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Creative Accounting and Municipal Mergers*
-A Theoretical and Empirical Approach-

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【JEL Classification】H74; H81; H83

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1 Introduction

Creative accounting[*1] has begun to be recognized as an important topic when examining government debt accumulation as well as political and economic crises. For example, the creative accounting employed by the Greek government was said to be one major reason behind the Greek debt crisis in the early 2010s (Spiegel, 2010; Siskos & Marangos, 2017). In many developing countries such as Malaysia and South Africa, scandals about the fiscal manipulation employed by politicians or governments came to light; as a result, corruption has been regarded as a barrier to development. To address this situation, the Fiscal Transparency Code proposed by the International Monetary Fund (IMF) prescribes a standard for disclosing information on public finance (International Manetary Fund, 2014). The implementation of this code is expected to reduce fiscal manipulation such as creative accounting.

Moreover, to reduce fiscal manipulation further, we need to elucidate its mechanism. However, understanding what causes fiscal manipulation is difficult for two main reasons. Firstly, the causality of fiscal manipulation is usually challenging to ascertain. Although the existence of creative accounting is seemingly closely tied to increases in debt, whether attempts to use creative accounting raise debt or attempts to raise debt lead to creative accounting is unknown[*2]. Secondly, creative accounting is difficult to be observed and is only identified through detection. Thus, the available data may only pertain to the number of detected incidents. These barriers prevent us from obtaining a comprehensive overview of creative accounting.

Based on the foregoing, this study aims to overcome these difficulties by focusing on amalgamations of local governments, namely municipal mergers. As a result, we can use publicly disclosed data in Japan, not detected data, to clarify that the incentive to increase debt causes the use of creative accounting rather than attempts to use creative accounting causing debt issuance.

Municipal mergers amplify the incentive of municipalities to increase debt before the merger since the burden of the debt repayment is shared by the whole merged municipality; in other words, only part of the debt is owed by the municipality which issued the debt and the other part will be repayed by the other merger counterparts. This is called the "fiscal common pool problem".

We observe creative accounting based on the fiscal common pool problem caused by municipal mergers. Municipalities have an incentive to increase debt before the merger because of the fiscal common pool problem, while financial restrictions and monitoring by others limit the room for debt issuance. However, such a limitation may be avoidable if municipalities can increase their debt in secret by using creative accounting. Thus, municipalities employ creative accounting before the merger if possible. We construct the proposed theoretical model based on this basic idea. Moreover, because Japanese municipalities, most of which experienced municipal mergers in the 2000s, could have employed creative accounting to

[*1] We define creative accounting as an act of intentionally publishing the financial indexes which do not reflect the real financial status. Whether it is legal or illegal, creative accounting under this definition will be deleterious to the soundness of public finance.

[*2] For example, Siskos & Marangos (2017) point out the possibility of both causalities by observing the Greek debt crisis.

exploit their special accounts before FY2007, we employ this situation to investigate the existence of creative accounting due to municipal mergers.

In the theoretical analysis, we construct a simple three-period model with two asymmetric municipalities (i.e., the population of each municipality is different). With this model, we examine three cases: (1) the benchmark case in which the municipalities are independent, (2) the merger case in which the municipalities merge in period 2, and (3) the restriction case in which the municipalities merge in period 2 and are restricted from increasing debt but can employ creative accounting. By using this setting, we theoretically show several results and clarify the mechanism of creative accounting.

Firstly, we prove that a municipality participating in the merger rationally attempts to issue more debt than usual without creative accounting because of the fiscal common pool problem in the merger case. We also show that the incentive to increase debt is larger for a municipality with a small population (called a "village" in this paper) than a municipality with a large population (called a "city") since a larger burden of the debt repayment will be owed by the city than the village.

