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## Does the method adopted for distribution of services by amalgamating municipalities affect expenditure after amalgamation? Evidence from Japan

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# **Does the method adopted for distribution of services by amalgamating municipalities affect expenditure after amalgamation? Evidence from Japan**

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## **Abstract**

Municipal boundary reform (municipal amalgamation) has been done in many countries in recent years as the result of a push to enlarge the size and coverage of local government units, which in turn is driven mainly by the prospect of economies of scale. However, in a notable body of previous literature, the enlargement of local government has not led to reduction of public expenditures. Decision-making before amalgamation might affect to public expenditure after amalgamation. This study uses Japanese municipal-level data and argues for a relation between the choice of public administration distribution method and expenditure after amalgamation. The results show that a plan for distributed or decentralized facility method is more likely to be adopted in a larger administrative jurisdiction and in one with large differences in finances or political structures between amalgamated sub-regions. In turn, a plan for distributed facilities has the effect of pushing up administrative expenditure.

*Keywords: local government amalgamation, consensus-building, multinomial logistic regression, local government expenditure*

*JEL classification: D78, H72, H73, H77, R51*

## 1. Introduction

Amalgamation to create larger municipal entities has been common in many countries since WWII. In Japan in particular, municipalities have experienced many amalgamations in the last decade; the number of municipal governments in the country decreased from 3,229 in April 2001 to 1,719 in January 2012. One of the key economics arguments supporting amalgamation is based on the prospect of economies of scale. However, it has not clarified whether municipal amalgamation really leads to decrease in municipal expenditure. Some previous literature does present a negative answer to this question. Mehay (1981) showed that municipalities that received net in-migration had a tendency to increase local public expenditure. Liner (1992, 1994) similarly showed that municipal expenditure did not necessarily decrease in municipalities that experienced amalgamation. Moreover, Bish (2001) and Byrnes and Dollery (2002) found that amalgamation increased public expenditure respectively in the United States and Canada and in Australia. On the other hand, Reingewertz (2012) showed that the municipal amalgamation in Israel resulted in a decrease in municipal expenditure, using difference-in-difference estimation.

One reason why amalgamation might not lead to a decrease in expenditure is that opportunistic municipal behavior before amalgamation might influence the actions of municipalities after amalgamation. Hinnerich (2009) shows that smaller local governments that are party to amalgamation tend to accumulate public debt so as to “free-ride” on the increased number of taxpayers in the new municipal entity. Jordahl and Liang (2010) show the same problem, calling it the “common pool problem” in politics. Although these studies do not focus the expenditures after amalgamation, but it is suggested that municipal behavior before amalgamation might affect municipal expenditure after amalgamation.

The study that examines relationship between municipal behavior before amalgamation and local public expenditure in the new municipal unit after

amalgamation has hardly received adequate attention. In the present study, we too consider municipal behavior before amalgamation. However, we change to focus slightly to look at consensus-building between municipalities before amalgamation and see whether it affects public expenditure in the new municipal unit after amalgamation. Municipalities might obtain residents' agreement before carrying out amalgamation. If residents feel that they will be inconvenienced by amalgamation or that their interests will suffer, they will presumably oppose it. Thus, municipalities before amalgamation might consider that their constituents should not be disadvantaged by amalgamation.

In the case of municipal amalgamation in Japan, many municipalities faced the problem of whether administrative function should be consolidated in one office building or similar facility across all municipalities. From the perspective of economies of scale, it might seem clear that consolidation is an advantage. On the other hand, municipalities might prefer to distribute administrative functions for the convenience of people in different areas or to settle other conflicts about breakdown and structures of service delivery or preeminence among (former) municipalities of similar size within the new entity.

In this paper, we consider the factors that may affect consensus-building for the distribution of public facilities and services among some Japanese municipalities as they considered amalgamation. Moreover, we estimate expenditures among municipalities after amalgamation and break them down by distribution of facilities. In this way, we examine how consensus-building for service distribution among municipalities before amalgamation affects municipal expenditures after amalgamation.

This paper is organized as follows. Section 2 gives background on Japanese municipal amalgamation and distribution of services. Section 3 presents our empirical method and hypothesis. Section 4 conducts a multinomial logistic analysis using municipal data to examine the relationship between consensus-building between

municipalities before amalgamation and distribution of services. Then we estimate municipal expenditure on facilities after amalgamation. Section 5 concludes the paper.

## **2. Background**

### **2.1 The “great amalgamation” in Japan**

Between April 2001 and January 2012, the number of municipalities in Japan decreased from 3,229 to 1,719. According to the Japanese Ministry of Internal Affairs and Communications (MIC; 2010), amalgamation was promoted to establish suitable administrative and fiscal foundations for a basic-model municipality. In other words, MIC aimed to strengthen the financial condition of municipalities by enlarging their scale (the “economies of scale” argument).

To promote amalgamation, MIC introduced a special law in 1999 easing the criteria for municipalities to qualify for issue of bond and grant from the national government. At the same time, however, the local allocation tax grant that is the local finance adjustment system from central government to local government to aim to adjust uneven distribution of fiscal resources in each local government had been decreased. Between FY2000 and FY2005, the total amount of the local allocation tax was decreased from 21.4 trillion JPY to 16.9 trillion JPY (21%). As a result of these policies, smaller municipalities in particular were brought to embrace amalgamation in greater numbers. The Japanese National Association of Towns and Villages, an organization of smaller municipal governments, published the report of hearing investigation of town and village. The report stated two factors that promoted municipality amalgamation. The first is financial problems that deterioration of sustainability of municipality finance because of population decrease, aging and decrease in local allocation tax grant. The second factor is strong guidance offered by the national and prefectural governments.

