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Abstract

This paper theoretically analyzes how firm location and wage differences among regions affect inter-municipal cooperation. When considering two regions, such as a city and a suburb, the suburb may not desire inter-municipal cooperation because of its low revenue. Industrial location induces the local government to accept such cooperation.

The results depend on the population in the peripheral region. When the population is large, the local government in the peripheral region accepts inter-municipal cooperation regardless of the industrial location. Conversely, suppose that the peripheral population is small. In this case, when the manufacturing sector agglomerates in the city, the local government in the peripheral region does not desire such cooperation. The peripheral region's local government accepts cooperation only when the manufacturing sector disperses and wages in the periphery increase sufficiently.

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1 Introduction

The global public sector is expected to reduce local public spending and improve financial efficiencies because of the declining birthrate and aging population, which decreases tax revenue and imposes the burden of social welfare. Alam et al. (2019) showed that unexpected factors increase the demand for local public goods and services in developing countries, leading to local public spending pressure.

Some local public goods, such as the registration of addresses, the collection and disposal of garbage, fire prevention, and some local government activities, such as organizing elections and collecting revenues, have economies of scale (e.g., Solé-Ollé and Bosch (2005) and Andrews and Boyne (2011)). For the smallest municipalities, the per capita cost is higher because the number of users is lower than the capacity size. For these municipalities, increasing local population size decreases the costs of local services without the diseconomies of scale, such as the congestion effect.

Inter-municipal cooperation is expected for financial efficiency and to achieve cost savings. This paper theoretically analyzes how firm location and wage differences among regions affect inter-municipal cooperation. Allers and Greef (2018) explain that inter-municipal cooperation may improve efficiency because of the economies of scale in the production of local public services. Bel and Warner (2015) and Niaounakis and Blank (2017) empirically analyze how municipalities can exploit economies of scale. It increases the number of people using these services through cooperation among municipalities.

Traditionally, the consolidation of municipalities is proposed to improve efficiency and reduce expenditure through economies of scale. Previous studies showed that local public expenditure decreases with the regional population as long as the population does not exceed a critical size. For many developing countries facing rapid urbanization, consolidation is expected to promote economic growth (Tang et al. (2017)).

However, the consolidation of municipalities is subject to several drawbacks. First, recent studies (e.g., Bless and Baskaran (2016), Miyazaki (2018)) showed that consolidation increases local public expenditures; municipal consolidation is no exception. Second, some municipalities do not desire municipal consolidation because it extinguishes independent control over policy matters. Rather, these municipalities desire decentralization. In practice, many consolidations are implemented compulsorily, although the amount of voluntary consolidation is small, particularly when compared with the optimal number (e.g., Avellaneda and Gomes (2014), Weese (2015)).

For utilizing economies of scale, an alternative solution should be provided to maintain decentralization. Inter-municipal cooperation is an efficient policy alternative to municipal consolidation. In fiscal decentralization, the problem lies in whether the inter-municipal cooperation is voluntarily realized. If cooperation does not occur, it should be implemented compulsorily.

This paper analyzes the relationship between inter-municipal cooperation and industrial distribution. On this topic, Roos (2004) analyzed the relationship between agglomeration and the public sector. When considering two regions, such as a city and a suburb, normally, the suburb does not want inter-municipal cooperation because of its low revenue. As a result, it is not implemented voluntarily among these two regions. However, if industrial dispersion increases the suburb’s revenue, that policy should be influenced, and cooperation would be implemented voluntarily, not compulsorily.

This paper is organized as follows. Section 2 presents and examines the model presented by this paper. Section 3 analyzes the local government's behavior without inter-municipal cooperation. Section 4 shows the effect of industrial distribution on inter-municipal cooperation. Section 5 presents concluding remarks.

2 The model

2.1 Setting

This paper's model follows Takatsuka (2014). This paper considers an economy with two regions (Region 1 and Region 2), where each individual in this economy consumes three goods: a manufactured good, an agricultural good, and a local public good.

The manufactured good is produced under constant returns and is provided in the national market. Following Anas and Xiong (2003, 2005), the model assumes that the equilibrium of the national market is exogenous. Each region can produce intermediate goods that can be traded between regions with transportation costs. These goods are intermediate inputs in the production of the manufactured good and are produced under increasing returns, with local labor as the input. In the market for intermediate goods, monopolistic competition occurs.

