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Municipality amalgamation in Japan: A survival analysis of the timings of the amalgamation process

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Abstract

This paper uses survival analysis to examine the time taken to carry out municipality amalgamation in Japan in terms of both forming the amalgamation committee and completing amalgamation. The results show that municipalities that depend on local allocation tax grants as a revenue source, those that have an incentive to become a city that has special administrative discretions, and those that jointly manage local services form a committee and complete amalgamation more quickly. Further, municipalities that have high local public debt tend not to form committees. These findings show that the central government's "carrot-and-stick" policy has strongly influenced municipality amalgamation.

JEL classification codes: H72, H73, H77, R51

1. Introduction

Amalgamation has become a common experience for many countries. In Japan, the number of municipalities almost halved from 3,229 to 1,719 between April 1999 and January 2012. Amalgamation has been done based on the argument that "bigger is better" (Dollery et al., 2006) owing to the subsequent improvement in economies of scale in terms of both services and administrative procedures. In this vein, a large literature stream has attempted to verify the population scale at which public expenditure per person is minimized or the existence of economies of scale following amalgamation (Mehay, 1981; Liner, 1992, 1994; Bish, 2001; Byrnes and Dollery, 2002; Reingewertz, 2012).[1] However, only a few have paid attention to municipality behavior before amalgamation.[2]

Bhatti and Hansen (2011), for instance, examined municipality amalgamation in Denmark by constructing a data set that represented feasible combinations of municipalities and comparing the characteristics of those that eventually amalgamated by using logit regression. These authors found that having a similar population size and geography plays an important role in amalgamation patterns. Similarly, Hirota (2007) also used logit regression in order to examine the amalgamation behavior of Japanese municipalities and found that those that have high ratios of inter-governmental grants to total revenue tend to merge.

However, it is insufficient to examine the amalgamation process in Japan only in the binary analysis because municipality amalgamation in Japan had progressed for several years and had passed two stages such as forming an amalgamation committee and completing amalgamation. In particular, the time taken to form an amalgamation committee and complete amalgamation differs by municipality. While these studies consider municipality amalgamation from the aspect of participants, they take account of neither the process nor the time taken to achieve amalgamation. In this study, we thus examine the time taken and municipality characteristics for forming an amalgamation committee and ultimately amalgamating using survival analysis.

The remainder of this paper is organized as follows. Section 2 discusses the background to municipal amalgamation in Japan. Section 3 presents our empirical

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[1] The early literature to verify the former is Hirsh (1959, 1965), Bodkin and Conklin (1971), and Walzer (1972). A large literature intended for the municipality in Japan have been performed in the latter half of the 1980's (Hayashi, 2002).

[2] Hinnerich (2009) and Jordahl and Liang (2010) found that smaller local governments that tend to amalgamate accumulate public debt in order to free-ride on the increased number of taxpayers in the new expanded municipal entity.

method and the data used. Section 4 describes the survival analysis carried out using municipal data to examine the relationship between municipality characteristics and amalgamation timing. Section 5 concludes the paper.

2. Background

2-1. The great amalgamation during the Heisei era

Municipality amalgamation in Japan can be roughly divided into three main waves. The first wave ran from 1888 to 1889 during which the number of municipalities decreased from 71,314 to 15,820. The second wave ran 1953 to 1961 during which the number of municipalities fell from 9,868 to 3,472. The latest wave, as discussed in the Introduction, began in 1999 and is called "the great amalgamation during the Heisei era." According to the Japanese Ministry of Internal Affairs and Communications (MIC, 2010), amalgamation since 1999 has been encouraged in order to establish suitable administrative and fiscal foundations for new larger municipalities. In other words, the MIC has aimed to strengthen the financial condition of municipalities by enlarging their scale (the "bigger is better" argument).

The Japanese government enacted the Municipal Amalgamation Law (the old law, henceforth) in 1965 in order to promote amalgamation. The old law included several measures to promote amalgamation, such as guaranteeing the merged municipality the same amount of inter-governmental subsidy (local allocation tax grant; LAT)[3] as before the amalgamation for 10 years. However, although the old law was revised every 10 years until the 1990s, voluntary amalgamation was not an option and thus the number of municipalities only decreased by 163 from 1965 to 1999.