Secondly, in the restriction case, we clarify that the incentive to increase debt causes the use of creative accounting and that a municipality with a stronger incentive tends to employ creative accounting more fiercely, by examining the behavior of the village, which has a stronger incentive to issue debt than the city. The result of the restriction case indicates that the village increases debt and employs creative accounting, while the city does not employ creative accounting and may even reduce debt issuance before the merger. This result suggests that any attempt to increase debt leads to the use of creative accounting. Hence, we show the mechanism of creative accounting by focusing on municipal mergers.

Thirdly, we show that the transparency and expected punishment when the use of creative accounting is exposed reduce the amount of excessive debt and lessen the severity of creative accounting. This finding suggests that measures to reduce the opacity in accounting such as the IMF's Fiscal Transparency Code work to prevent creative accounting and excessive debt accumulation.

These results suggest that creative accounting is caused by municipal mergers, although it is uncertain whether the results hold in reality. Therefore, we verify these theoretical results in an empirical analysis. In the empirical part, we employ data on the widespread Japanese municipal mergers in the 2000s because Japanese municipalities can have utilized creative accounting at that time. Indeed, they were restricted from issuing debt if their financial index, called real balance ratio, was low. However, they could manipulate their real balance ratio by reducing the money transfer from the general account to special accounts, because this ratio only captures the financial status of the general account. Because data on debt issuance, the real balance ratio, and money transfers are publicly accessible—even though there was a time lag from the occurrence of creative accounting to the data publication of at least one year in the 2000s and creative accounting schemes were not as popular then—we can analyze the use of creative accounting by Japanese municipalities. Through a difference-in-difference (DID) analysis, the empirical results show that small municipalities, which were expected to have a stronger incentive to increase debt, utilized creative accounting, verifying the theoretical results. As a result, this study theoretically and empirically shows the mechanism of creative accounting.

Although we focus on creative accounting by governments, this study is related to two strands of the literature: creative accounting and the fiscal common pool problem[*3].

The first strand, creative accounting, is the main focus of this study. Although grasping the mechanism and causality of creative accounting is usually difficult as explained above, several empirical works have attempted to investigate it, primarily focusing on the tendency of governments to use fiscal manipulation. Koen & van den Noord (2005) research accounting gimmicks and their determinants in EU countries, which were expected to follow the Maastricht Treaty. They point out that decentralized governments and governments with deficits tend to use these gimmicks, although the mechanism is unknown and the result is based only on the detected number of gimmicks. von Hagen & Wolff (2006) show similar results about creative accounting in EU countries; however, they focus on the stock flow adjustment as a tool of creative accounting rather than the number of fiscal gimmicks. While the causality is still unknown, they show that creative accounting by using this adjustment was employed at the time of the introduction of the euro[*4]. Clemenceau & Soguel (2017) identify the factors influencing the use of creative accounting in the public sector, using 1980–2002 panel data on Swiss cantons, which are based on detected data. They suggest that the background of mayors explains the occurrence of creative accounting well. In Japan, Hirota & Yunoue (2017a) suggest that Japanese municipalities employ creative accounting to evade infringing on the new law for sound finances, although the mechanism and causality of creative accounting are vague. While several empirical studies of creative accounting exist, theoretical research is scarce. The exception is Milesi-Ferretti (2003), who shows that the introduction of severe fiscal rules reduces the room for creative accounting, although myopic governments with deficits still employ budget gimmickry to behave as if they adhere to the fiscal rules. The important result of Milesi-Ferretti (2003) is that the larger penalty or expected loss from violating the fiscal rules reduces deficit amounts, although the author assumes the existence of a myopic government and that irrationality explains the occurrence of creative accounting. Our study fills the shortfalls of these works empirically and theoretically and helps explain the mechanism of creative accounting.