The manufacturers are located in Region 1, as are the firms making the intermediate goods. This means that the manufacturing sector (firms making the manufactured and intermediate goods) agglomerates in Region 1. The intermediate goods producer can relocate to Region 2. In the equilibrium, when it is efficient for some of the intermediate producers to relocate, they disperse in each region. In this case, the manufacturer in Region 1 uses all of the intermediate goods that are produced in each region.

The agricultural goods are produced under constant returns and are provided in the national market. The producer of agricultural goods uses local labor. In each region, the labor market is competitive. When intermediate goods producers pay a higher wage than the agricultural producers, labor shifts from the production of agricultural goods. Then, the region does not produce agricultural goods and imports them from the national market. Conversely, when intermediate goods producers are not located in a region (offering higher wages), the agricultural producer can use local labor and the region produces agricultural goods.

Each region has a local government that can provide the local public good. To produce the good, the manufactured good is utilized. The local government imposes an income tax on individuals in its own region to finance the production of the local public good. The object of each local government is to maximize individual utility in its own region.

Following Takatsuka (2014) and Tsubuku (2016), in the model, each individual in each region supplies one unit of labor and cannot migrate across regions. In this economy, the total population is represented by $\bar{L} = \mathrm{L}_1 + \mathrm{L}_2$, where $L_i \quad (i = 1,2)$ is region i's population. This paper assumes that $L_1 > L_2$. That is, Region 1 is larger (has a greater population) than the other region. Intuitively, this assumption means that Region 1 represents the city and Region 2 represents the periphery.

2.2 Model specification

Individuals in Region i have the following utility function:

$$U_i = x_i^{\alpha} z_i^{1-\alpha} G_i$$

where x_i is the manufactured good, z_i is the agricultural good, and G_i is the local public good. The budget constraint of an individual is $(1-t_i)w_i = p_x x_i + p_z z_i$ where p_x is the price of the manufactured good, p_z is the price of the agriculture good, w_i is the wage, and t_i is the tax rate.

Initially, manufacturing sector agglomerates in Region 1. The production function of the manufactured good is as follows:

$$X_1 = \left\{\int_0^{N_1} q_j^{\rho} dj\right\}^{\frac{1}{\rho}} \qquad 0 < \rho < 1$$

where q_j denotes the intermediate goods j ($j \in [0,\ N_1]$) and N_1 is the variety of intermediate goods. One intermediate good is produced by one firm. The production function of each intermediate good is given by the following:

$$L_{q_j} = f + bq_j$$

where L_{q_j} is the labor input, f is the fixed labor input and b is the marginal labor input.

An intermediate goods producer can relocate to Region 2. When producers disperse in each region, manufacturers in Region 1 use all of the intermediate goods of each region. In this case, the production function of the manufactured good is as follows:

$$X_1 = \left\{ \int_0^{N_1} q_j^{\rho} dj + \int_0^{N_2} q_k^{\rho} dk \right\}^{\frac{1}{\rho}}$$

where q_j is the intermediate good j $(j \in [0,\ N_1])$ produced in Region 1 and q_k is the intermediate good k $(k \in [0,\ N_2])$ produced in Region 2. N_i is the variety of intermediate goods produced in Region i $(i = 1,2)$. For using the good produced in Region 2, the producer must pay the iceberg transportation cost that is, $\tau > 1$ unit of the good is required to provide one unit of good in region 1. The production function of each intermediate good is the same as that in the case of agglomeration.

The production function of agricultural good z is as follows: $z = L_z$, where L_z is the labor input. This good is produced under perfect competition.

In each region, the local government can produce the local public good. The production function is as follows:

$$G_i = \exp(\epsilon L_i)\, {X_{G_i}}^{\gamma}$$

where X_{G_i} is the manufactured good's input. $\exp(\epsilon L_i)$ exhibits the population's economies of scale in the production. The budget constraint of the local government is given as follows:

$$t_i w_i L_i = p_x X_{G_i}$$

The local government maximizes individual utility in its own region.