This situation changed greatly in the latter half of the 1990s when the Japanese government reviewed the roles of the central, prefectural, and municipal governments. In 1999, the old law was amended to conform to the provisions of the Omnibus Law of Decentralization, including additional measures that supported municipality amalgamation through financial provisions. First, the guaranteed period for receiving the same amount of LAT was extended to 15 years after amalgamation. Second, the law allowed amalgamated municipalities the 95% of the amalgamation cost (e.g., construction) by issuing special purpose municipal bonds for 10 years, and the central government covered 70% of the principal and interest repayments. At the same time, on

[3] LAT is the inter-governmental subsidy that aims to adjust the uneven distribution of central government resources between local governments.

the other hand, total LAT declined from 21.4 trillion JPY to 16.9 trillion JPY (21%) between FY 2000 and FY 2005.

By using such a carrot-and-stick policy, financially unstable municipalities, especially those that relied on the LAT for their survival, embraced amalgamation in greater numbers. Moreover, because the financial support provided by the national government for amalgamation was revised under the new law in FY 2006, many municipalities only pursued amalgamation until the end of FY 2005.

Furthermore, the old law offered comparatively large or wealthy municipalities a non-financial incentive to amalgamate. To be considered to be a city, a municipality in Japan needs to be certified by the central government. A city is then allowed special administrative discretions in accordance with its population size and thus type: designated cities, over 500,000; core cities, 300,000–500,000; special cities, 200,000–300,000; and regular cities, 50,000–200,000. The law thus eased the population requirement to become a city. In particular, these special administrative discretions are considered to be a center city in a specific province or across Japan that receives a share of administrative authority from the upper (prefectural) government.

2-2. Amalgamation process

Since 1999, all municipalities that wish to amalgamate form an amalgamation committee to decide on the amalgamation process. This committee is established by the municipality government or following the wishes of residents. The amalgamation committee discusses the municipality system after merging and the method of amalgamation. According to Miyashita and Nakazawa (2009), the average, minimum, and maximum number of days from the formation of the amalgamation committee to amalgamation approval is 538, 46, and 1352, respectively. However, the time taken between committee formation and approval differs by municipality. Figure 1 shows the number of municipalities that formed amalgamation committees and received amalgamation approval between FY 1999 and FY 2005. This figure shows that not all amalgamation committees arrived at consensus, with some forming another amalgamation committee or abandoning the amalgamation altogether.

[Figure 1 here]

Moreover, municipality amalgamation in Japan takes two forms: absorption occurs when a comparatively large municipality absorbs the surrounding municipalities,

whereas newly established municipalities amalgamate equally to create a new composite municipality.

3-1. Methodology

We apply survival analysis in order to examine the time taken from forming an amalgamation committee to actual amalgamation by municipality. Thus, we consider two specific cases: the number of days taken to form the committee and the number of days taken to achieve amalgamation. These time variables are time-continuous data. We then adopt the accelerated failure-time model, which changes the time scale by a factor derived from the independent variables, because Japanese municipality amalgamation was limited under the old law. Thus, the assumption that hazard functions should be strictly parallel is hard to satisfy.[4]

We assume that the time taken to achieve either of the above events (i.e., days to form the amalgamation committee and days to achieve amalgamation) to be T. The cumulative distribution function $F(t)$ of random variable T is thus shown as follows:

$$F(t) = \Pr(T \le t) = \int_0^t f(s)ds \qquad (1)$$

The survival function is shown in equation (2):

$$S(t) = \Pr(T \ge t) = 1 - F(t) \qquad (2)$$

The hazard function $\lambda(t)$ shows the probability that the event happens in the following period under the condition of survival until period t:

$$\lambda(t) = \lim_{\Delta t \to 0} \frac{\Pr(t \le T \le t + \Delta t \mid T \ge t)}{\Delta t} = \frac{f(t)}{S(t)} \qquad (3)$$

To estimate the parametric hazard function, we must first specify the distributions. We use a number of distributions (Exponential, Weibull, Lognormal, Loglogistic, and Generalized gamma) and compare the goodness-of-fit of the model by using Akaike's

[4] We carried out the proportional hazards assumption test based on Schoenfeld residuals. The results of this test rejected this assumption.

