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Municipality amalgamation in Japan: an examination using event history analysis

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Abstract

This study considers the factors behind municipality amalgamations in Japan from fiscal year 1999 to 2005 using event history analysis. We use discrete-time logit model and 21,165 parson-year data. Our findings show that the central government's "carrot and stick" policy strongly influenced municipality amalgamations for those with high ratios of inter-governmental grants to total revenue. Moreover, neighboring municipalities became the trigger for the amalgamation of other municipalities.

I Introduction

Many countries have implemented municipality amalgamation or boundary reform in order to create larger local governments. Several studies of this topic have focused on the local public expenditure of the municipality *after* amalgamation (Mehay, 1981; Liner, 1992, 1994; Bish, 2001; Byrnes and Dollery, 2002; Reingewertz, 2012). However, only a few have paid attention to the decision making of the municipality beforehand.

Bhatti and Hansen (2011), for instance, examined municipality amalgamation in Denmark. They constructed a data set that represented feasible combinations of municipalities and compared the features of municipalities that actually amalgamated by using logit regression. They found that having a similar population size and geography plays an important role in amalgamation patterns. Similarly, Hirota (2007) used logit regression to examine whether Japanese municipalities amalgamate or not.

While these studies consider municipality amalgamation from the aspect of the participants, they consider neither the presence of amalgamation alone nor its timing. In particular, municipality amalgamation in Japan progressed between fiscal year (FY) 1999 and FY 2005,[1] while the timing of amalgamation differs by municipality. To the authors' knowledge, no studies have thus far examined the timing of amalgamations. In this study, we bridge this gap in the literature by using event history analysis to examine amalgamation timing.

Our findings show that the central government's policy forced amalgamation

[1] The fiscal year in Japan starts on April 1.

on municipalities with high ratios of inter-governmental grants to total revenue. Moreover, neighboring municipalities became the trigger for the amalgamation of other municipalities.

II Background

Between April 1999 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 encouraged in order to establish suitable administrative and fiscal foundations for a new "basic model" municipality. To promote amalgamation, the MIC introduced a special law in FY 1999 that relaxed the criteria for municipalities to qualify for the issue of bonds and grants from the national government.

At the same time, however, the local allocation tax grant, which aims to adjust the uneven distribution of central government resources between local governments, decreased. Between FY 2000 and FY 2005, the total amount of local allocation tax declined from 21.4 trillion JPY to 16.9 trillion JPY (21%). As a result of these policies, smaller municipalities embraced amalgamation in greater numbers.

Moreover, the government's special law (old law hereafter) ended in FY 2005 and this was replaced in FY 2006 by a new law. Because the financial support provided by the national government for amalgamations was revised in this new law, many municipalities only pursued amalgamation until the end of FY 2005. Thus, we analyze municipality amalgamations in Japan from FY 1999 to FY 2005.

III Empirical Methods and Data

Event history analysis is a multivariate analysis that considers both occurrence probability and the timing of the event. This analysis technique examines the studied event based on a change in the attributes and in the state of the object (Allison, 1984). We adopt a discrete-time logit model because amalgamation decision making typically occurs annually, and thus the presented data set comprises annual data. Moreover, the discrete-time logit model allows its variables (i.e., financial and social variables in this case) to change by period (i.e., every fiscal year herein).

The discrete-time logit model is formulated as follows:

$$\ln\left[\frac{P_t}{(1-P_t)}\right] = a_t + \sum_{i=1}^{n} \beta_i X_{i,t-1} \qquad (1)$$

where P_t is the hazard ratio in year t and a_t is the time (year) variable as the base hazard. The time variable takes 1 when the year is 1999, and this increases throughout the study period.

We construct the person-year data set of the investigated municipalities from FY 1999 to FY 2005.[2] The number of municipalities is 3,184, and this includes 1,967 municipalities that amalgamated during that time. The total amount of person-year data is 21,165.

We adopt financial, demographic, and industrial structure variables as those that affect the decision to amalgamate. Moreover, we adopt the amalgamation

[2] The explanatory variables run from FY 1998 to FY 2004.

rate of municipalities in the same prefecture as an indicator of the neighborhood effect. The data used for the estimation with their sources and descriptive statistics are described in Table 1.

[Table 1 here]

IV Estimation Results

The estimation results are presented in Table 2. We report the estimation results using odds ratios and z values. In this estimation, we adopt three models. Model 1 uses only the time variable. Model 2 uses the time variable and the financial, demographic, and industrial structure variables of each municipality. Model 3 is the full model including the neighborhood effect.

[Table 2 here]

The result of the time variable is significant, and the odds ratio is very high for all models. When calculating the marginal effect using the result of Model 3, the probability of amalgamation is 0.8%, implying that amalgamations were advanced under the advantageous financial support of the old law.