Amalgamation was rapid but not without problems. In a national survey by Japan City Center (2008), a public interest incorporated foundation for research of local government, 68.5% of respondents agreed that “Public office buildings have become far away and become inconvenient” as a result of amalgamation,<sup>1</sup> and 54.1% that “The difference between the central area and the region surrounding has expanded,” making these the most commonly identified issues. It is pointed that the former municipalities that did not become the center of a new municipality are declining. The first issue was seen less when one large municipality absorbed small peripheral municipalities, but when municipalities of similar size joined to form a new one, the location of municipal government and services often became a big problem. Resistance among residents was often stronger in these cases, and location and distribution of public buildings within a municipality after amalgamation was often planned with the need to win the support of residents in mind.

As mentioned above, the result of amalgamation varied between municipalities in terms of the location and distribution of buildings, between extremes of centralization of all municipal government in one building on the one hand and strong decentralization on the other. In this paper we investigate whether the choice of centralization or decentralization of public office buildings affects public expenditure in these municipalities after amalgamation and in some cases may counterbalance economies of scale achieved.

## **2.2 Distribution of department of public services**

During the great amalgamation, three methods of organizing municipal service provision by location were seen. The current investigation considers only administrative services, not basic services such as public library, fire, etc. The features of the three methods are described in Figure.1.

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<sup>1</sup> Multiple answers were allowed.



[Figure 1 here]

### *2.2.1 Method 1: Single centralized facility*

This method consolidates all administrative functions into one public office building, mothballing other facilities. This method seems good from the perspective of economies of scale; however, access to services becomes less convenient for many residents. In many cases, the municipality opens a liaison office that provides specific service (e.g., resident registration and the acceptance of the document, etc. ) to ease the access of the resident of an former municipality where the new central public office building was not set up.

### *2.2.2 Method 2: Multiple independent facilities*

This method involves the distribution of various facilities across various locations. One former public office building is chosen as the central building in a new municipality, departments of administrative functions are allocated to the other former public buildings. For example, the department of management and the department of resident registration are distributed to a former public building, the department of welfare and health is distributed the other former public building. This method consolidates each department function into one public office building, but still an inconvenience for people who need to access a service that is not located in their area.

### *2.2.3 Method 3: Integrated branch offices*

This method consolidates council and senior administration in one central building, but maintains all other services in the same distribution as before amalgamation. Thus, it achieves maximum convenience at the expense of consolidation.

#### 2.2.4 Assessing the relative merits of the three methods

From the perspective of economies of scale mentioned previously, Method 1 is obviously the best choice, just as from the perspective of convenience, it is clearly the worst. On the other hand, Method 3 is obviously the best choice to ease the transition to new municipal, but the arrangement of the business and the staff is not efficient because an administrative organization has been left as before amalgamation. However, the ultimate merits and demerits of each method on the expenditure reduction that is expected to be a benefit of amalgamation are not clear. In the following sections, we assess whether the municipalities under study adopted Method 1 and what factors affected this. Then, we estimate municipal expenditure after amalgamation and examine the effect of this method on it.

### 3. Empirical approach

#### 3.1 Estimation model

We use multinomial logistic regression, because we are dealing with multiple facility options. The model is as follows. We assume the choice of facility distribution method to be  $J$  and the selection result to be  $y_i$ . For amalgamated municipality  $i$  with regional characteristics  $x_i$ , we find probability  $\pi_{ij}$  of selecting method  $j$ , as follows.

$$P(y_i = j | x_i) = \pi_{ij} \quad (1)$$

This mathematical form can be transformed by generalizing, as follows.

$$\pi_{ij} = \frac{\exp(x_i' \beta_j)}{\sum_{r=1}^J \exp(x_i' \beta_r)} \quad j = 1, \dots, J \quad (2)$$

Then, we estimate the following log-likelihood functions.

$$\log L(\beta_2, \dots, \beta_J; y, x) = \sum_{i=1}^n \sum_{j=1}^J d_{ij} \log \pi_{ij} \quad d_{ij} = \begin{cases} 1 & \text{for } y_i = j \\ 0 & \text{otherwise} \end{cases} \quad (3)$$

### 3.2 Hypotheses

Each method given above has advantages and disadvantages. The integrated branch office method (Method 3) might be preferable for a municipality is greatly expanding the geographical area over which it has amalgamation. In contrast, when a municipality with a large population is participating in the amalgamation, a new municipality after amalgamation might consolidate administrative functions in one building. Moreover, the method might change depending on the number of municipalities and the political difficulty of each municipality participating in amalgamation. We adopt the following variables for regional characteristic vector  $x_i$  of the amalgamating municipalities.

#### 3.2.1 Demographic and geographic factors

The expansion of the size of a jurisdiction by amalgamation gives an incentive to distribute administrative functions. Thus, we adopt the area of the municipality after amalgamation (*area*) as a variable. When a municipality with a large population and one with a small population scale amalgamate, the utility of consolidating the administrative functions in the (ex-)municipality with a large population (i.e., in that section of the amalgamated population) is high. Thus, we also adopt the ratio of the population in the ex-municipality whose population is the largest before amalgamation to the population of the municipality after amalgamation (*r\_pop*). Next, when the population is relatively elderly, the likelihood is strong that decentralization will be preferred to secure accessibility for the elderly. Thus, we adopt the average age of residents in the municipality after amalgamation (*ro65*).