Information Criterion (AIC).

3-2. Data

The observation start date is April 1, 1999, which is the start of the great amalgamation during the Heisei era. The observation end date is March 31, 2005, which is the end date of the application of the old law. When a municipality forms an amalgamation committee, its survival time is calculated as the number of days from April 1, 1999 to the date of formation. We calculated the date of amalgamation itself similarly. Of the total number of municipalities (n = 3,184), the number that formed an amalgamation committee is 2,414 (76%) and the number that achieved amalgamation is 1,959 (62%).

We consider the characteristics of each municipality to be explanatory variables. As explained in section 2, municipalities that are highly dependent on the LAT as a source of revenue have a strong incentive to amalgamate. Thus, we adopt the ratio of LAT revenue to total revenue (*r_LAT*) for the analysis. According to the fiscal practices under the old law, a high LAT ratio would not be problematic for municipalities that participated in amalgamations; however, the financial conditions might affect amalgamation behavior.

In addition, we adopt a ratio that indicates financial resilience and soundness (*r_cb*).[5] This ratio implies that the elasticity of finance is adversely affected when the value of this index is high. We also adopt the measure of local public debt per capita (*p_debt*). Poor financial conditions might serve as a positive incentive to amalgamate and vice versa. In particular, when a municipality that has high debt amalgamates, the other partner municipalities bear some responsibility for that debt. Therefore, poor fiscal conditions might serve as a barrier to amalgamation.

We also consider the incentive to become a city that benefits from special administrative discretions. Therefore, we adopt a dummy variable that takes 1 when the municipality becomes a special administrative direction after amalgamation (*special_a_d*).

Further, where two or more municipalities jointly manage local services cooperatively (e.g., waste disposal, waterworks, firefighting, etc.), it is thought that an amalgamation committee is formed or amalgamation is achieved more easily. Thus, we adopt a dummy variable that takes 1 when the municipality experiences joint

[5] *Keijyou-shyushi hiritu* in Japanese.

administration (*joint*).

In addition, the upper-level (prefectural) government plays a role in supporting amalgamation. However, the degree of this support differs by prefecture. Therefore, we adopt a prefecture dummy to control for the difference in the effect of the support of the upper-level government.

Finally, the following municipality characteristics and their variables are also used in the analysis: population size (*pop*), municipality area (*area*), the ratio of the elderly (over 65s) to the total population (*r_o65*), the ratio of under 15s to the total population (*r_u15*), and the ratio of the daytime population to the nighttime (registered) population (*r_daypop*). The data used for the estimation with their sources and descriptive statistics are described in Table 1.

[Table 1 here]

We employ these explanatory variables one fiscal year before starting the great amalgamation (i.e., FY 1998). However, some variables (*area*, *r_o65*, *r_u15*, *r_daypop*) are captured from the national census, which is carried out every five years in Japan. Therefore, those variables use data from 1995.

4. Estimation results

Before describing the estimated results, we present the results of comparing the goodness-of-fit of the distributions using AIC (Table 2).

[Table 2 here]

The result shows that the Loglogistic distribution is preferred for the number of days taken to form an amalgamation committee, whereas the Weibull distribution is preferred for the number of days taken to achieve amalgamation. The hazard functions of both regressions are shown in Figure 2 and Figure 3.

[Figure 2 here]

[Figure 3 here]

We estimate four models to check robustness. Model 1 uses only the financial and incentive variables. Model 2 adds municipality characteristics to Model 1. Model 3 adds the prefecture dummy to Model 1. Model 4 is the full model that has all variables. The estimation result for the time taken to form the amalgamation committee is presented in Table 3. We show the coefficients and standard errors in this table, too.