In terms of the second strand, the basic mechanism of the fiscal common pool problem is that when several groups utilize a common budget, they do not use their own budgets. This is similar to "the tragedy of the commons." The fiscal common pool problem has long been theoretically analyzed (Weingast et al. , 1981; Persson & Tabellini, 1994; Velasco, 2000; Krogstrup & Wyplosz, 2010), although empirical studies have been limited since finding treatments and controls has been difficult. However, by focusing on municipal mergers, empirical researchers have begun to observe the fiscal common pool problem[*5]. Before municipal mergers, municipalities can free-ride and issue considerable debt because of the fiscal common pool problem. In many countries, empirical researchers have shown that municipalities

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[*3] In addition, this study deals with the regulation of finance by subnational governments(e.g., Ter-Minassian, 1997; Singh & Plekhanov, 2005; Foremny, 2014; Martinez-Vazquez & Vulovic, 2016; Heinemann et al. , 2016; Burret & Feld, 2018; Heinemann et al. , 2018).

[*4] Maltritz & Wuste (2015) also investigate the relationship between creative accounting and the primary budget balance in EU countries as well as summarize empirical studies of the influence of fiscal rules on fiscal performance.

[*5] Hinnerich (2009) and Jordahl & Liang (2010) investigate the fiscal common pool problem in the mergers of Swedish municipalities. Hansen (2014), Saarimaa & Tukiainen (2015), and Fritz & Feld (2015) show the common pool problem in Denmark, Finland, and Germany, respectively. Japanese municipalities are investigated by Nakazawa (2016) and Hirota & Yunoue (2017b).

issue excessive debt before their mergers happen, using the DID method as an identification strategy in which the municipalities to be merged are treatments and the others are controls. Corresponding to this, theoretical studies began to deal with the common pool problem caused by municipal mergers. For example, Akai & Goto (2018) show that municipalities issue excessive debt before they merge by using a simple two-period model[*6]. Although many studies have pointed out that the fiscal common pool problem causes the accumulation of considerable debt, whether the fiscal common pool problem leads to creative accounting has been unclear until now. This is our contribution to this strand of the literature.

The remainder of the paper consists of five sections. The theoretical model and its implications are presented in Section 2. Section 3 presents the empirical analysis, where the institutional background of Japanese local governments, data, and methodology are explained as well as the results of the analysis. Section 4 discusses the results of the theoretical model and empirical analysis. Finally, Section 5 concludes.

2 Theoretical model and its implication

In this section, we deal with the three-period model with two asymmetric municipalities. The model is based on Milesi-Ferretti (2003), who analyzes creative accounting, and Akai & Goto (2018), who show the fiscal common pool problem in municipal mergers.

2.1 Model setting

Consider an economy with three periods (denoted as $\tau = 0, 1, 2$) and two municipalities called a "city" and a "village" (denoted as $i = c, v$). The city has n consumers, whereas the village has only one consumer. A consumer in i enjoys a publicly supplied good $x_{i\tau}$ in period τ and receives utility $u(x_{i\tau})$ ($u' > 0$ and $u'' < 0$ are assumed). Utility in period 2 is discounted by the discount factor $\delta \in (0, 1]$ when evaluated in period 1. A benevolent government in each municipality i supplies a good $x_{i\tau}$ individually in period τ, utilizing an endowment per person, ω_τ. In addition, each municipality can issue debt, denoted d_i[*7] per person, in period 1 as a fund, which has to be repaid in period 2 with an interest rate r. Since a small open economy is assumed, r is virtually exogenous. Therefore, the budget constraint of municipality i is

$$\begin{cases} \psi_i \omega_1 + \psi_i d_i = \psi_i x_{i1} \\ \psi_i \omega_2 - (1+r)\psi_i d_i = \psi_i x_{i2}.. \end{cases} \tag{1}$$

ψ_i takes $\psi_c = n$ and $\psi_v = 1$ for $i = c, v$.

In the theoretical part, we consider three cases: (1) the benchmark case in which the city and village are independent throughout all periods, (2) the merger case in which the city and village are independent in period 1 and merge in period 2 with no restriction on borrowing, and (3) the restriction case in which the city and village have a restriction on debt issuance, are independent in period 1, and merge in period

[*6] Goto (2017) also theoretically deal with the fiscal common pool problem and municipal mergers.

