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Abstract

This paper analyzes the consolidation of a city and village. Inhabitants of a village benefit from the city without bearing the city's tax burden. Therefore, a village is likely to oppose municipal consolidation because they want a free ride. Conversely, a city favors consolidation because a village shares the cost of services provided by the city after consolidation. This paper analyzes that merger. From the social welfare point of view, it analyzes whether or not consolidation is desirable.

The result depends on the commuting cost between districts. On the one hand, when the commuting cost is very high, consolidation is socially undesirable and is not realized. On the other, when that cost is very low, consolidation is socially desirable and is realized. Moreover, there exists a range of commuting costs within which a village opposes consolidation that is socially desirable. That range increases as the fixed cost of public goods in the city increases, while the population in the village decreases, and the city population increases. In that case, the national government should encourage consolidation via a redistribution policy.

JEL classification: D71, H41, H73, R53

Keywords: Consolidation; Local public goods; Asymmetric district

1 Introduction

A regional population is analyzed for improving the efficiency of local government. As such a regional population is large, the local government can utilize economies of scale for efficiency. Hinnerich (2009) shows that some studies analyze the relationship between larger local governments and the economies of scale. Anas and Xiong (2005), and Conley and Dix (1999) analyzed the optimal population of a local government. The consolidation of local governments is a measure that accommodates a larger regional population. For example, Orutuño-Ortin and Sempere (2006), and Blume and Blume (2007) have analyzed fiscal integration.

Local governments decide whether they will integrate into a larger municipality or separate. When each local government believes that it is better off by merging into a larger region, consolidation is realized. Moreover, should one of the local governments oppose consolidation, it will not be realized. For example, Bolton and Roland (1996), and Ellingsen (1998) have analyzed that consolidation. Such voluntary behaviors of local governments may not be desirable from a social welfare viewpoint. For example, consider consolidations in a city and village. Inhabitants of a village benefit from the city without sharing the city's tax burden. Therefore, a village is likely to oppose consolidation because they want a free ride. Conversely, a city favors consolidation because the village shares the cost of services provided by the city after consolidation. Without a redistribution

policy, such a consolidation is not realized. When that consolidation is socially desirable, the national government should encourage consolidation through a redistribution policy.

This paper analyzed voluntary mergers. From a social welfare point of view, it analyzed whether or not consolidation is desirable. Moreover, this paper discusses the conditions under which a voluntary merger of local governments is socially desirable. If the behavior of local governments is socially undesirable, it is necessary that the national government must solve the problem.

This paper considers two asymmetric local governments. Dur and Staal (2008) utilized two asymmetric districts, i.e., a city and a village. However, both districts differ only in population. From a public service provided by the local government, both districts are symmetric. In general, however, these public goods are asymmetric. For example, Braid (2010) analyzed the local public goods that some jurisdictions provide and others do not. This paper considers two districts (the city and the village) that provide heterogeneous public goods. Public services provided by the city bring more benefits than the village does. Therefore, the village benefits from public services in the city without sharing the cost of those services. After consolidation, however residents in the village will share that cost. Given those conditions, this paper analyzes whether or not local governments consolidate voluntarily when consolidation is socially desirable.

The remainder of the paper is divided as follows. Section 2 shows this paper's model.

Section 3 analyzes the social optimum and the behavior of the local government. Section 4 examines consolidation. Section 5 concludes the paper.

2 The model

The economy is composed of many regions. This paper analyzes one region in that economy. Each region consists of two districts. District 1 is a city and district 2 is a village. The population size of district i is l_i $(i = 1, 2)$, and this paper's model assumes $l_1 > l_2$. That is, the population of the city is larger than that of the village. Each resident is homogeneous and immobile. y is the per capita income exogenously defined. Residents utilize that income to purchase a private good and pay a tax.

Initially, each district constitutes a municipality, which provides local public goods that are financed by a lump sum tax. In district 1, two kinds of local public goods, q and g, are provided. The local public good q is produced under an increasing-returns technology, and the good g is produced under constant-returns. Residents in district 2 can utilize the local public good q with a commuting cost. However, they can not utilize the public good g provided in district 1. In district 2, the local public good g is produced under a constant-returns technology.