[Table 3 here]

The prefecture dummy is significant and the log likelihood of Model 4 is the largest. Therefore, we use Model 4 for the presented analysis. We find that municipalities that have high LAT ratios tend to form committees early, because the carrot-and-stick policy used by the central government forces municipalities to amalgamate. On the other hand, municipalities that have high local public debt per capita tend to form committees later, while becoming a special administrative direction accelerates the formation of a committee. In other words, a positive incentive to create a larger municipality accelerates forming the committee. Further, the experience of the joint management of local services accelerates forming a committee.

Population size does not affect the time taken to form a committee. Generally, municipalities that have large populations do not have strong incentives to amalgamate. As for municipalities that have a wide area, committee formation is difficult. Finally, municipalities that have a high elderly ratio tend to speed up committee formation.

The estimation results for the time taken to complete amalgamation are shown in Table 4.

[Table 4 here]

A number of the findings on time taken to amalgamate are similar to those on forming the amalgamation committee. In general, when a municipality forms its committee early, the possibility of amalgamation is also brought forward. However, some variables show different results.

For example, local public debt per capita hampers committee formation but not amalgamation. Municipalities that have high debt tend to be excluded from forming an amalgamation committee, but after becoming involved in committee formation, this variable does not delay the overall time taken. Population size affects the time taken to amalgamate, however. Municipality that has large population tend to take the

absorption form. Absorption form allows the smooth progress of the discussion because the core (large) municipality leads the discussion. Therefore, municipalities that have a large population size do not have a strong incentive to amalgamate, however, when forming a committee once, a large size advances the committee. Further, the ratio of elderly and young people, namely the high ratio of dependent people, both accelerate the time taken to amalgamate.

As a result, municipalities that are highly dependent on the LAT and have an incentive to become a special administrative direction accelerate the time taken to both form the committee and amalgamate. The carrot-and-stick policy to promote amalgamation thus influences the municipality significantly. On the other hand, some variables show different results, notably for local public debt per capita, which serves to hamper committee formation but does not obstruct amalgamation itself.

5. Conclusion

The present study showed that the great amalgamation in Japan since 1999 is marked by different timings with regard to municipalities forming amalgamation committees and achieving final amalgamation. While previous studies have considered whether a municipality amalgamated or not, our study considers the time taken to form an amalgamation committee and complete amalgamation. Using survival analysis thus allowed us to examine the relationship between municipality characteristics and the time taken for these two events.

This study examined municipality amalgamation in Japan from FY 1999 to FY 2005. During this period, 2,414 municipalities formed amalgamation committees and 1,959 achieved amalgamation owing to strong promotion by central government. In particular, municipalities that highly depended on the LAT as a revenue source were forced to amalgamate by the government's carrot-and-stick policy, whereas others had a financial incentive to become a larger city.

The estimation results show that particularly municipalities that were highly dependent on the LAT but also those that had an incentive to become a special administrative direction quickly formed committees and amalgamated. These results suggest that the amalgamation promotion policy by the central government in Japan has worked sufficiently. However, the LAT provision ends 15 years after amalgamation. Therefore, if a municipality accelerates forming the committee and amalgamation only to receive additional fiscal support, and if the amalgamated municipality cannot enjoy

economies of size, the effect of the amalgamation could be reduced.

The results for local public debt per capita provide a different result. Municipalities that have high debt tend to be excluded from forming an amalgamation committee, but after joining the committee, this variable does not delay the time taken to amalgamate. However, municipalities that have very large local public debt may be prevented from amalgamating and thus future studies should aim to examine the financial conditions of a municipality when centralized fiscal support ends.

6. References

Bhatti, Y. and K. Hansen (2011) "Who 'Marries' Whom? The Influence of Societal Connectedness, Economic and Political Homogeneity, and Population Size on Jurisdictional Consolidations", European Journal of Political Research, Vol. 50, pp. 212–238.