2.3 Equilibrium of the agglomerated case

First, the case in which the manufacturing sector agglomerates in Region 1 is analyzed. From the first-order condition of production through manufacturing, the following condition holds:

$$p_{mj} = p_x X_1^{1-\rho} q_j^{d\,\rho-1} \qquad (1)$$

where p_{mj} is the price of the intermediate good j and q_j^d is the intermediate good j .

Because the intermediate goods are produced under monopolistic competition, the first-order condition for profit maximization is given by the following:

$$p_{mj} = \frac{w_1 b}{\rho} \qquad (2)$$

Moreover, from the zero-profit condition, the output of goods and labor input are obtained as follows:

$$q_j = \frac{\rho f}{b(1-\rho)} \qquad (3)$$

$$L_{qj} = \frac{f}{1-\rho} \qquad (4)$$

It is assumed that the agricultural good is not produced in Region 1. Conversely, in Region 2, only the agricultural good is produced. The first-order condition for profit maximization is as follows:

$$p_z = w_2 \qquad (5)$$

The labor input for agricultural production is L_{2z}. In the following, it is assumed that $p_z = 1$. This assumption and (5) indicate that Region 2's wage is 1. If the agricultural good is produced in Region 1, then $1 = p_z = w_1$ holds true. However, if w_1 is larger than 1 in the equilibrium, workers in Region 1 do not supply labor to the agricultural producer, and the agricultural good is not produced. The assumption that it is not produced indicates that the wage is larger than 1 in the equilibrium.

In the equilibrium, Region 1's intermediate good market and each region's labor markets must clear. From these conditions, the following conditions hold true:

$$q_j^d = q_j \qquad (6)$$

$$L_1 = N_1 L_{qj} \qquad (7)$$

$$L_2 = L_{2j} \qquad (8)$$

Because the intermediate goods are symmetric, (6) is satisfied for each good and the labor demand in Region 1 is $N_1 L_{qj}$.

In the equilibrium, equations (1) through (8) determine the variables w_1, w_2, p_{mj}, N_1, L_{qj}, L_{2z}, q_j, and q_j^d . The exogenous variables are p_x, p_z, L_1 , and L_2 . From these equations, we get the following:

$$q_j = q_j^d = \frac{\rho f}{b(1-\rho)} \qquad L_{2z} = L_2 \qquad L_{qj} = \frac{f}{1-\rho} \qquad w_2 = 1$$

The variety of intermediate goods is given by the following:

$$N_1 = \frac{L_1(1-\rho)}{f}$$

The wage in Region 1 is given by the following:

$$w_1^a = p_x \frac{\rho}{b} \left\{\frac{1-\rho}{f}\right\}^{\frac{1-\rho}{\rho}} L_1^{\frac{1-\rho}{\rho}} \qquad (9)$$

In the following, w_1^a reflects Region 1's wage in the agglomerated case. From the wage, the price of intermediate goods is as follows:

$$p_{mj} = p_x \left\{\frac{1-\rho}{f}\right\}^{\frac{1-\rho}{\rho}} L_1^{\frac{1-\rho}{\rho}}$$

In this equilibrium, the amount of the manufactured product is as follows:

$$X_1^a = \left\{\frac{1-\rho}{f}\right\}^{\frac{1-\rho}{\rho}} \frac{\rho}{b} L_1^{\frac{1}{\rho}} \qquad (10)$$

2.4 Equilibrium of a dispersed case

Now, the case in which intermediate producers disperse in each region is analyzed. The profit maximization conditions of the manufactured good producer are as follows:

$$p_{1j} = p_x X_1^{1-\rho} {q_{1j}^d}^{\rho-1} \qquad (11)$$

$$p_{2k}\tau = p_x X_1^{1-\rho} {q_{2k}^d}^{\rho-1} \qquad (12)$$

where p_{1j} is the price of the intermediate goods j produced in Region 1. p_{2k} is the price of good k produced in Region 2, and q_{1j}^d and q_{2k}^d denote the demand for corresponding goods. In addition, τ is the iceberg transportation cost.