[*7] Although d_i is called debt here, it may be savings since we do not limit the range of d_i specifically. Therefore, it can be interpreted as savings if $d_i < 0$ and as debt if $d_i \geq 0$.

2. Municipalities tend to issue more debt than the ordinal level when they face municipal mergers. This phenomenon, the fiscal common pool problem, is described in the merger case. The restriction case corresponds to the model of Milesi-Ferretti (2003), who deals with creative accounting in public sectors. In this case, a reference point is set to ensure that municipalities do not overissue debt, while municipalities can issue more debt than the reference point by utilizing creative accounting and incur a cost for that. Unlike Milesi-Ferretti (2003), the reference point can be endogenously determined in this model[*8]. As a result of this restriction case, we find that only the village employs creative accounting, while the city reduces its debt when the reference point is set.

The implications explained above can be derived from the model. However, some may think that the city will not merge (i.e., it has an incentive to deviate from the merger) since it knows that it will repay the cost of the merger later. To avoid such a deviation, we assume that when municipalities merge, an incentive, I_{c+v}, is distributed to each consumer in the merged municipality from a higher level of government such as the national government[*9]. This assumption is natural, considering the actual situation of municipal mergers[*10]. As a result, although these is a distortion about the good allocation, the utility of a consumer in the merger case and restriction case may be higher than that in the benchmark case, which has no distortion about a good allocation.

The timing of the game is as follows:

0 The reference point, d^*, is exogenously determined by the national government (or endogenously determined by a negotiation between the city and village[*11]). If a municipality prefers not to participate in the merger, it can quit here.

1 Each municipality decides x_{i1} and d_i.

2B Each municipality decides x_{i2}.

2M After the municipal merger, a united government of the merged areas decides x_{c2} and x_{v2}.

The setting of the reference point d^* in period 0 is only applied for the restriction case since the other cases have no reference point d^*. In the merger case and restriction case, municipalities choose whether to join the merger by considering the incentive I_{c+v} in period 0[*12]. If they decide to participate in the merger, a united government is formed and it decides x_{c2} and x_{v2} in period 2, after each of them decides x_{i1} and d_i in period 1. Thus, period 2 in the merger case and restriction case corresponds to 2M above. In the benchmark case, each municipality decides x_{i1} and d_i in period 1 and x_{i2} in period 2, as described

[*8] We examine this setting in Appendix A7.

[*9] In this model, I_{c+v} affects the utility of residents, which means that it can be not only a pecuniary incentive but also a psychological incentive. Although it may be an odd assumption, if you consider the utility function as quasi-linear function and I_{c+v} works as a pecuniary numeraire there, I_{c+v} can be interpreted naturally. Moreover, though the source of I_{c+v} is not described here, we can describe it by assuming that there are N pairs of city and village and the upper government levies a lump-sum tax T on each resident of all municipalities to finance the incentives (Since T is a lump-sum tax and does not cause any distortion, we can omit to describe the existence of it.).

[*10] For example, the Japanese government provided incentives to accelerate municipal mergers in the 2000s (the so-called the great Heisei mergers). The concrete measures taken in Japan are explained in the institutional background section.

[*11] In Appendix A7, we examine the endogenous setting of the reference point.

[*12] The benchmark case does not have a period 0 since the municipalities decide whether to merge by referring to the benchmark case in the other cases.

in 2B above. The game is solved by backward induction and the equilibrium concept in this model is the subgame perfect Nash equilibrium.

2.2 Benchmark case

In this case, municipalities are independent throughout all periods and there is no distortion for a good allocation.