Bish, R. (2001) "Local Government Amalgamations: Discredited Nineteenth-Century Ideals Alive in the Twenty-First", C.D. Howe Institute Commentary, No. 150.

Bodkin, R.G., and Conklin, D.W. (1971) " Scale and Other Determinants of Municipal Government Expenditures in Ontario: A Quantitative Analysis", International Economic Review, 12, pp.465–481.

Byrnes, J. and B. Dollery (2002) "Do Economics of Scale Exist in Australian Local Government? A Review of the Research Evidence", Urban Policy and Research, Vol. 20, pp. 391–414.

Dollery, B., L. Crase, and J. Byrnes (2006) "Local Government Amalgamation and South Australian Rising to the Challenge Inquiry", Working Paper Series in Economics, University of New England.

Hinnerich, B. T. (2009) "Do Merging Local Governments Free Ride on their Counterparts when Facing Boundary Reform?", Journal of Public Economics, Vol. 93, pp. 721–728.

Hirota, H. (2007) "Choice Behavior of Municipality and Verification of Amalgamation Factors", Keikaku Gyousei, Vol. 30, pp. 75–81. (In Japanese)

Hirsch, W. (1959) "Expenditure Implications of Metropolitan Growth and Consolidation", Review of Economics and Statistics, Vol. 41, pp.232–241.

Hirsch, W. (1965) "Cost Functions of an Urban Government Service: Refuse Collection", Review of Economics and Statistics, Vol. 47, pp.87–93.

Jordahl, H. and C. Y. Liang (2009) "Merged Municipalities, Higher Debt: on Free Riding and the Common Pool Problem in Politics", Public Choice, Vol. 143, pp. 157–172.

Liner, H. (1992) "Annexation Impact on Municipal Efficiency", Review of Regional Studies, Vol. 22, pp. 75−87.

Liner, H. (1994) "Institutional Constraints, Annexation and Municipal Efficiency in the 1960s", Public Choice, Vol. 79, pp. 305−323.

Ministry of Internal Affairs and Communication (2010) "Publication About the Great Amalgamation", <http://www.soumu.go.jp/gapei/pdf/100311_1.pdf> Accessed 2013

Feb 12. (In Japanese)

Miyashita, T. and K. Nakazawa (2009) “Empirics on the Consensus Building Cost of Municipality Amalgamation”, Zaisei kenkyuu, Vol. 5, pp. 254–275. (In Japanese)

Mehay, S. L. (1981) “The Expenditure Effects of Municipal Annexation”, Public Choice, Vol. 36, pp. 53–62.

Reingewertz, Y. (2012) “Do Municipal Amalgamations Work? Evidence from Municipalities in Israel”, Journal of Urban Economics, Vol. 72, pp. 240–251.

Walzer, N. (1972) “Economies of Scale and Municipal Police Services: The Illinois Experience”, Review of Economics and Statistics, Vol.60, pp. 431–447.

Figure 1. The number of municipalities forming an amalgamation committee and amalgamating

