)$$

When the level of utility u and the amount of local public goods consumed z_i are given, the amount of private goods x_i is $x_i = e^u \frac{n_i}{z_i H_i}$. Given these and the model's specification, the resource constraint is as follows:

$$\beta_1 n_1 + \beta_2 n_2 = n_1{}^2 \frac{e^u}{z_1 H_1} + n_2{}^2 \frac{e^u}{z_2 H_2} + z_1{}^\gamma n_1{}^{\gamma\delta} + z_2{}^\gamma n_2{}^{\gamma\delta}$$

The next section analyzes the efficient allocation of resources.

3   Efficient allocation of resources

This section shows that municipal consolidation should be achieved through efficient allocation of resources. From the previous section, considering the efficient allocation that the central planner uses to maximize individuals' utilities, subject to the resource constraint, the resulting Lagrangean is as

follows:

$$L \equiv u$$

$$+ \lambda \left[\beta_1 n_1 + \beta_2 (N - n_1) - n_1{}^2 \frac{e^u}{z_1 H_1} - (N - n_1)^2 \frac{e^u}{z_2(H - H_1)} \right.$$

$$\left. - z_1{}^\gamma n_1{}^{\gamma\delta} - z_2{}^\gamma (N - n_1)^{\gamma\delta} \right]$$

From this function, first-order conditions for z_1, z_2, n_1 and H_1 are as follows:

$$\frac{n_1{}^2 e^u}{z_1{}^2 H_1} \quad - \quad \gamma z_1{}^{\gamma-1} n_1{}^{\gamma\delta} = 0 \tag{1}$$

$$\frac{(N - n_1)^2 e^u}{z_2{}^2 (H - H_1)} \quad - \quad \gamma z_2{}^{\gamma-1}(N - n_1)^{\gamma\delta} = 0 \tag{2}$$

$$\beta_1 - \beta_2 \quad - \quad \frac{2 n_1 e^u}{z_1 H_1} + \frac{2(N - n_1)e^u}{z_2(H - H_1)}$$

$$- \gamma\delta z_1{}^\gamma n_1{}^{\gamma\delta-1} + \gamma\delta z_2{}^\gamma (N - n_1)^{\gamma\delta-1} = 0 \tag{3}$$

$$\frac{e^u n_1{}^2}{z_1 H_1{}^2} \quad - \quad \frac{e^u (N - n_1)^2}{z_2(H - H_1)^2} = 0 \tag{4}$$

Equations (1) and (2) are conditions pertaining to the optimal provision of public goods. Equations (3) and (4) indicate the optimal allocation of population and land. From these conditions, utility is as follows:

$$u_D = \frac{\gamma + 1}{\gamma} \log \frac{\{\beta_1 n_1^* + \beta_2(N - n_1^*)\} H^{\frac{\gamma}{\gamma+1}}}{\frac{\gamma+1}{\gamma} \gamma^{\frac{1}{\gamma+1}} \left\{ n_1^{* \frac{2\gamma+\gamma\delta}{2\gamma+1}} + (N - n_1^*)^{\frac{2\gamma+\gamma\delta}{2\gamma+1}} \right\}^{\frac{2\gamma+1}{\gamma+1}}} \tag{5}$$

where n_1^* is the efficient allocation of population.

In this economy, municipal consolidation can be carried out. Such consolidation means that the number of jurisdictions decreases through regional integration. Doing so results in the number of regions being reduced from two to one. Then, all residents and land are allocated to a single region. The local public good is provided only in that integrated region. In this case, the objective function is as follows:

$$L' \equiv u + \lambda \left[\beta_1 N - N^2 \frac{e^u}{z_1 H} - z_1{}^\gamma N^{\gamma\delta} \right]$$

where all residents and land are allocated to Region 1. The first-order condition for z_1 is as follows:

$$\frac{N^2 e^u}{z_1{}^2 H} - \gamma z_1{}^{\gamma-1} N^{\gamma\delta} = 0 \tag{6}$$

From this condition, the utility in the case of municipal consolidation is the following:

$$u_A = \frac{\gamma+1}{\gamma} \log \frac{\beta_1 N H^{\frac{\gamma}{\gamma+1}}}{\frac{\gamma+1}{\gamma} \gamma^{\frac{1}{\gamma+1}} \left\{ N^{\frac{2\gamma+\gamma\delta}{2\gamma+1}} \right\}^{\frac{2\gamma+1}{\gamma+1}}} \tag{7}$$

Comparing (5) and (7), if

$$\frac{\beta_1 n_1^* + \beta_2 (N - n_1^*)}{\beta_1 N} > \left[\frac{n_1^{* \frac{2\gamma+\gamma\delta}{2\gamma+1}} + (N - n_1^*)^{\frac{2\gamma+\gamma\delta}{2\gamma+1}}}{N^{\frac{2\gamma+\gamma\delta}{2\gamma+1}}} \right]^{\frac{2\gamma+1}{\gamma+1}}$$

$u_D > u_A$ is satisfied and municipal consolidation is not optimal. This is possible only if $\gamma\delta > 1$, that is, the cost of local public good per capita increases with increase in population. In this case, if β_1 is sufficiently small, municipal consolidation is not optimal. Moreover, when β_1 is sufficiently large, $u_D < u_A$ and municipal consolidation is efficient because of its overall production. The production of private good is maximized when all residents provide their labor in region 1. If β_1 is larger, the effect of this production is larger and municipal consolidation bears more benefits. Conversely, if $\gamma\delta < 1$, municipal consolidation is efficient. Therefore, the following proposition is derived.