The utility maximization problem for municipality i in period 2 is

$$\max_{x_{i2}} \psi_i u(x_{i2}) \quad \text{s.t.} \quad \psi_i(\omega_2 - (1+r)d_i) = \psi_i x_{i2}.$$

ψ_i takes $\psi_c = n$ and $\psi_v = 1$ for $i = c, v$. The Lagrangian of this problem is

$$V_i \equiv \psi_i u(x_{i2}) + \lambda_i \psi_i \{\omega_2 - (1+r)d_i - x_{i2}\}.$$

The first-order condition shows

$$\frac{\partial V_i}{\partial x_{i2}} = \psi_i u'(x_{i2}) - \lambda_i \psi_i = 0$$

and $\lambda_i = u'(x_{i2})$ is derived.

The utility maximization problem for municipality i in period 1 is

$$\max_{x_{i1}, d_i} \psi_i u(x_{i1}) + \delta V_i \quad \text{s.t.} \quad \psi_i(\omega_1 + d_i) = \psi_i x_{i1}.$$

The Lagrangian here is

$$W_i \equiv \psi_i u(x_{i1}) + \delta V_i + \mu_i \psi_i \{\omega_1 + d_i - x_{i1}\}.$$

From the first-order conditions, we can derive

$$\frac{\partial W}{\partial x_{i1}} = \psi_i u'(x_{i1}) - \mu_i \psi_i = 0$$
$$\frac{\partial W}{\partial d_i} = -(1+r)\delta \lambda_i \psi_i + \mu_i \psi_i = 0$$

and, summarizing these conditions, we obtain

$$u'(x_{i1}) = (1+r)\delta u'(x_{i2}). \tag{2}$$

The budget constraints per consumer are

$$\omega_1 + d_i = x_{i1}$$
$$\omega_2 - (1+r)d_i = x_{i2}$$

in either municipality i and (2) is also obtained. Therefore, with the subscript B showing the benchmark case, we can derive $x_1^B \equiv x_{c1}^B = x_{v1}^B$ and $x_2^B \equiv x_{c2}^B = x_{v2}^B$ here. In addition, satisfying (2), the benchmark debt level is determined as $d^B \equiv d_c^B = d_v^B$.

2.3 Merger case

In this case, the city and village are independent in period 1 and merge in period 2. Since the governments are benevolent, a united government provides goods to maximize the sum of the utility of all consumers in c and v in period 2, while each government of municipality i supplies goods to maximize the utility of the consumer(s) in i in period 1.

The utility maximization problem for the united government in period 2 is

$$\max_{x_{c2},x_{v2}} nu(x_{c2}) + u(x_{v2}) + (n+1)I_{c+v}$$
$$\text{s.t.} \quad \omega_2(n+1) - (1+r)(nd_c + d_v) = nx_{c2} + x_{v2}.$$

I_{c+v} is the per capita incentive for municipal mergers. The Lagrangian of this problem is

$$\begin{aligned} V \equiv & nu(x_{c2}) + u(x_{v2}) + (n+1)I_{c+v} \\ & + \lambda\{\omega_2(n+1) - (1+r)(nd_c + d_v) - nx_{c2} - x_{v2}\}. \end{aligned} \tag{3}$$

The first-order condition for i is

$$\frac{\partial V}{\partial x_{i2}} = \psi_i u'(x_{i2}) - \lambda\psi_i = 0$$

and $\lambda = u'(x_{c2}) = u'(x_{v2})$ is derived. Therefore, for x_{i2} satisfied here, $x_2^M \equiv x_{c2}^M = x_{v2}^M$ can be defined with the subscript M, which represents the merger case.