The demographic and industrial structure variables of Model 2 and Model 3 are robust. The population scale is not significant, while the size of space significantly lowers the amalgamation probability. The other industrial structure variables are all significantly positive for the probability of amalgamation in each fiscal year.

These results mean that municipalities with a small area and those in rural locations chose to amalgamate. However, the odds ratios of these variables are close to 1. Thus, the effect on the probability of amalgamating is not as strong.

The results of the financial variables are also robust for Model 2 and Model 3. The higher value of the variables *r_debt* and *r_cb* means a lower elasticity of fiscal management, which improves the probability of amalgamation but not to a large degree. By contrast, the ratio of inter-governmental grants to total revenue is shown to strongly improve the probability of amalgamating. Given, as mentioned in Section II, that local allocation tax grants decreased through the study period, this finding suggests that municipalities that highly depend on inter-governmental grants as a form of revenue prefer amalgamation.

Finally, the neighborhood effect significantly affects the probability of amalgamating for each fiscal year. Moreover, the amalgamation situations of municipalities in the same prefecture influence the amalgamation of other municipalities.

V Conclusion

The presented findings suggested the strong influence of the central government's policy on municipality amalgamation. The reduction in local allocation tax grants and financial support after amalgamation (a "carrot and stick" approach) provided a strong incentive for amalgamation for those municipalities with high ratios of inter-governmental grants to total revenue. We also found a strong influence for the central government's policy from the result of the time effect. The

amalgamation probability rises to exploit the benefits of the old law. Although the elasticity of fiscal management, the magnitude of municipality space, and industrial structure also affect the decision to amalgamate, these effects are not as strong. Moreover, the amalgamation of neighboring municipalities became a trigger for the amalgamation of other municipalities.

This study focused on municipality-level factors. However, the period in which amalgamation is approved is not only a factor of an individual municipality and rather depends on the consensus building process between municipalities that are preparing for the amalgamation. Analysis that considers the difference between municipalities that plan to amalgamate is a future research topic. Event history analysis might also be useful in this regard.

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Table 1. Data descriptions and descriptive statistics

Valuable	Description	Mean	S.D.	Min	Max
pop	Population (1,000 people)	37.16	126.40	0.20	3,518.10
space	Area (km^2)	116.00	137.00	1.27	1,408.00
agri	Percentage in agriculture	16.61	11.88	0.10	79.40
manufa	Percentage in manufacturing	33.41	9.06	1.00	63.40
	Financial index of stock				
r_debt	Ratio of principal and interest repayment of debt	14.67	4.17	0.40	39.00
	to scale of government finance				
	Financial index of flow				
r_cb	Ratio that indicates financial resilience and	84.11	7.70	35.00	164.50
	soundness				
	Financial capability index				
r_grant	Ratio of inter-governmental grants to total	0.34	0.15	0.00	0.78
	revenue				
r_neighbor	Amalgamation rate of municipalities in the same prefecture	0.13	0.34	0.00	0.66

Source: The population, space, and industrial structure variables are from the national censuses carried out in 1995 and 2000.[3] The municipality financial variables in each FY are from the Statistics Bureau, Ministry of Internal Affairs and Communications in Japan. The amalgamation rate of municipalities in the same prefecture and the dummy variable for the absorption form of amalgamation are calculated from data provided by the Ministry of Internal Affairs and Communications (Digital Archive of Amalgamation).

[3] The variables in each year are calculated by linear interpolation between 1995 and 2000. The variables of a small number of municipalities that amalgamated before 2000 are calculated using the same method between 1990 and 1995.

Table 2. Estimation results of the discrete-time logit model

	Model 1		Model 2		Model 3	
	Odds ratio	z	Odds ratio	z	Odds ratio	z
time	4.273 ***	45.16	4.396 ***	41.82	4.001 ***	36.57
pop			1.000	-1.51	1.000	-1.43
space			0.998 ***	-8.25	0.998 ***	-7.71
agri			1.021 ***	5.36	1.021 ***	5.45
manufa			1.031 ***	7.68	1.029 ***	7.32
r_debt			1.021 ***	2.88	1.022 ***	2.98
r_cb			1.027 ***	5.75	1.026 ***	5.49
r_grant			2.528 ***	3.10	2.447 ***	2.97
r_neighbor					4.521 ***	5.66
constant	0.000 ***	-50.14	0.000	-30.87	0.000 ***	-29.78
Log likelihood	-4039.781		-3887.235		-3870.808	
LR Chi^2	5012.240		5317.330		5350.190	
Pseudo R^2	0.382		0.406		0.409	

Notes: ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.1 levels, respectively.