### 3.2.2 *The Calculus of Consent*

An increase in the number of municipalities participating in a potential amalgamation has the possibility of complicating the successful conclusion of an agreement to amalgamate. In contrast, there might be a higher possibility of conflicts of interest in an amalgamation involving a smaller number of municipalities. We check whether the number of municipalities ( $nm$ ) participating in amalgamation influences the distribution of facilities. Moreover, we take the number of days of negotiations for amalgamation ( $n\_term$ ) as an index showing the difficulty of the negotiations. Finally, we adopt as a dummy variable the political parties to which the mayors of the amalgamating municipalities belong ( $d\_poli$ ). This variable takes 1 when there is a difference in party membership present.

### 3.2.3 *Financial differences between municipalities*

We adopt three variables related to differences in financial conditions between municipalities. The *financial capacity index* is the ratio of expected fiscal revenues to standard fiscal demands. It thus shows the level of financial resources available within the municipality. We use the standard deviation of the financial capacity index in each municipality before amalgamation ( $fci\_sd$ ). Then, we adopt the standard deviation of public debt per capita ( $pdebt\_sd$ ) as a second financial variable. Finally, we adopt the standard deviation of income per capita ( $income\_sd$ ). When these variables are large, it means that economic and financial differences between municipalities before amalgamation are large.

### 3.2.4 *Type of amalgamation*

Municipal amalgamation in Japan has taken two forms: *absorption*, in which one municipality absorbs others; and *consolidation*, where the municipalities amalgamate equally and create a new composite municipality. Absorption might be more likely than

consolidation to adopt Method 1, since a single centralized facility makes more sense where one ex-municipality maintains dominance in the new entity. For our study, we adopt type of amalgamation as a dummy variable taking 1 when municipality chooses consolidation ( $d_{conso}$ ).

### 3.3 Post-amalgamation municipal expenditure

After assessing the method of facility provision, we estimate expenditure after amalgamation to verify the influence of facility method on it. As described in section 2, municipalities after amalgamation received fiscal support from the central government. Thus, it is not appropriate to compare municipalities that did not amalgamate with those that did, and therefore we consider only amalgamated municipalities.

First, we define public service cost function as follows.

$$C = c(g, w) \quad (4)$$

where  $C$  is municipal expenditure,  $g$  is amount of production (D-output),  $w$  is price of production input. Local government minimize cost  $C$  under the given  $g$  and  $w$ .

However, we cannot observe D-output directly. Then,  $g$  is converted to public services level  $z$  to which the resident finally consumes (C-output; e.g., Bradford et al. 1963; Duncombe and Yinger 1993). Generally, previous studies seems  $z$  as exogenous variable. In addition, municipality characteristics affect the consumption process of  $z$ . Thus, we convert eq.(4) as follows.

$$g = g(z, \mathbf{x}) \quad (5)$$

When eq.(5) is substituted for eq.(4), the cost function is shown as follows.

$$C = c(g(z, \mathbf{x}), w) \quad (6)$$

Then, we specify the cost function to estimate. We assume the cost function is Cobb-Douglas form and the production input is capital and labor. Thus, price of production input is divided price of a capital  $r$  and price of a labor  $w$ . When the cost function is shown in with log linear as follows.

$$\ln C = \alpha_0 + \alpha_r \ln r + \alpha_w \ln w + \alpha_g \ln g \quad (7)$$

On the other hand,  $g$  is transformed with log linear as follows.

$$\ln g = \beta_z \ln z + \sum_{j=1}^l \beta_j \mathbf{x}_j \quad (8)$$

It is seemed that price of a capital  $r$  is not different between municipalities (Brueckner 1981) and vector  $\mathbf{x}$  of the municipality characteristics as follows. We assume that the economies of population scale and diseconomies of population scale (congestion) at the consumption process of public good. Then, we adopt square of population scale. As other factors, we employ valuables of geographic and demographic structures of municipality. Finally, we substituted (8) into (7), and we add the methods distribution of department of public services, we can obtain local public cost estimation equation in each municipality as follows.

$$\begin{aligned} \ln C_i = & \alpha_0 + \alpha_w \ln w_i + \beta_z \ln z_i + \beta_1 \ln pop_i + \beta_2 (\ln pop)_i^2 + \sum_{j=3}^l \beta_j \mathbf{x}_{i,j} + \lambda_1 d\_conso_i + \lambda_2 trend_i \\ & + \lambda_3 d\_method2_i + \lambda_4 d\_method3_i \end{aligned} \quad (9)$$

where  $C$  is municipal expenditure. We consider two kinds of expenditures. First is total public expenditure. Second is general administrative expenditure that is calculated total public expenditure minus public investment expenditure. It is thought that facility provision method might affect the cost of running of the administration. We examine the effect of facility provision method on these expenditures.

Explanatory variable  $w$  is obtained as average cost that calculated total labor cost of the municipality divided by number of public employees.

Recent literatures estimating local public cost function in Japanese municipalities use “Total score of public services” prepared by Nihon Keizai Shinbunsha as  $z$  (Hayashi 2002, Yamashita, Akai and Sato, 2002). However, this index has a problem that the is made only for cities. When this index is used, a lot of dropouts are caused in the sample because municipalities after amalgamation include many towns and villages. Miyazaki (2006) established new index that is able to be applied to the towns and villages with referring “Total score of public services.” We use Miyazaki’s method to make index  $z$ . A calculation method is described in Appendix.