The utility function of residents in district 1 is

$$U_1 = \sqrt{g_1} + \sqrt{q} + y - t_1 \tag{1}$$

where g_1 and q are local public goods, and t_1 is a local lump-sum tax. This function follows Dur and Staal (2008). In district 2, the utility function is as follows:

$$U_2 = \sqrt{g_2} + \sqrt{\frac{q}{\tau}} + y - t_2 \tag{2}$$

Residents in district 2 should commute to district 1 when they consume the local public good q . τ ($\tau > 1$) represents that commuting cost.

To produce one unit of the local public good g requires one unit of the private good. Similarly, the required private good for the production q is $a + q$, where a represents a fixed cost. These goods are financed by a local lump-sum tax. In district 1, the local governmet's budget constraint is

$$a + q + g_1 = t_1 l_1 \tag{3}$$

And in district 2, that constraint is:

$$g_2 = t_2 l_2 \tag{4}$$

3 Social optimum and local government

This section analyzes whether or not the economy realizes the optimal allocation. First, the optimal solution is derived. Next, the local government's behavior is analyzed. Then, this section compares the results.

Under the social optimum, the sum of utilities in the region is maximized:

$$\max_{g_1, g_2, q} \; l_1 \left(\sqrt{g_1} + \sqrt{q}\right) + l_2 \left(\sqrt{g_2} + \sqrt{\frac{q}{\tau}}\right) + (l_1 + l_2)\, y - (a + q + g_1 + g_2)$$

The optimum levels of public goods are as follows:

$$g_1 = \left(\frac{l_1}{2}\right)^2 \quad g_2 = \left(\frac{l_2}{2}\right)^2 \quad q = \left(\frac{l_1 + \frac{l_2}{\sqrt{\tau}}}{2}\right)^2 \tag{5}$$

Now, consider the local government. First, in the city the local government maximizes the sum of each resident's utility subject to the budget constraint.

$$\begin{aligned} \max_{g_1,q,t_1} \quad & l_1\left(\sqrt{g_1} + \sqrt{q} + y - t_1\right) \\ s.t. \quad & a + q + g_1 = t_1 l_1 \end{aligned}$$

Solving this problem yields:

$$g_1 = \left(\frac{l_1}{2}\right)^2 \quad q = \left(\frac{l_1}{2}\right)^2 \quad t_1 = \frac{1}{l_1}\left(a + \frac{l_1^2}{2}\right) \tag{6}$$

And the equilibrium level of utility is:

$$U_1^* = \frac{l_1}{2} - \frac{a}{l_1} + y \tag{7}$$

The local public good g_1 is at the same level as the social optimum. That is, the local public good g is at the optimum level. However, the local public good q is underprovided in its provision of the local government, because residents in the village do not share the cost of the public good.

Similarly, the local government in the village maximizes the sum of each resident's utility.

$$\begin{aligned} \max_{g_2,t_2} \quad & l_2\left(\sqrt{g_1} + \sqrt{\frac{q}{\tau}} + y - t_2\right) \\ s.t. \quad & g_2 = t_2 l_2 \end{aligned}$$

Considering the behavior of the city's local government, the equilibrium levels are as follows:

$$g_2 = \left(\frac{l_1}{2}\right)^2 \tag{8}$$

$$t_2 = \frac{l_2}{4} \tag{9}$$

$$U_2^* = \frac{l_2}{4} + y + \frac{l_1}{2\sqrt{\tau}} \tag{10}$$

Compared to the social optimum, the local public good g_2 is at the optimum level. To summarize, when each local government provides local public goods, the good g is a its optimal level, whereas the good q is underprovided. Therefore, the behavior of the local government is socially undesirable.

4 Consolidation and commuting cost

Section 3 shows that the local public good is underprovided when both local governments provide that good. This section analyzes whether or not consolidation can resolve these problems.

When consolidation is realized, two districts form one municipality that provides two local public goods in the city, while in the village, no local public goods are provided. Residents in the village must commute to the city for their consumption of public goods, which are financed by the lump-sum tax imposed on all individuals. That tax is uniform across districts.