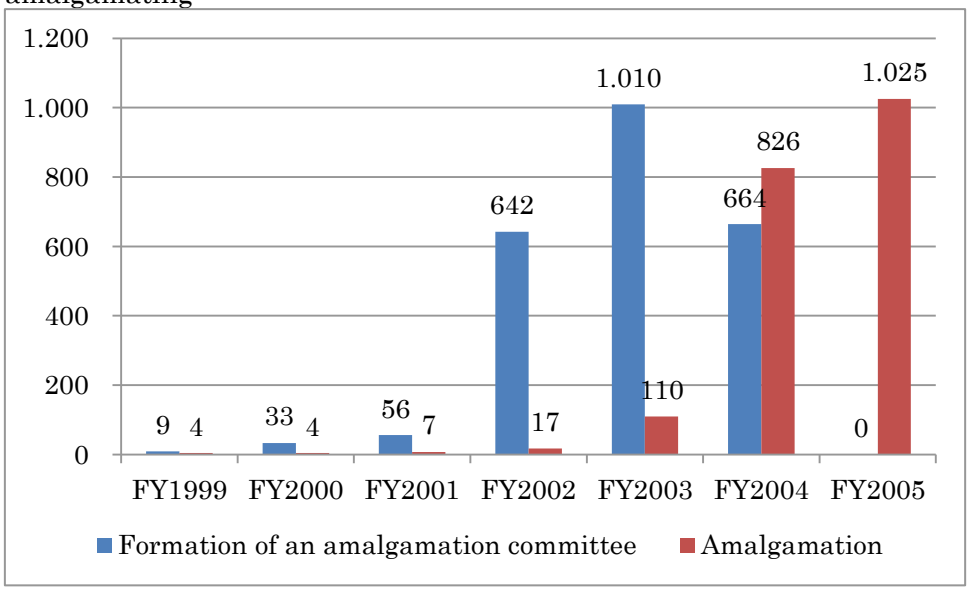

Table 1. Data description and descriptive statistics

	Obs.	Mean	Std. Dev.	Min	Max	Source
Days taken to form an amalgamation committee	2,414	1591.93	343.84	4	2,177	A
Days taken for amalgamation to be achieved	1,959	2223.11	269.69	641	3,276	A
r_LAT	3,184	0.30	0.13	0	0.705	B
r_cb	3,184	81.66	7.31	35.00	137.10	B
p_debt	3,184	683.58	622.09	59.04	12,968	B
special cities	3,184	0.03	0.17	0	1	C
joint	3,184	0.15	0.36	0	1	C
pop (1,000 person)	3,184	36.53	122.65	0.20	3351.61	C
area	3,184	114.98	135.00	1.27	1408.10	D
r_o65	3,184	22.75	6.84	6.84	49.32	D
r_u15	3,184	14.19	2.31	4.53	26.16	D
r_daypop	3,184	91.20	11.98	58.11	285.57	D

Source: A: Ministry of Internal Affairs and Communications (Digital Archive of Amalgamation), B: Local Government Finance Settlement, C: Statistics Bureau, Ministry of Internal Affairs and Communications, D: The national census

Table 2. AIC results

	Exponential	Weibull	Lognormal	Loglogistic	Generalized gamma
Days taken to form an amalgamation committee	6668.51	3227.19	3941.71	2990.28	3174.08
Days taken until amalgamation is achieved	5705.90	-491.11	84.24	-490.23	-490.77