Explanatory variable  $\ln pop$  is log-transformed population, and  $(\ln pop)^2$  is its square. As mentioned above, these two variables are used to capture the economies of population scale and diseconomies of population scale (congestion). we assume public expenditure per capita exhibits a U-shaped curve by population. As geographic and demographic characteristics in each municipality, we adopt following variables.

Explanatory variable  $\ln area$  is the geographic area of the municipality;  $ru15$  is proportion of population who are 15 years old or less,  $ro65$  is those 65 years old or more,  $rpd$  is the ratio of the number of people present in the municipality during the day (for example, for work). We seems these variables are cost-pushing factors because additional staff and expenditure would be increased with increasing these ratios.

The explanatory variable  $d_{conso}$  takes 1 a municipality chooses the “consolidation” form of amalgamation. Amalgamation with consolidation form might be more likely

than absorption to additional expenditure, since the municipality amalgamated with consolidation form might increase administrative slack. In general, municipality that amalgamated with absorption form might often employ the administration procedures of the municipality that absorbed other municipalities in surrounding. On the other hand, municipality that amalgamated with consolidation form might increase the slack cost because the adjustment cost to integrate the business between administration staff would be high.

The explanatory variable *trend* is the number of years since amalgamation, calculated as 2010 minus the year of amalgamation. If economies of scale as a result of amalgamation did not take effect at once but did take effect with the passage of years, this variable will impart a negative effect on municipal expenditure.

Finally, *d\_method2* and *d\_method3* are dummy variables that represent facility provision methods 2 and 3 respectively.

### 3.4 Data

We consider amalgamating Japanese municipalities from FY 2000 to FY 2005. (The Japanese fiscal year runs from the start of April to the end of March.) The analysis object is 479 amalgamated municipalities that contain 1,176 ex-municipalities. Thus, We employ the explanatory variables given above for FY 2000 in the multinomial logistic regression.

From the Amalgamation Digital Archive by MIC, we see that 138 of these municipalities (29%) adopted the “single centralized facility” method (Method 1), 115 (24%) adopted “multiple independent facilities” (Method 2), and 226 (47%) adopted “integrated branch offices” (Method 3).<sup>2</sup>

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<sup>2</sup> Ministry of Internal Affairs and Communications, Amalgamation digital archive: <http://www.gappei-archive.soumu.go.jp/>. Accessed 2013 Feb 12.



We employ the variables given above for FY 2010 to estimate municipal expenditure since it is the latest data that can be used. We show descriptive statistics and data sources in Table 1.

[Table 1 here]

## 4. Estimation results

### 4.1 Multinomial logistic regression

First, we assess facility provision method in the amalgamated municipalities using cross-section multinomial logistic regression. We use Method 2 (multiple independent facilities) as a base outcome and report coefficient and relative risk ratio (rrr).

Simultaneously, to approve the multinomial logistic regression, we test Hausman's independence from irrelevant alternatives (IIA) assumption. The result supports the use of multinomial logistic regression. The hypothesis (H0) of Hausman's IIA test of odds is independent of the other alternatives.

[Table 2 here]

Hausman's IIA test results all support the H0. Thus, the use of multinomial logistic regression is approved.<sup>3</sup>

We observe that the size of geographic area of post-amalgamation municipality is likely to choose Method 3. Figure 2 shows that the expansion of the administrative jurisdiction of a municipality improves the probability of the selection of a decentralized model involving integrate branch offices. Correspondingly, the selection probability of Method 1 decreases with the expansion of the area.

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<sup>3</sup> In addition, we tested alternative IIA test using Small-Hsiao tests. The results of the tests all support the H0.

[Figure 2 here]

The probability to choose Method 1 and Method 3 are higher than Method 2 when  $r_{pop}$  is high. In addition, the relative risk ratio of Method 1 is higher than that for Method 3. When a municipality with a large population and one with a small population amalgamate, the likelihood that administrative functions will be consolidated in the municipality with a large population (“absorption”) is high. Figure 3 shows selection probability and  $r_{pop}$  for each of these methods. Method 3 is consistently high, but selection probability for Method 1 improves as  $r_{pop}$  increases (while that for Method 2 declines). This also supports the choice to make the consolidation dummy ( $d_{conso}$ ) is less likely to choose Method 1.

[Figure 3 here]

The probability to choose Method 1 and Method 3 are higher than Method 2 when  $r_{old}$  is high. Here, the relative risk ratio of Method 3 is higher than that of Method 1. Figure 4 shows selection probability and  $r_{old}$  for each method. We see that the selection probability of Method 1 decreases with increasing age. Thus, an older population improves the selection probability of a decentralized facility provision method.

[Figure 4 here]

The probability to choose Method 1 and Method 3 are higher than Method 2 as the number of municipalities participating in amalgamation ( $nm$ ) increases. One explanation could be the result for Method 1, as we noted above, a municipality with a large

population often absorbs many small municipalities. Figure 5 shows selection probability and  $nm$ . In it, we see the selection probability of Method 3 increasing with an increasing number of municipalities participating in amalgamation.

[Figure 5 here]

The probability to choose Method 1 and Method 3 are higher than Method 2 as the number of days of negotiations for amalgamation ( $n\_term$ ) increases. Figure 5 shows, however, that the strength of the influence varies. The selection probability of Method 2 decreases in a linear fashion as the amount of negotiation increases. Also, the effect of the mayors of amalgamating municipalities' belonging to different political parties ( $d\_poli$ ) is strong for Method 3, meaning that it tends to promote a decentralized, integrated branch office method.