The consolidated government maximizes the sum of utilities in the economy.

$$\max_{g_1,g_2,q} \quad l_1\left(\sqrt{g_1}+\sqrt{q}\right)+l_2\frac{\sqrt{g_2}+\sqrt{q}}{\sqrt{\tau}}+\left(l_1+l_2\right)y-\left(a+q+g\right)$$

where τ represents the commuting cost residents in the village must pay. From this maximization, the amounts of local public goods are:

$$g=\left(\frac{l_1+\frac{l_2}{\sqrt{\tau}}}{2}\right)^2 \quad q=\left(\frac{l_1+\frac{l_2}{\sqrt{\tau}}}{2}\right)^2 \tag{11}$$

Compared to the social optimum, the local public good g is overprovision. The consolidated government can utilize the tax revenue from the village for the additional local public good. Since in the economy only one government provides this public good for two districts, the amount of the public good increases compared to the case of two governments that provide the local public good in each district. On the other hand, the amount of the local public good q is optimal. As for the provision of the local public good q, the consolidated government considers all individuals in the economy. This condition is the same as that in the optimal condition.

These results show that consolidation does not achieve the first-best. But consolidation may increase the social welfare compared to the case in which two districts are independent. When two districts are independent, the social welfare is as follows:

$$W_d=\frac{2{l_1}^2+{l_2}^2+\frac{2l_1l_2}{\sqrt{\tau}}}{4}-a+(l_1+l_2)y \tag{12}$$

When consolidation occurs, the social welfare is as follows:

$$W_m = \frac{\left(l_1 + \frac{l_2}{\sqrt{\tau}}\right)^2}{2} - a + (l_1 + l_2)y \tag{13}$$

The difference between these welfares is:

$$W_m - W_d = \frac{\left(\frac{2}{\tau} - 1\right) {l_2}^2 + \frac{2l_1 l_2}{\sqrt{\tau}}}{4} \tag{14}$$

If $\tau = \left[\frac{l_1}{l_2} + \sqrt{\left(\frac{l_1}{l_2}\right)^2 + 2}\right]^2 = \tau^*$, $W_m - W_d = 0$. Moreover, if $\tau > \tau^*$, $W_m - W_d < 0$: if $\tau < \tau^*$, $W_m - W_d > 0$. In a case where the commuting cost is higher than τ^*, the welfare under consolidation is worse off than that under independent case, because individuals in the village must incur the higher commuting cost unnecessary under an independent case. When the commuting cost is smaller than τ^*, the welfare under consolidation is better off due to the small cost.

In the economy, consolidation requires the consent of both governments. Each government favors consolidation when the sum of residents' utilities increases. First, we consider the case of the city. When consolidation occurs, the individual's utility in the city is as follows:

$$U_{mc} = \frac{l_1 + \frac{l_2}{\sqrt{\tau}}}{2} - \frac{a}{l_1 + l_2} + y \tag{15}$$

Comparing (7) and U_{mc} , the individual's utility in the city is better off when consolidation occurs. That is because the village shares the cost of public goods in the case of consolidation. Therefore, the city always favors consolidation.

Next, in the village, when districts consolidate, the individual's utility is as follows:

$$U_{mv} = \frac{l_1 + \frac{l_2}{\sqrt{\tau}}}{\sqrt{\tau}} - \frac{1}{l_1 + l_2}\left[a + \frac{\left(l_1 + \frac{l_2}{\sqrt{\tau}}\right)^2}{2}\right] + y \tag{16}$$

The difference between (16) and (10) is as follows:

$$U_{mv} - U_2^* = \frac{\left(\frac{1}{\sqrt{\tau}} - 1\right) 2{l_2}^2 + \left(\frac{4}{\tau} - \frac{2}{\sqrt{\tau}-1}\right) l_1 l_2 + \left(\frac{2}{\tau} - 1\right) {l_2}^2}{4(l_1 + l_2)} - \frac{a}{l_1 + l_2} \tag{17}$$