Regarding the intermediate goods, from the profit maximization and zero-profit conditions, the following conditions hold true:

$$p_{1j} = \frac{w_1 b}{\rho} \qquad (13)$$

$$p_{2k} = \frac{w_2 b}{\rho} \qquad (14)$$

$$q_j = q_k = \frac{\rho f}{b(1-\rho)} \qquad (15)$$

$$L_{qj} = L_{qk} = \frac{f}{1-\rho} \qquad (16)$$

In Region 2, intermediate goods producers begin to provide the intermediate goods if they can use Region 2's labor employed by the agricultural producer in the agglomerated case. It is possible when they pay a higher wage than the agricultural producer, that is, $w_2 > 1$. Then, the intermediate producer uses all of Region 2's labor force, and the agricultural good is not produced. In the equilibrium of the dispersed case, each region does not produce the agricultural good and imports it from the national market.

The market-clearing conditions for intermediate goods and labor are as follows:

$$q_{1j}^d = q_j \qquad (17)$$

$$\tau q_{2k}^d = q_k \qquad (18)$$

$$L_1 = N_1 L_{qj} \qquad (19)$$

$$L_2 = N_2 L_{qk} \qquad (20)$$

Because the intermediate goods are symmetric in each region, (17) and (18) are satisfied for each good. From this symmetric condition, (19) and (20) are derived.

From equations (11) through (20), the following variables are derived: w_1, w_2, p_{1j},

p_{2k}, N_1, N_2, L_{qj}, L_{qk}, q_j, q_k, q_{1j}^d , and q_{2k}^d . The exogenous variables are p_x, p_z, L_1 , and L_2 . Then the following is obtained:

$$q_j = q_{1j}^d = \frac{\rho f}{b(1-\rho)} \quad q_k = \frac{\rho f}{b(1-\rho)} \quad q_{2k}^d = \frac{\rho f}{\tau b(1-\rho)} \quad L_{qj} = L_{qk} = \frac{f}{1-\rho}$$

The varieties of intermediate goods in each region are as follows:

$$N_1 = \frac{L_1(1-\rho)}{f} \qquad N_2 = \frac{L_2(1-\rho)}{f}$$

The wage in each region is given by the following:

$$w_1^d = p_x \frac{\rho}{b}\left\{\frac{1-\rho}{f}\right\}^{\frac{1-\rho}{\rho}} [L_1 + L_2\tau^{-\rho}]^{\frac{1-\rho}{\rho}} \qquad (21)$$

$$w_2^d = \tau^{-\rho} p_x \frac{\rho}{b}\left\{\frac{1-\rho}{f}\right\}^{\frac{1-\rho}{\rho}} [L_1 + L_2\tau^{-\rho}]^{\frac{1-\rho}{\rho}} \qquad (22)$$

Comparing (9) and (21), we can observe that (21) is larger than (9). The dispersion of the manufacturing sector increases Region 1's wage. This is because the portion of Region 2's labor force that is not used for the manufactured good in the agglomerated case can be utilized for the production of the good. Moreover, (21) and (22) show that $w_1/w_2 = \tau^{\rho} > 1$. This means that Region 1's wage is greater than Region 2's wage in the case of dispersion. From these wages, the prices of intermediate goods are given by the following: $p_{1j} = w_1 b/\rho$ and $p_{2k} = w_2 b/\rho$.

In this equilibrium, the total amount of the manufactured goods produced is given by the following:

$$X_1^d = \left\{\frac{1-\rho}{f}\right\}^{\frac{1-\rho}{\rho}} \frac{\rho}{b} [L_1 + L_2 \tau^{-\rho}]^{\frac{1}{\rho}} \qquad (23)$$

Comparing (10) and (23), we can observe that the amount of production is larger than that in the agglomerated case because the labor in Region 2 can be utilized for manufactured goods.

2.5 The location decision of intermediate goods firms

Initially, it is assumed that all firms making intermediate goods agglomerate in Region 1. However, these firms are able to relocate to Region 2. When the transportation cost of the intermediate goods decreases, some firms relocate to Region 2 for the sake of lower labor costs. Consequently, the case arises that the intermediate goods firms disperse across regions. In equilibrium, this case (dispersed) is realized whenever a higher wage is created in Region 2 than in the agglomerated case. When these firms agglomerate in Region 1, Region 2's wage w_2^a is 1. If they distribute across regions, Region 2's wage w_2^d is (22). Therefore, if (22) is larger than 1, these firms disperse in equilibrium. Consider the transportation cost τ^* that satisfies $(22) = 1$. Because (22) is a decreasing function of τ, if the transportation cost is larger than τ^*, then $w_2^a < 1$ and the dispersed case does not arise. Conversely, if the transportation cost decreases and $\tau < \tau^*$, firms disperse across regions.