Proposition 1 When the cost of a local public good per capita increases with increase in population, municipal consolidation may not be optimal. If, however, the cost does not increase with increase in population, municipal consolidation is optimal.

On the one hand, when the congestion effect δ is larger and scale economies are smaller, the public sector cost is higher and municipal consolidation

9

may not improve utility. On the other hand, if scale economies in the production of a local public good are larger and the congestion effect is smaller, $\gamma\delta < 1$, the consolidation is efficient because of economies of scale. If $\gamma\delta < 1$, it means that the cost function of local public good per capita decreases with increase in population. When this condition is satisfied, previous studies indicate that municipal consolidation will reduce the local public expenditure per capita. The next section analyzes whether this reasoning is true.

4 Effect of municipal consolidation

The previous section explains the conditions whereby municipal consolidation may result in an efficient allocation of resources. This section analyzes the effect of municipal consolidation on local public spending. When such consolidation is realized, the amount of local public goods is as follows:

$$z_1 = \left[\frac{\beta_1 N^{1-\gamma\delta}}{\gamma+1} \right]^{\frac{1}{\gamma}} = z^m \tag{8}$$

The cost of local public goods per capita is as follows:

$$\frac{C(z_1, N)}{N} = \frac{\beta_1}{\gamma+1} = c^m \tag{9}$$

In order to analyze the effect of municipal consolidation, we compare the case of municipal consolidation with the equilibrium case where the population and the land are equally distributed across regions, that is, $n_i = N/2$ and $H_i = H/2$. In this equilibrium, the central planner chooses local public goods to maximize the representative resident's utility. Then, the problem becomes the following:

$$L^e \equiv u$$
$$+ \lambda \left[\beta_1 \frac{N}{2} + \beta_2 \frac{N}{2} - \frac{N}{2} \frac{e^u N}{z_1 H} - \frac{N}{2} \frac{e^u N}{z_2 H} - z_1{}^\gamma \left(\frac{N}{2}\right)^{\gamma\delta} - z_2{}^\gamma \left(\frac{N}{2}\right)^{\gamma\delta} \right]$$

From this maximization problem, the amount of local public goods consumed and their costs per capita are as follows:

$$z_1 = z_2 = \left[\frac{(\beta_1 + \beta_2)N^{1-\gamma\delta}}{2^{2-\gamma\delta}(\gamma + 1)} \right]^{\frac{1}{\gamma}} = z^e \tag{10}$$

$$\frac{C(z_1, n_1)}{n_1} = \frac{C(z_2, n_2)}{n_2} = \frac{\beta_1 + \beta_2}{2(\gamma + 1)} = c^e \tag{11}$$

First, compare the amount of local public good consumed. From (8) and (10), the following condition holds:

$$\frac{z^m}{z^e} = \left[\frac{2\beta_1}{\beta_1 + \beta_2} 2^{1-\gamma\delta} \right]^{\frac{1}{\gamma}} \tag{12}$$

When $\gamma\delta < 1$ or β_1 is sufficiently large, municipal merger is efficient. In this case, (12) > 1 and the amount of local public goods consumed will be larger than it was in the equilibrium case. Second, the cost in each case is the following:

$$\frac{c^m}{c^e} = \frac{2\beta_1}{\beta_1 + \beta_2} > 1 \tag{13}$$

Because $\beta_1 > \beta_2$, the cost per capita is larger in the case of municipal consolidation. Therefore, the following proposition is made.

Proposition 2 Assuming that a municipal consolidation that decreases the number of regions through regional integration is efficient, by comparing the equilibrium distribution that the population and the land are equally distributed across regions, the local public expenditure per capita increases because of increase in the amount of the local public good.

Buettner and Holm-Hadulla (2013) show that the efficient level of public expenditure per capita is larger in more populated regions because of the larger provision of local public goods. Similar to their results, Proposition 2 shows that municipal consolidation increases local public expenditure

12

per capita and, thus, the amount of local public goods consumed. When municipal consolidation is efficient, some studies would expect us to see decreases in the local public expenditure per capita. However, this paper shows that the effect of municipal consolidation is to increase regional population through regional integration, including an expansion of local public services. That increase causes local public expenditure to increase with increase in population. Municipal consolidation is not expected to decrease local public expenditure through economies of scale.

5   Conclusion

This paper analyzes whether municipal consolidation reduces local public spending, using the local public goods model. Some studies show that the object of municipal consolidation is to reduce public expenditure through economies of scale. This paper suggests that municipal consolidation accomplishes this objective through the efficient allocation of resources.

The result is as follows. If the cost function of local public good per capita decreases with increase in population, municipal consolidation is efficient and increases local public expenditure because the amount of local

public goods consumed increases. Some studies expect to see reductions in the local public expenditure in that cost function. However, this paper shows that municipal consolidation leads to the expansion of local public services and not to the reduction of local public expenditure.

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