(17) is zero if:

$$\tau = \tau^{**} = \left[\frac{l_1(l_1 - l_2) + \sqrt{{l_1}^2(l_1 - l_2)^2 + (2{l_1}^2{l_2}^2 + l_1 l_2 + {l_2}^2 + 4a)2l_2(2l_1 + l_2)}}{2{l_1}^2{l_2}^2 + l_1 l_2 + {l_2}^2 + 4a}\right]^2 \tag{18}$$

When $\tau > \tau^{**}$, $(17) < 0$ and consolidation decreases utility in the village. Therefore, the village opposes consolidation that increases the amount of public goods provision in the city. However, as the commuting cost is higher, individuals in the village must pay a higher cost for the consumption of public goods. As a result, the amount of public goods consumption in the village decreases. On the other hand, when the commuting cost is smaller, individuals in the village can utilize public goods without the higher commuting cost. Consolidation then increases the amount of public goods consumption. Sørensen (2006) showed that the political transaction cost impeded consolidations in Norway. In this paper, the commuting cost behaves as if it were that cost.

As the population of village l_2 increases, τ^{**} increases. This indicades that the possibility the village favors consolidation also increases. The larger population of the village increases the public good provision caused by consolidation. The welfare gain from con-

solidation then increases. Thus, the larger population in the village enhances the incentive to consolidate.

Next, consider the population of the city l_1 . When the fixed cost of public good q , a , is sufficiently small, τ^{**} decreases as the population of the city increases. The larger population in the city weakens the incentive to consolidate. When consolidation is realized, the public good is provided only in the city. Individuals in the village then have to consume the public good in the city along with the commuting cost. When the population of a city is higher, the increment of public good q after consolidation decreases. Thus, the larger population in the city weakens the incentive for consolidation.

Does the village favor consolidation when it is socially optimal? Comparing τ^* and τ^{**} , $\tau^{**} < \tau^*$ holds. When $\tau > \tau^*$, consolidation is not desirable and does not occur because of the village's opposition. When $\tau < \tau^{**}$, consolidation is desirable and is realized.

When $\tau \in [\tau^{**}, \tau^*]$, a problem occurs. In this case, consolidation is desirable, though the village opposes consolidation as being not feasible. If $\tau < \tau^*$, the consolidation increases welfare because the amount of public goods provision in the city is greater, as is the welfare in the city. However, when that commuting cost is greater, the village opposes consolidation to avoid the larger burden for public goods consumption. If $\tau > \tau^{**}$, the increment of public goods after consolidation is not sufficient to relieve the burden of the

commuting cost in the village. The village then opposes consolidation because they do not consider the welfare in the city. When $\tau \in [\tau^{**}, \tau^{*}]$, the national government should encourage consolidation.

The range of $[\tau^{**}, \tau^{*}]$ increases when a increases. If the fixed cost of public good q is larger, consolidation increases the burden of the village, which then opposes the consolidation that increases social welfare.

Figure 1 depicts the relationship between the population of the village and the commuting cost. The range of $[\tau^{**}, \tau^{*}]$ decreases when l_2 increases. As the population of the village increases, it is more likely that the village will favor consolidation that increases social welfare. When l_2 is small, the possibility that the village opposes consolidation increases.

Figure 2 shows the relationship between the population of the city and the commuting cost. It supposes that the fixed cost a is sufficiently small. The range of $[\tau^{**}, \tau^{*}]$ increases when l_1 increases. As the population of the city increases, the possibility that consolidation improves social welfare also increases. Because of the higher commuting cost, however, the village simultaneously opposes consolidation.

Figure 3 depicts the relationship between the total population and the commuting cost when the relative population between the city and village is constant. When the population increases, the range of $[\tau^{**}, \tau^{*}]$ decreases, though τ^{*} does not change. Com-

pared to Fig.1, the range is larger. When the total population increases, the populations of the city and village increase simultaneously. As for social welfare, the effect of the city population offsets that of the village population, and τ^* becomes constant. From the viewpoint of the social optimum, the possibility that the national government should support consolidation is greater than the case in Fig.1.