Difference in fiscal condition between municipalities before amalgamation increases the probability to choose Method 1 and Method 3 compared to Method 2, and relative risk ratio of  $fci\_sd$  for Method 3 is higher than that for Method 1. However,  $income\_sd$  does not affect selection probability in any methods.

We can summarize the above results as follows. Method 1 has a tendency to be selected when a larger municipality in population scale absorbs other municipalities—in other words, when the magnitude correlation between municipalities that amalgamate is clear. Method 2 has a tendency to be selected when amalgamation is small scale or when the difference in socioeconomic conditions between municipalities before amalgamation is small. Finally, Method 3 has a tendency to be selected when large financial and political differences exist between municipalities or when the jurisdiction becomes large and access to the public buildings becomes more difficult as a result.

Thus, in short, the method by which provision of public facilities is organized in post-amalgamation municipalities is affected by demographical, geographical, socioeconomic, and political differences among municipalities before amalgamation.

Next, we examine the effect of the facility provision method on municipal expenditure after amalgamation.

#### 4.2 Estimation result of local public expenditure function

In this section, we estimate equation (3) using cross-section data for FY 2010 and OLS with HCSEs for heteroskedasticity implemented. Estimation results are presented as Table 3.

[Table 3 here]

The coefficient  $z$  is significantly positive for both regressions that adjustment to economic theory. The coefficient  $w$  is not significant for total public expenditure. One explanation could be the result that total expenditure includes expenditures that are not related to price of a labor (e.g., construction). Therefore, the coefficient  $w$  is significantly positive for general administrative expenditure.

The coefficient of  $\ln pop$  is significantly negative and that of  $(\ln pop)^2$  is significantly positive for total public expenditure. We observe that the economies and diseconomies of population scale exist in the post-amalgamation municipal total public expenditure. The negative effect of  $\ln pop$  is large compared to positive effect of  $(\ln pop)^2$ . Therefore, the post-amalgamation municipality with a large population scale could cut total public expenditure. However, this result might not be clear because the coefficient of  $\ln pop$  is just 10% level. Moreover, the coefficient of  $\ln pop$  is not significant for general administrative expenditure. This result shows the probability that post-amalgamation municipality did not reduce the administrative cost as population scale.

The coefficients of  $\ln area$ ,  $ru15$ ,  $ro65$ , and  $rpd$  are significantly positive. These variables seem thus to constitute cost-push factors.

The coefficient  $d_{conso}$  is significantly positive for both expenditure. Public expenditures by municipalities amalgamated with the consolidated form (several municipalities of approximately equal size joining into one) increase as we forecasted above. The coefficient of *trend* is significantly positive. This result is opposite to that expected. The effect of cost reduction may be small because soon after amalgamation the implementation of new procedures, reduction of staff, etc., has not yet been done. Moreover, while it is thought that economies of scale take effect with the passage of time, this result contradicts that idea as well. Local public expenditures expand as time passes after amalgamation. We think the reason is the policy of easing criteria for grants and loans from higher levels of government. Municipalities that amalgamated early on have had more time to benefit from this policy. Moreover, this policy might affect post-amalgamation municipalities less incentive of effort of cost minimization.

Thus, it has been seen that the choice of arrangements for the distribution of public facilities affects municipal total public expenditures. In the comparison with Method 1, Method 2 is the same, but Method 3 has the effect of pushing up total public expenditure. The effect on the latter in particular is strong and clear. The reason why Method 2 is not significant compared with Method 1 could be explained from our result of multinomial logistic regression. Method 2 has a tendency to be selected when amalgamation is small scale or when the difference in socioeconomic conditions between municipalities before amalgamation is small from our multiple. Thus, post-amalgamate municipalities with Method 2 could manage the administration.

From this result, it could be seen that the selection of a decentralized facility distribution method had the effect of pushing up administrative expenditure.

## 5. Conclusion

Economies of scale are believed to promote municipal amalgamation. However, amalgamation is not only enlarge population scale but various kinds can interfere with

the achievement of economies of scale. For example, changes in geographic and demographic factors might affect the cost of post-amalgamate municipality. Moreover, consensus-building factors that demographical, geographical, socioeconomic, and political differences among municipalities before amalgamation may affect expenditure later on, as shown above. In these cases, the cost reduction effect of amalgamation may be compromised, a fact not reflected by previous discussions.

In this paper, we examined the effect of differences in facility distribution methods on municipal expenditures after amalgamation. We estimated multinomial logistic regressions for three such methods and found that expansion of administrative jurisdiction, large differences in financial situation between amalgamating municipalities, and political differences between them improve the probability of the selection of a decentralized method. Then, we estimated the expenditures of municipalities after amalgamation. The results showed that decentralized methods had the effect of pushing up administrative expenditure. In other words, the local public expenditures of municipalities after amalgamation are related to the distribution of services agreed on by municipalities before amalgamation. Thus, the effect of economies of scale in these situations might be counterbalanced and somewhat smaller than previously assumed.