Figure 2. Hazard function of committee formation

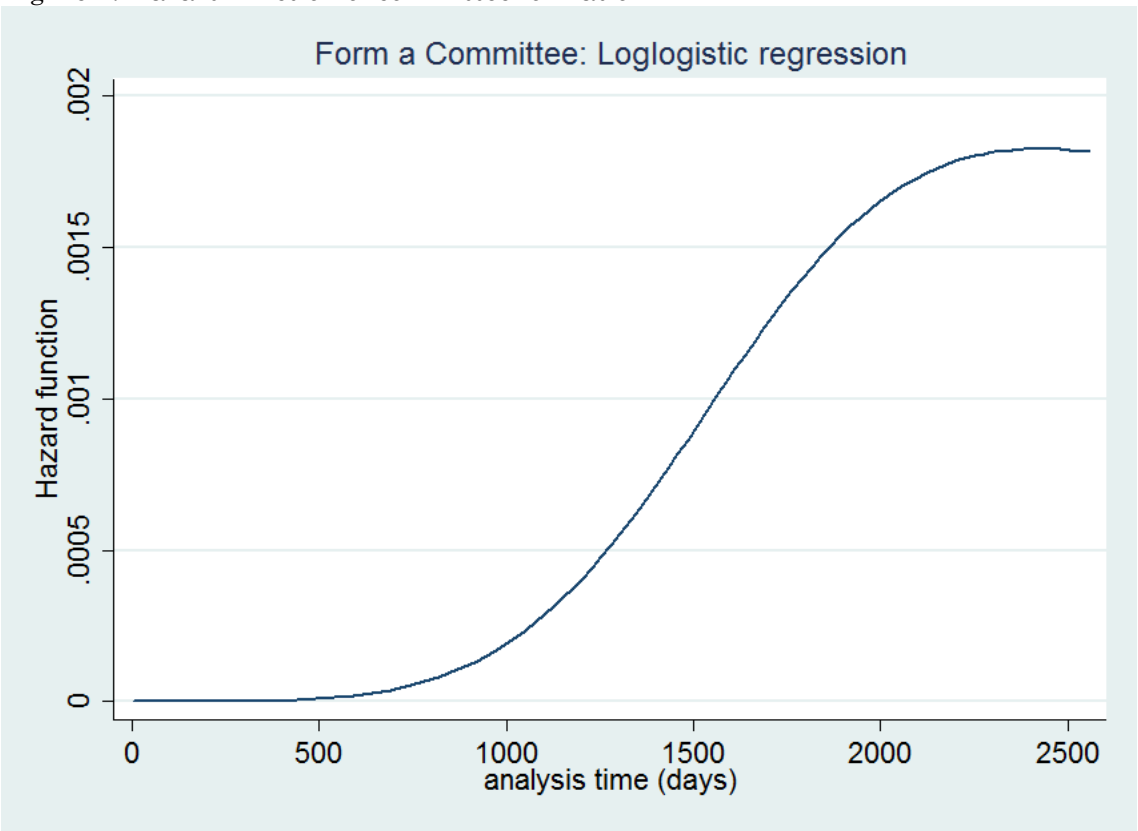

Figure 3. Hazard function of amalgamation completion

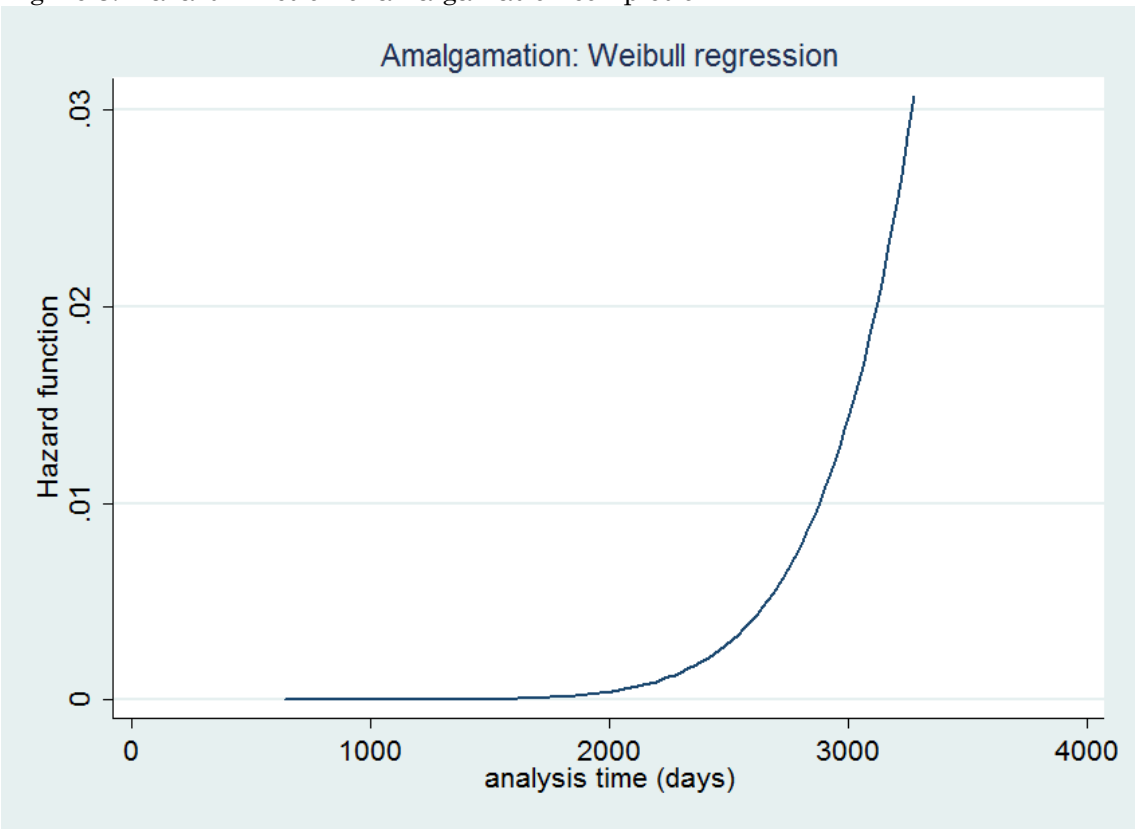

Table 3. Estimation results of the time taken to form an amalgamation committee

	Model 1		Model 2		Model 3		Model 4	
r_LAT	-0.6861	***	-0.3504	***	-0.5642	***	-0.4201	***
	0.0570		0.0791		0.0557		0.0801	
r_cb	0.0010		0.0013		-0.0004		-0.0005	
	0.0010		0.0010		0.0010		0.0010	
p_debt	0.0000	***	0.0001	***	0.0000	**	0.0000	***
	0.0000		0.0000		0.0000		0.0000	
special cities	-0.1011	***	-0.1023	**	-0.1283	***	-0.1319	***
	0.0357		0.0349		0.0355		0.0355	
joint	-0.0461	**	-0.0279		-0.0600	***	-0.0528	**
	0.0187		0.0182		0.0209		0.0208	
pop			0.0000				0.0001	
			0.0001				0.0001	
area			0.0006	***			0.0003	***
			0.0001				0.0001	
r_o65			-0.0150	***			-0.0056	***
			0.0019				0.0021	
r_u15			-0.0116	***			-0.0038	
			0.0044				0.0047	
r_daypop			-0.0011	**			-0.0007	
			0.0007				0.0006	
_cons	7.6221	***	8.0164	***	7.9577	***	8.0323	***
	0.0827		0.1372		0.0879		0.1458	
pref.dummy	No		No		Yes		Yes	
/ln_gam	-1.5256	***	-1.5628	***	-1.6842	***	-1.6908	***
	0.0173		0.0173		0.0174		0.0174	
Log likelihood	-1880.8927		-1775.4975		-1457.5360		-1437.1407	
Num of obs.	3184		3184		3184		3184	