Considering the utility satisfied in each municipality, the utility for consumers in the city is $\frac{n}{n+1}$ of V and that for the consumer in the village is $\frac{1}{n+1}$ of V. Therefore, the objective function of the government in i in period 1 is

$$\max_{x_{i1},d_i} \psi_i u(x_{i1}) + \delta\frac{\psi_i}{n+1}V \qquad \text{s.t.} \quad \psi_i\omega_1 + \psi_i d_i = \psi_i x_{i1}. \tag{4}$$

ψ_i takes $\psi_c = n$ and $\psi_v = 1$ for $i = c, v$. The Lagrangian of this problem is

$$W_i \equiv \psi_i u(x_{i1}) + \delta\frac{\psi_i}{n+1}V + \mu_i\{\psi_i\omega_1 + \psi_i d_i - \psi_i x_{i1}\}$$

and the first-order conditions are

$$\begin{aligned} \frac{\partial W_i}{\partial x_{i1}} &= \psi_i u'(x_{c1}) - \mu_i\psi_i = 0 \\ \frac{\partial W_i}{\partial d_i} &= -\frac{\psi_i}{n+1}(1+r)\delta\psi_i\lambda + \psi_i\mu_i = 0. \end{aligned}$$

By summarizing these conditions and denoting the subscript M as the optimized solution in this case, we obtain

$$u'(x_{i1}^M) = \frac{\psi_i}{n+1}(1+r)\delta u'(x_2^M). \tag{5}$$

In period 0, each municipality chooses whether to join the merger. The condition for ensuring participation in the merger is $W_i^M \geq W_i^B$. In the following part of this case, we only focus on the case where the incentive for the merger I_{c+v} is sufficiently large to satisfy $W_i^M \geq W_i^B$ for both municipalities[*13] and investigate what happens there compared with the benchmark case.

We first obtain the proposition indicating the fiscal common pool problem in municipal mergers.

Proposition 1 The total debt issued in the merger case is larger than that in the benchmark case, namely $nd_c^M + d_v^M > (n+1)d^B$.

(Proof) See Appendix A1.

Many empirical studies such as Hinnerich (2009) empirically show that the debt issuance of merged municipalities is larger than that of non-merged municipalities on average. If we divide $nd_c^M + d_v^M > (n+1)d^B$ by $n+1$, this proposition explains the phenomenon shown in these empirical studies since the municipality in the benchmark case of our model can be seen as a non-merged municipality. This phenomenon is the fiscal common pool problem.

Proposition 1 shows the total debt amount between the benchmark case and merger case. Additionally, we can obtain some implications about the debt per capita and difference between the debt issuance of the city and village. From (5), the optimum condition for each municipality in the merger case is

$$u'(x_{c1}^M) = \frac{n}{n+1}(1+r)\delta u'(x_2^M) \tag{6}$$

$$u'(x_{v1}^M) = \frac{1}{n+1}(1+r)\delta u'(x_2^M). \tag{7}$$

From (6) and (7), we can obtain $u'(x_{c1}^M) = nu'(x_{v1}^M)$, and $x_{c1}^M < x_{v1}^M$ holds from $u'' < 0$. Thus, $d_c^M < d_v^M$ holds in this case because $x_2^M = x_{c2}^M = x_{v2}^M$ holds and the endowment per capita is the same across municipalities. Moreover, we can show that the per capita debt of the village in the merger case is always larger than that in the benchmark case, namely $d_v^M > d^B$[*14]. Therefore, the debt issuance by the village is always excessive in the merger case.

On the contrary, we cannot show that the debt issuance by the city is always excessive in the merger case. Although merged municipalities issue more debt than non-merged municipalities on average, merged municipalities with a large population may issue less debt than non-merged municipalities. We summarize this as the following proposition.

Proposition 2 Although $d_c^M < d_v^M$ and $d^B < d_v^M$ always hold, $d^B < d_c^M$ is not always satisfied and $d^B \geq d_c^M$ can be shown when the city's population n is sufficiently large.

(Proof) See Appendix A2.

Appendix A2 shows that $d^B \geq d_c^M$ is obtained if $n \geq 1 + \delta$ ($\delta \in (0, 1]$) holds in the case in which the utility function is a natural logarithm function such as $u(x) = \log(x)$. Indeed, this number is not so large since, in reality, mergers between a small municipality and a large municipality whose size is more

[*13] There are other equilibria where $W_i^M < W_i^B$ holds for either municipality and the results obtained there coincide with the benchmark case.