## **Appendix**

C-output index is composed of five sub-indexes Aged care, Child care, Education, Life infrastructure, and Safety. These sub-indexes are weighted 30, 35, 25, 40, and 20, respectively, and include components that provide an index for each category of public service. The numerical values of weights of these sub-indexes are referred from the “Total score of public services.” All components are converted to their deviation values.

$$z = \left( 30 \times \frac{1}{4} \sum_{s=1}^4 y_s + 35 \times \frac{1}{2} \sum_{s=5}^6 y_s + 25 \times \frac{1}{3} \sum_{s=7}^9 y_s + 40 \times \frac{1}{2} \sum_{s=10}^{11} y_i + 20 \times y_{12} \right) \div 150 \quad (\text{A.1})$$

where  $y_1$  represents the number of doctors divided by the elderly population,  $y_2$  the capacity in welfare facilities for the elderly divided by the elderly population,  $y_3$  the capacity of healthcare facilities divided by the elderly population,  $y_4$  the capacity of sanatorium-type medical care facilities divided by the elderly population,  $y_5$  the enrollment in kindergartens and day nurseries divided by the 0- to 4-year-old population,  $y_6$  the number of children on day nursery waiting-lists divided by the enrollment in day nurseries,  $y_7$  the number of elementary school teachers divided by number of elementary school students,  $y_8$  the number of junior high school teachers divided by number of junior high school students,  $y_9$  the number of community centers divided by the population,  $y_{10}$  the total road length (km) divided by the area (km<sup>2</sup>),  $y_{11}$  the number of people who disposed of general household garbage divided by the population, and  $y_{12}$  the number of fire occurrences divided by the population. All data are for FY2010.

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Figure 1. Types of distribution of public services

Method 1: Single centralized facility

Former municipality 1 · New main government building consolidated all functions	
Former municipality 2 · Former office building closed or liaison office	Former municipality 3 · Former office building closed or liaison office

Method 2: Multiple independent facilities

Former municipality 1 · New main government building council and senior administration department A, B	
Former municipality 2 · Former office building department C	Former municipality 3 · Former office building department D, E

Method 3: Integrated branch offices

Former municipality 1 · New main government building council and senior administration department A, B, C, D, E	
Former municipality 2 · Former office building department A to E	Former municipality 3 · Former office building department A to E

Table 1. Descriptive statistics and data sources for 479 municipalities

Variable Names	Mean	SD	Min	Max	Unit	Year	Source
<i>area</i>	359.061	307.6	13.31	2,179	km <sup>2</sup>	2000	A
<i>r_pop</i>	0.645	0.191	0.161	0.998	ratio	2000	A
<i>r_old</i>	0.199	0.052	0.082	0.38	ratio	2000	A
<i>nm</i>	3.255	1.786	2	14	number	2000	B
<i>n_term</i>	609.833	220.764	112	1,491	day	2000	B
<i>d_poli</i>	0.307	0.461	0	1	dummy	2000	C
<i>fci_sd</i>	0.155	0.126	0	1.124	1,000 yen	2000	D
<i>pdebt_sd</i>	3.582	2.609	0	22.91	1,000 yen	2000	D
<i>income_sd</i>	105.491	61.055	1.218	387.703	1,000 yen	2000	E
<i>d_conso</i>	0.802	0.399	0	1	dummy	2000	B
<i>public expenditure</i>	35,615	55,432	2,644	777,000	1 million yen	2010	D
<i>general administrative expenditure</i>	30,508	48,897	2,185	691,493	1 million yen	2010	D
<i>w</i>	9,394	884	6,920	12,850	1,000 yen	2010	D
<i>z</i>	50	2.768	42.423	70.048	-	2010	F, G
<i>pop</i>	81,877	12,758	1,371	1,382,685	number	2010	A
<i>ru15</i>	0.125	0.017	0.047	0.178	ratio	2010	A
<i>ro65</i>	0.296	0.643	0.135	0.545	ratio	2010	A
<i>rpd</i>	0.991	0.085	0.76	1.128	ratio	2010	A
<i>trend</i>	4.603	0.712	4	8	year	2010	B

Sources: A: National Census, B: Amalgamation Digital Archive, C: Nationwide Mayor's List, D: Local Government Finance

Settlement, E: Tax Investigation for Municipalities. F: Statistic Bureau, Ministry of Internal Affairs and Communications, G: Statistic

Bureau, Ministry of Health, Labour and Welfare

Table 2. Estimation results of multinomial logistic regression

	Method 1			Method 3		
	coef.	rrr	z-value	coef.	rrr	z-value
<i>Area</i>	0.000	1.000	0.35	0.003	1.003 ***	3.54
<i>r_pop</i>	3.355	34.825 ***	2.71	2.533	12.595 **	2.04
<i>r_old</i>	6.28	533.736 **	2.03	7.552	1906.384 ***	2.59
<i>Nm</i>	0.462	1.587 ***	2.85	0.383	1.467 **	2.47
<i>n_term</i>	-0.002	0.998 ***	-3.08	-0.001	0.998 ***	-2.94
<i>d_poli</i>	0.475	1.607	1.24	0.664	1.942 *	1.83
<i>fci_sd</i>	3.748	42.438 **	2.15	4.434	83.449 ***	2.61
<i>pdebt_sd</i>	0.11	1.116 *	1.90	0.093	1.097 *	1.68
<i>income_sd</i>	-0.001	0.999	-0.38	0.001	1.000	0.18
<i>d_conso</i>	-1.217	0.296 **	-2.16	-0.394	0.674	-0.70
<i>constant</i>	-3.306	0.036 **	-2.16	-4.058	0.017 ***	-2.75
Hausman IIA test						
Chi-squared	7.745			5.645		
Prob.>Chi-squared	-0.756			-0.896		
Log likelihood	-420.418					
LR chi-squared (20)	170.32 ***					
Pseudo- $R^2$	0.168					
Sample	479					

Note: Base outcome is that for Method 2. Asterisks \*\*\*, \*\*, and \* indicate statistical significance at the 0.01, 0.05 and 0.1 levels, respectively.