Num of failures	2414		2414		2414		2414	

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

Table 4. Estimation results of the time taken to amalgamate

	Model 1		Model 2		Model 3		Model 4	
r_LAT	-0.2744	***	-0.1193	***	-0.2497	***	-0.1933	***
	0.0235		0.0312		0.0229		0.0324	
r_cb	0.0005		0.0007	*	0.0003		0.0003	
	0.0004		0.0004		0.0004		0.0004	
p_debt	0.0000	***	0.0000	***	0.0000		0.0000	
	0.0000		0.0000		0.0000		0.0000	
special cities	-0.1621	***	-0.1563	***	-0.1426	***	-0.1428	***
	0.0126		0.0124		0.0145		0.0145	
joint	-0.0243	***	-0.0102		-0.0312	***	-0.0307	***
	0.0073		0.0072		0.0084		0.0084	
pop			0.0000				-0.0001	**
			0.0000				0.0000	
area			0.0002	***			0.0001	***
			0.0000				0.0000	
r_o65			-0.0078	***			-0.0040	***
			0.0008				0.0009	
r_u15			-0.0054	***			-0.0047	**
			0.0017				0.0019	
r_daypop			-0.0002				-0.0004	
			0.0003				0.0002	
_cons	7.8996	***	8.0759	***	8.0515	***	8.1728	***
	0.0324		0.0535		0.0361		0.0593	
pref.dummy	No		No		Yes		Yes	
/ln_p	2.1457	***	2.1656	***	2.2677	***	2.2735	***
	0.0197		0.0194		0.0191		0.0191	
Log likelihood	-193.4273		-76.6944		284.8273		303.5541	
Num of obs.	3184		3184		3184		3184	
Num of failures	1959		1959		1959		1959	

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