[*14] The proof of this condition is in Appendix A1.

than twice that of the small one can be observed easily. Therefore, the situation of $d^B \geq d_c^M$ is likely to happen.

2.4 Restriction case

2.4.1 Setting of the restriction case

In the merger case, total issued debt is larger than that in the benchmark case. To reduce debt there, consider the case in which a per capita debt ceiling, d^*, is set (i.e., the reference point). Municipalities are supposed not to issue more per capita debt than d^*. If a municipality issues more per capita debt than d^*, it receives punishment K, which is subtracted from per capita utility[*15]. The punishment in this model affects the utility of residents, which means that it can be not only a pecuniary punishment but also a psychological impairment[*16].

Despite the existence of the punishment, municipalities can avoid such a penalty by employing creative accounting, namely by declaring a false per capita debt amount Δ_i as their issued debt amount instead of the true amount d_i. With creative accounting, a municipality can issue more debt than d^*, although it has to bear the punishment K if creative accounting is detected. Creative accounting is detected with probability p:

$$p = \min\{1, \frac{\gamma}{2}(d_i - \Delta_i)^2\}. \tag{8}$$

γ is an index showing the transparency of the municipality and p rises if γ increases.

If the true debt is $d_i \leq d^*$, municipality i has no incentive to declare a false debt amount and employ creative accounting. Therefore, $d_i = \Delta_i \leq d^*$ holds. On the contrary, municipality i whose debt is $d_i > d^*$ has an incentive to use creative accounting and declare a false debt amount as Δ_i satisfies $d_i > \Delta_i = d^*$. This is because the municipality has to bear the punishment if it declares $\Delta_i > d^*$ and the probability p increases if it declares $\Delta_i < d^*$. In addition, for simplicity and to ensure the inner solution, we assume that $\frac{\gamma}{2}(d_i - \Delta_i)^2 < 1$ is always satisfied following Milesi-Ferretti (2003)[*17].

In this game, d^* can be determined endogenously by each municipality in period 0 before it decides x_{i1} and d_i in period 1. Moreover, from both the endogenous and the exogenous setting of the reference point, we can derive similar results. However, in the Japanese municipal mergers in the 2000s, the reference point d^* was determined exogenously. Therefore, we assume that d^* is determined exogenously in the main part of this paper and deal with the endogenous setting of d^* in Appendix A7.

[*15] Although, a municipality that increased its debt before the merger may be penalized after the merger in reality, the punishment K appears in period 1 in this model. This is because even if we introduce K in period 2, we have to evaluate the disutility of K in period 1 eventually because K should only be applied to the municipality that increased its debt before the merger, not the other municipality. Thus, if you think the punishment should be realized in period 2, please consider $K' \equiv \frac{K}{\delta}$ as the punishment realized in period 2 and evaluate it in period 1 as $K = \delta K'$, which is equivalent to the original model.

[*16] This means that the bad reputation or disadvantage provoked by excessive debt issuance harms the utility of residents. Moreover, this model allows that such a punishment is realized after the merger as footnote *15 explains.

[*17] Actually, we do not have to assume $\frac{\gamma}{2}(d_i - \Delta_i)^2 < 1$ since this condition always holds for the presence of large K. Although we examine this in Appendix A3, we assume $\frac{\gamma}{2}(d_i - \Delta_i)^2 < 1$ here for simplicity.

2.4.2 The solution of the restriction case

The objective function of the government in period 2 is the same as that in the merger case:

$$\max_{x_{c2},x_{v2}} nu(x_{c2}) + u(x_{v2}) + (n+1)I_{c+v}$$
$$\text{s.t.} \quad \omega_2(n+1) - (1+r)(nd_c + d_v) = nx_{c2} + x_{v2}.$$

The Lagrangian of this problem is the same as (3) and is shown as V. By solving this, we obtain $x_2 \equiv x_{c2} = x_{v2}$. The existence of the reference point does not affect this result, which holds even when one municipality issues more debt than the reference point and the other issues less debt than the reference point. Moreover, the utilities for the consumers in c are $\frac{n}{n+1}$ of V and that for the consumer in v is $\frac{1}{n+1}$ of V.