Figure 2. *area* and selection probability

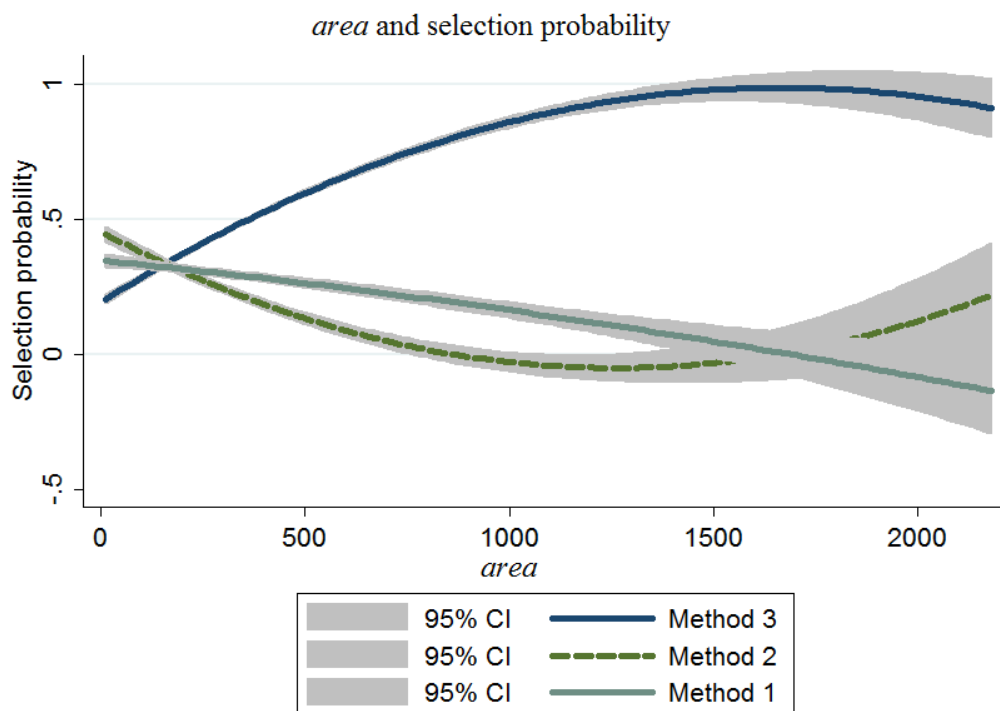


Figure 3.  $r_{pop}$  and selection probability

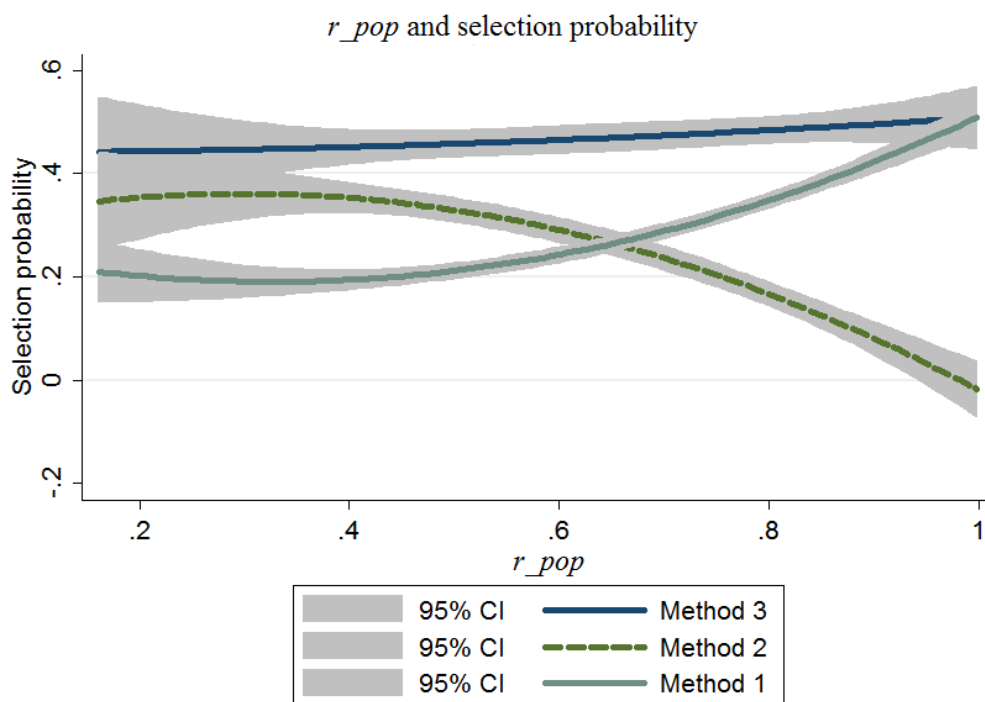


Figure 4.  $r_{old}$  and selection probability

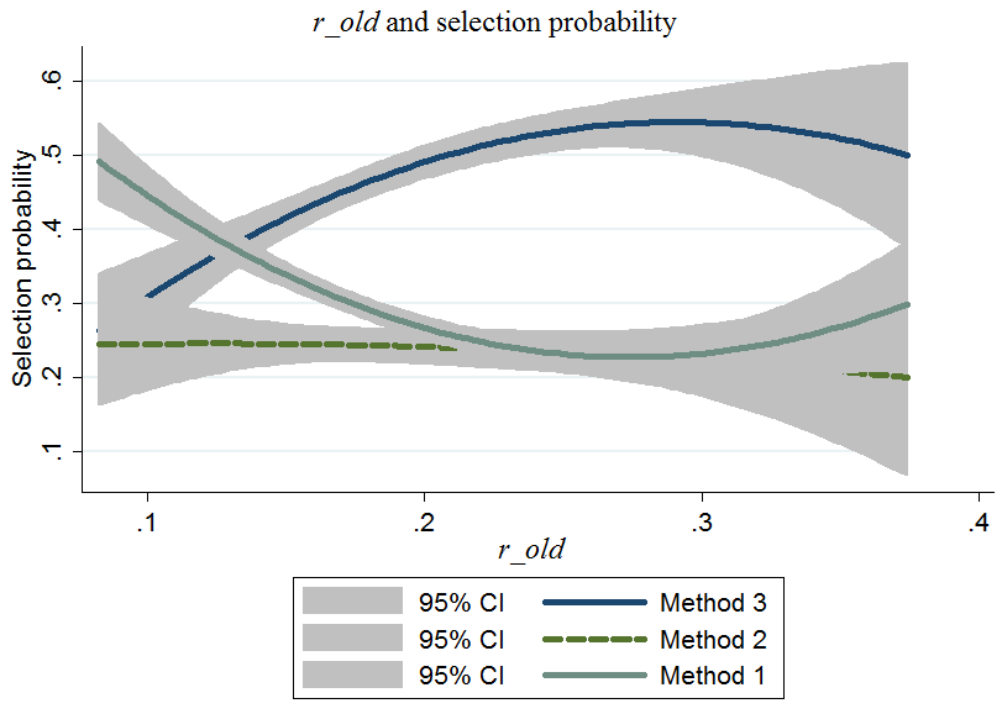


Figure 5. *nm* and selection probability

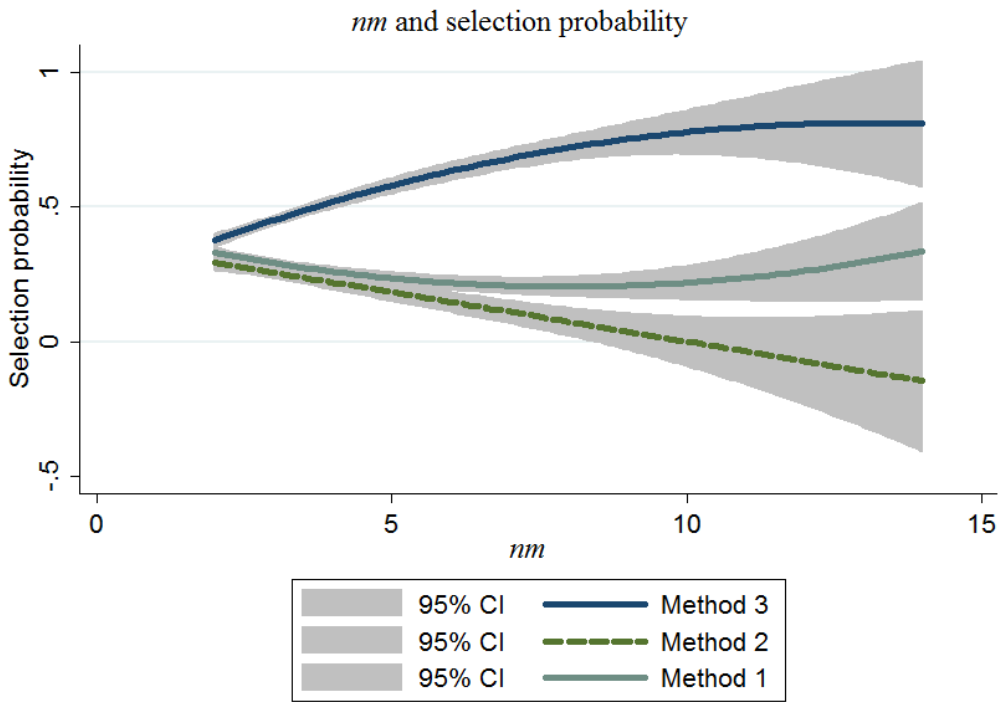


Table 3. Estimation results for local public cost function

	<i>public expenditure</i>		<i>general administrative expenditures</i>	
	coef.	t-value	coef.	t-value
<i>w</i>	0.113	1.35	0.166 ***	2.44
<i>z</i>	0.622 ***	3.61	0.562 ***	4.87
<i>lnpop</i>	-0.23 *	-1.65	-0.095	-0.81
<i>lnpop</i> <sup>2</sup>	0.047 ***	7.52	0.042 ***	7.8
<i>lnarea</i>	0.114 ***	8.38	0.111 ***	10.52
<i>ru15</i>	3.457 ***	4.16	2.727 ***	4.14
<i>ro65</i>	1.618 ***	5.81	1.445 ***	6.47
<i>rp</i>	0.687 ***	7.35	0.636 ***	8.22
<i>d_conso</i>	0.042 **	2.52	0.047 ***	3.19
<i>trend</i>	0.036 ***	3.66	0.028 ***	3.21
<i>d_method 2</i>	0.026	1.39	0.028	1.63
<i>d_method 3</i>	0.035 **	2.15	0.038 ***	2.58
<i>constant</i>	8.03 ***	5.52	6.994 ***	6.51
Adj <i>R</i> <sup>2</sup>	0.972		0.979	
Sample	479		479	

Note: Asterisks \*\*\*, \*\*, and \* indicate statistical significance at the 0.01, 0.05 and 0.1 levels, respectively.