5 Conclusion

This paper examines the consolidation in local governments. When a small district merges into a larger one, the consolidating government can provide a higher level of public services. Normally, residents in large districts favor consolidation because small districts share the cost of public services, while the large district's loss in consolidation is low. However, residents in a small district oppose consolidation when it results in a large loss from taxes and commuting costs. This paper shows a condition in which consolidation, though desirable, is unrealized.

The result depends on the commuting cost between districts. When the commuting cost is very high, consolidation is socially undesirable and thus not realized. On the other hand, when that cost is very low, consolidation is socially desirable and is realized. Moreover, there exists a range of commuting costs within which a small district opposes consolidation that is socially desirable. That range increases as the fixed cost of public goods in a large district increases, whereas the population in a small district decreases as

the population in a large district increases. In that case, the national government should encourage consolidation via a redistribution policy.

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Fig.1 The effect of village population on optimal consolidation and village behavior.

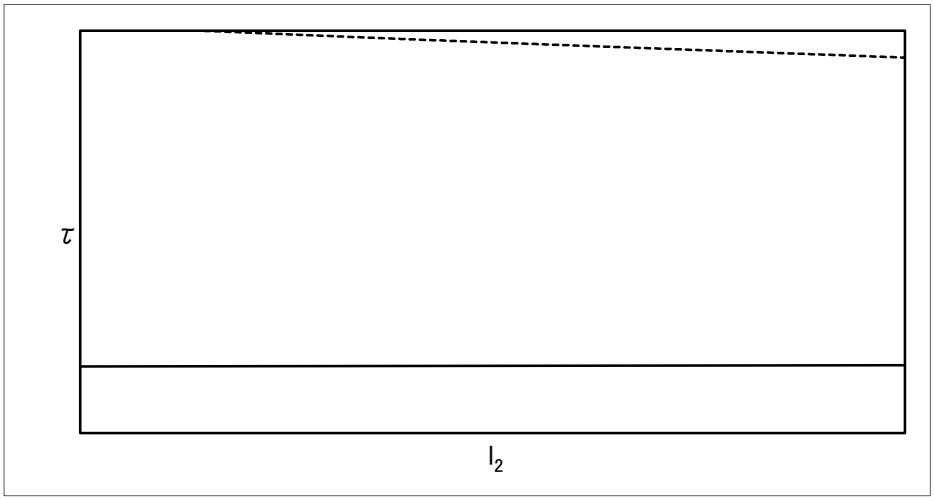

Fig.2 The effect of city population on optimal consolidation and village behavior.

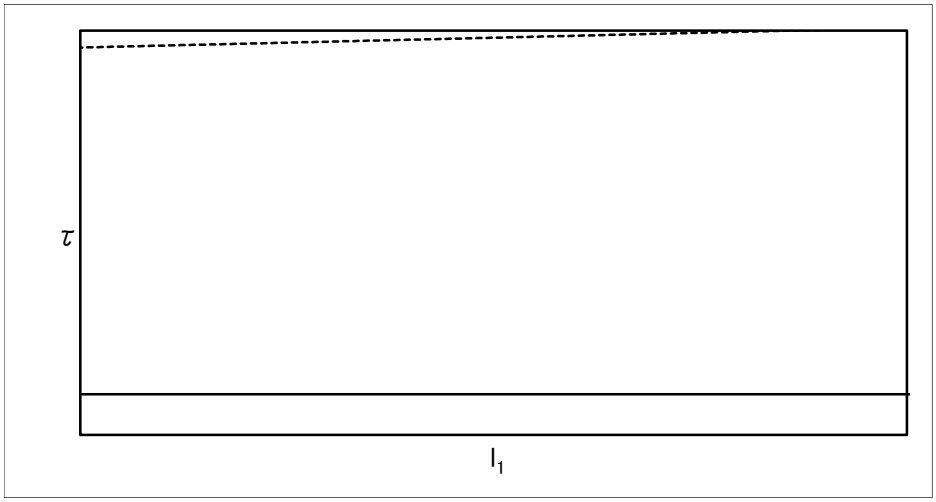

Fig.3 The effect of total population on optimal consolidation and village behavior.