3 Local government behavior

This section analyzes the local government's behavior, in which it behaves independently. That is, the government does not consider cooperation, and each local government seeks to maximize individual utility in its own region.

In Region 1, the local government provides the local public good. From the model's specifications, the local government's issue is as follows:

$$\max_{t_1} V_1 = \left(\frac{\alpha}{p_x}\right)^{\alpha} \left(\frac{1-\alpha}{p_x}\right)^{1-\alpha} (1-t_1)w_1 \left(\frac{t_1 w_1 L_1}{p_x}\right)^{\gamma} \exp(\epsilon L_1)$$

where V_1 is the indirect utility in Region 1. When the manufacturing sector agglomerates in Region 1, w_1 is (9). Conversely, in the case of dispersion, w_1 is (21). From the first-order condition of this problem, the tax rate is $t_1 = \gamma/(\gamma+1)$ and the following is obtained:

$$G_1 = \left[\frac{\gamma w_1 L_1}{(\gamma+1)p_x}\right]^{\gamma} \exp(\epsilon L_1) \qquad (24)$$

Then, the utility in Region 1 is given by the following:

$$V_1 = \left(\frac{\alpha}{p_x}\right)^{\alpha}\left(\frac{1-\alpha}{p_x}\right)^{1-\alpha}\frac{{w_1}^{\gamma+1}{L_1}^{\gamma}}{\gamma+1}\left[\frac{\gamma}{(\gamma+1)p_x}\right]^{\gamma}\exp(\epsilon L_1) \qquad (25)$$

The local government in Region 2 provides the local public good. Similar to Region 1, the tax rate is $t_2 = \gamma/(\gamma+1)$ and the following holds true:

$$G_2 = \left[\frac{\gamma w_2 L_2}{(\gamma+1)p_x}\right]^{\gamma} \exp(\epsilon L_2)$$

Moreover, the utility is given by the following:

$$V_2 = \left(\frac{\alpha}{p_x}\right)^{\alpha}\left(\frac{1-\alpha}{p_x}\right)^{1-\alpha}\frac{{w_2}^{\gamma+1}{L_2}^{\gamma}}{\gamma+1}\left[\frac{\gamma}{(\gamma+1)p_x}\right]^{\gamma}\exp(\epsilon L_2) \qquad (26)$$

when the manufacturing sector agglomerates in Region 1, $w_2 = 1$. Conversely, w_2 is (22) in the dispersed case.

4 Local government cooperation

This section analyzes the cooperation of local governments. The cooperation is implemented as follows: When each local government cooperates, they utilize the economies of scale in the production of the local public good. Then, the production function is as follows:

$$G_i = \exp(\epsilon \bar{L})\, {X_{G_i}}^{\gamma}$$

Because of cooperation, in the population's economies of scale, the local government can utilize both region's total population instead of its own region's population. If the amount of local public good is fixed, cooperation decreases the input through the economies of scale. Then, each local government can benefit from the reduction in production cost. In other words, the population size decreases the cost of local services. For utilizing cooperation, each local government should pay the fixed cost T. Intuitively, this is the transaction costs for cooperation (e.g., Bel and Warner (2015)).

Cooperation is realized when each region wishes to carry this out. First, we analyze whether Region 1's local government accepts it. When cooperation is implemented, the local government in Region 1 maximizes the utility in its own region. The budget constraint of Region 1's local government is as follows:

$$t_1 w_1 L_1 = p_x X_{G_1} + T$$

where T reflects the fixed transaction cost for cooperation. The local government's issue is as follows:

$$\max_{t_1} V_1 = \left(\frac{\alpha}{p_x}\right)^{\alpha} \left(\frac{1-\alpha}{p_x}\right)^{1-\alpha} (1-t_1) w_1 \left(\frac{t_1 w_1 L_1 - T}{p_x}\right)^{\gamma} \exp(\epsilon \bar{L})$$

where w_1 is (9) in the agglomerated case and (21) when the dispersed case arises. Similar to the previous section, the tax rate is as follows:

$$t_1 = \frac{\gamma + \frac{T}{w_1 L_1}}{\gamma + 1}$$

Compared to the previous section, the tax rate is larger. Because of the transaction cost, the local government should increase the tax rate. The economies of scale do not reduce the public expenditure, although it can enhance the public good’s level. The amount of local public good is as follows:

$$G_1 = \left[\frac{\gamma(w_1 L_1 - T)}{(\gamma+1) p_x}\right]^{\gamma} \exp(\epsilon \bar{L}) \qquad (24)$$

Then, the utility V_{1j} is as follows:

$$V_{1j} = \left(\frac{\alpha}{p_x}\right)^{\alpha} \left(\frac{1-\alpha}{p_x}\right)^{1-\alpha} \frac{1 - \frac{T}{w_1 L_1}}{\gamma + 1} w_1 \left[\frac{\gamma(w_1 L_1 - T)}{(\gamma+1) p_x}\right]^{\gamma} \exp(\epsilon \bar{L}) \qquad (27)$$

The local government decides whether to cooperate. In this setting, when the utility (27) is larger than the utility in a non-cooperation case (25), the local government cooperates.

First, we analyze the case in which the manufacturing sector agglomerates in Region 1. From the model specification, the relative utility is as follows:

$$\frac{V_{1j}}{V_1} = \left\{1 - \frac{T}{w_1 L_1}\right\}^{\gamma+1} \exp\{\epsilon(\bar{L} - L_1)\} \qquad (28)$$

where w_1 is (9). When (28) is larger than 1, Region 1's local government wants cooperation.

On the right-hand side of (28), the first term represents the effect of the cost for cooperation and the second term is the benefit of cooperation. If $L_1 = \bar{L}$, the second term is 1 and Region 1's benefit disappears. This means that Region 1 does not want cooperation in the case of full population agglomeration. Conversely, if $L_1 = \bar{L}/2$, the second term maximizes in the range of $\bar{L}/2 \leq L_1 \leq \bar{L}$. This paper assumes that (28) > 1 when $L_2 = \bar{L}/2$. This means that Region 1 desires cooperation when each region's population is equal in number.

Consider L_1^* that is a sole solution to the equation $(28) = 1$ in the range of $\bar{L}/2 \leq L_1 \leq \bar{L}$. From the previous analysis, when the population is smaller than L_1^*, Region 1 should accept cooperation. Conversely, when the population is larger than L_1^*, Region 1 does not accept it.

Next, we analyze the case in which the manufacturing sector disperses across regions. Then, Region 1's wage increases and the relative utility (28) increases. Assume that $(28) > 1$ when the manufacturing sector agglomerates in Region 1. Then, in the case of dispersion, Region 1 always accepts cooperation.

To summarize these results, the following lemma is obtained.

Lemma

Consider the case in which the manufacturing sector agglomerates in Region 1. When the population in Region 1 is not sufficiently large, the local government desires cooperation. This policy does not change when the firm location pattern changes.

When population agglomeration is almost perfect, the benefit of cooperation almost disappears. However, when population agglomeration is not perfect, the local government of the larger region always accepts cooperation, whether or not the manufacturing sector agglomerates. In the following analysis, we assume that this condition is satisfied. Cooperation is realized if the local government in Region 2 desires it.

In the following, we analyze Region 2's local government policy. The local government in Region 2 maximizes the utility in its own region in the case of cooperation. In what is similar to Region 1, the tax rate is:

$$t_2 = \frac{\gamma + \frac{T}{w_2 L_2}}{\gamma + 1}$$

Similar to Region 1, the economies of scale do not reduce the public expenditure, although it can enhance the public good's level. The utility is given by the following:

$$V_{2j} = \left(\frac{\alpha}{p_x}\right)^{\alpha} \left(\frac{1-\alpha}{p_x}\right)^{1-\alpha} \frac{1 - \frac{T}{w_2 L_2}}{\gamma + 1} w_2 \left[\frac{\gamma(w_2 L_2 - T)}{(\gamma + 1) p_x}\right]^{\gamma} \exp(\epsilon \bar{L}) \qquad (29)$$

where w_2 is 1 in the agglomerated case and (22) when the dispersed case arises.

First, we analyze the case in which the manufacturing sector agglomerates in Region 1. In what is similar to Region 1's analysis, the relative utility is as follows:

$$\frac{V_{2j}}{V_2} = \left\{1 - \frac{T}{w_2 L_2}\right\}^{\gamma+1} \exp\{\epsilon(\bar{L} - L_2)\} \qquad (30)$$

where $w_2 = 1$. When (30) is larger than 1, Region 2's local government wants cooperation. Conversely, when (30) is smaller than 1, it does not.

From the assumption, $0 \leq L_2 \leq \bar{L}/2$. holds. If L_2 is sufficiently small, (30) is smaller than 1 because the utility of the cooperation case V_{2j} disappears. When the population of Region 2 is sufficiently small, Region 2 cannot pay the transaction cost for cooperation and cannot acquire the positive utility. Then, Region 2's local government does not accept cooperation. Conversely, if $L_2 = \bar{L}/2$, the first term maximizes in the range of $0 \le L_2 \le \bar{L}/2$ and $V_{2j} > 0$. This means that the capacity for paying the cost is enough because of the population. Then, Region 2's local government may accept cooperation. This paper assumes that $(30) > 1$ when $L_2 = \bar{L}/2$. This means that Region 2 wants cooperation when each region's population is the same.

Consider that L_2^* is a sole solution of the equation $(30) = 1$ in the range of $0 \le L_2 \le \bar{L}/2$ and $V_{2j} > 0$. From the previous analysis, when the population is smaller than L_2^*, Region 2 does not accept cooperation. Conversely, when the population is larger than L_2^*, Region 2 should accept it. To summarize these results, the following proposition is obtained.

Proposition 1

Consider the case in which the manufacturing sector agglomerates in Region 1 and the local government in this region always accepts cooperation. When the population in Region 2 is larger than L_2^*, cooperation is realized. Conversely, when the population is smaller than L_2^*, Region 2's local government does not wish to cooperate.

Cooperation causes additional costs for Region 2. Nevertheless, Region 2 desires the cooperation if the population is larger because the capacity for taking that cost is enough. However, if the population of Region 2 is smaller, the burden of the transaction cost is larger for the region, which seriously decreases the utility. Thus, Region 2 should decline cooperation.

Next, we analyze whether the change in industrial distribution (in which the manufacturing sector disperses across regions) could change the local government's policy. In what is similar to the agglomerated case, the relative utility is (30), though w_2 is (22). From the analysis of the locations of intermediate goods firms, the decision regarding location is not of concern if the transportation cost is τ^*. Then, $(22) = 1$ and we assume that $(30) = 1$ in this case. That is, the policy of Region 2's local government is one of indifference in the agglomeration. When the transportation cost decreases, τ^*,

w_2 increases and (30) is larger than 1. In this case, the local government accepts cooperation. That is, if the transportation cost decreases sufficiently, (30) increases sufficiently and is larger than 1, though (30) is smaller than 1 in the agglomerated case. Consequently, the following proposition is obtained.

Proposition 2

In the case of agglomeration, assume that Region 2's local government declines cooperation. The manufacturing sector disperses because of the reduced transportation cost; when that cost is sufficiently small, Region 2's local government desires cooperation.

From Proposition 1, if the population in Region 2 is not large, Region 2's local government does not desire cooperation. However, from Proposition 2, if the transportation cost decreases sufficiently, the government accepts cooperation. The reduced transportation costs increases Region 2's wages. Correspondingly, the revenue of Region 2 increases and the region can accept the participation cost for cooperation.

Although the population in Region 2 is smaller, the change in industrial distribution may change the local government's policy.

5 Conclusion

This paper analyzes how firm location and wage differences among regions affect inter-municipal cooperation. When considering two regions, such as a city and a suburb, the suburb may not desire inter-municipal cooperation because of its low revenue. The industrial location induces the local government to accept inter-municipal cooperation.

The results depend on the population in the peripheral region. When the population is large, the local government in the peripheral region accepts inter-municipal cooperation regardless of industrial location. Conversely, if the peripheral population is small, when the manufacturing sector agglomerates in the city, the local government in the peripheral region does not want cooperation. The peripheral region's local government accepts cooperation only when the manufacturing sector disperses and wages in the peripheral region sufficiently increase.

The local public sector is expected to improve financial efficiencies in developed countries. Meanwhile, unexpected factors and rapid urbanization has led to local public spending pressure in developing countries. Consolidation is an option to solve these concerns because it exploits economies of scale. However, some local governments do not consolidate and remain independent because of decentralization. In this context, inter-municipal cooperation is an alternative to consolidation. In that case, the problem lies in whether inter-municipal cooperation is voluntary implemented. This paper shows that local governments voluntarily participate in inter-municipal cooperation in some cases without such participation being compulsory.

References

Alam, A B M M., Alam, M. and Hoque, A. (2019) Spending pressure, revenue capacity and financial condition in municipal organizations: An empirical study, The Journal of Developing Areas 53(1): 243-256. https://doi.org/10.1353/jda.2019.0014

Allers, M. A., and de Greef, J.A. (2018) Intermunicipal cooperation, public spending and service levels, Local Government Studies 44(1): 127-150. https://doi.org/10.1080/03003930.2017.1380630

Anas, A., and Xiong, K. (2003) Intercity trade and the industrial diversification of cities, Journal of Urban Economics 54: 258-276. https://doi.org/10.1016/S0094-1190(03)00073-1

Anas, A., and Xiong, K. (2005), The formation and growth of specialized cities: efficiency without developers or Malthusian traps, Regional Science and Urban Economics 35: 445-470. https://doi.org/10.1016/j.regsciurbeco.2003.11.001

Andrews, R., and Boyne, G. (2011) Corporate capacity and public service performance, Public Administration 89: 894-908. https://doi.org/10.1111/j.1467-9299.2010.01891.x

Avellaneda, C. N., and Gomes, R. C. (2014) Is small beautiful? Testing the direct and nonlinear effects of size on municipal performance, Public Administration Review 75: 137-149. https://doi.org/10.1111/puar.12307

Bel, G., and Warner, M.E. (2015) Inter-municipal cooperation and costs: expectations and evidence, Public Administration 93(1): 52-67. https://doi.org/10.1111/padm.12104

Blesse, S., and Baskaran, T. (2016) Do municipal mergers reduce costs? Evidence from a German federal state. Regional Science and Urban Economics 59: 54-74. https://doi.org/10.1016/j.regsciurbeco.2016.04.003

Miyazaki, T. (2018) Examining the relationship between municipal consolidation and cost reduction: an instrument variable approach. Applied Economics 50:1108-1121. https://doi.org/10.1080/00036846.2017.1352077

Niaounakis, T., and Blank, J. (2017) Inter-municipal cooperation, economies of scale and

cost efficiency: an application of stochastic frontier analysis to Dutch municipal tax departments, Local Government Studies 43(4): 533-554.
https://doi.org/10.1080/03003930.2017.1322958

Roos, M. W. M. (2004) Agglomeration and the public sector, Regional Science and Urban Economics 34: 411-427. https://doi.org/10.1016/S0166-0462(03)00058-9

Solé-Ollé, A., and Bosch, N. (2005) On the relationship between authority size and the costs of providing local services: lessons for the design of intergovernmental transfers in Spain, Public Finance Review 33(3): 343-384.
https://doi.org/10.1177/1091142104272708

Takatsuka, H. (2014) Tax effects in a two-region model of monopolistic competition, Papers in Regional Science 93:595-617.
https://doi.org/10.1111/pirs.12010

Tang, W., and Hewings, G. J. D. (2017) Do city-county mergers in China promote local economic development?, Economics of Transition 25: 439-469. https://doi.org/10.1111/ecot.12118

Tsubuku, M. (2016) Endogenous transport costs and firm agglomeration in new trade theory, Papers in Regional Science 95: 353-362. https://doi.org/10.1111/pirs.12126

Weese, E. (2015) Political mergers as coalition formation: An analysis of the Heisei municipal amalgamation, Quantitative Economics 6: 257-307. https://doi.org/10.3982/QE442