In this case, the objective function of the government in i in period 1 is modified from that in the merger case. A term showing the punishment is added if $d_i > d^*$ holds since municipality i uses creative accounting. However, because there is no need for a municipality to employ creative accounting if $d_i \leq d^*$ holds, the objective function in period 1 is the same as that in the merger case. Therefore, we only focus on the case of $d_i > d^*$ in this section since the solutions in the case of $d_i \leq d^*$ have already been derived in the merger case.

When $d_i > d^*$ holds, municipality i sets its false debt amount as $\Delta_i = d^*$ and the objective function in period 1 is

$$\max_{x_{i1},d_i} \psi_i u(x_{i1}) - \psi_i Kp + \delta\frac{\psi_i}{n+1}V \quad \text{s.t.} \quad \psi_i\omega_1 + \psi_i d_i = \psi_i x_{i1}, p = \frac{\gamma}{2}(d_i - d^*)^2.$$

ψ_i takes $\psi_c = n$ and $\psi_v = 1$ for $i = c, v$. The Lagrangian of this problem is

$$W_i^R = \psi_i u(x_{i1}) - \psi_i K\frac{\gamma}{2}(d_i - d^*)^2 + \delta\frac{\psi_i}{n+1}V + \mu_i\psi_i(\omega_1 + d_i - x_{i1}),$$

where we use the subscript R to show the restriction case. The first-order conditions are

$$\frac{\partial W_i^R}{\partial x_{i1}} = \psi_i u'(x_{i1}) - \psi_i\mu_i = 0$$
$$\frac{\partial W_i^R}{\partial d_i} = -\psi_i K\gamma(d_i - d^*) - (1+r)\delta\frac{\psi_i^2}{n+1}\lambda + \psi_i\mu_i = 0.$$

By summarizing these equations, we can derive

$$u'(x_{i1}^R) = \delta\frac{\psi_i}{n+1}(1+r)u'(x_2^R) + K\gamma(d_i^R - d^*). \tag{9}$$

By using (5) and (9), we can see the effect of the restriction, the introduction of which reduces debt issuance. Summarizing this fact, we obtain the following proposition.

Proposition 3 When a municipality issues more debt than the reference point, the existence of the restriction reduces debt issuance.

(Proof) See Appendix A4.

This proposition indicates that debt issuance can be reduced by the existence of the restriction because municipalities bear punishment for excessive debt issuance with a positive probability even if they use creative accounting. This proposition thus implies that setting a restriction for borrowing is a good policy for reducing excessive debt. In reality, Nakazawa (2016) shows that Japanese municipalities with a restriction on their debt issuance do not increase their debt compared with municipalities without a restriction before their mergers. Thus, this proposition explains that phenomenon.

Proposition 3 shows the effect of the restriction itself. In addition, we can show the following proposition related to the effect of high transparency and heavy punishment.

Proposition 4 Higher transparency and a heavier punishment reduce the debt amount and creative accounting more.

(Proof) See Appendix A5.

This proposition suggests that measures to enhance transparency eliminate excessive debt and lessen the use of creative accounting. This implication encourages policies such as the IMF's Fiscal Transparency Code that aim to prevent excessive debt issuance.

Moreover, we can show that $d_c \leq d_v$ holds regardless of the existence of the restriction. We have already confirmed that $d_c \leq d_v$ holds in the solution of the merger case and we can apply this in the restriction case if $d_i = \Delta_i \leq d^*$ holds for both is. In addition, no equilibrium such as $d_i^* < d_v < d_c$ or $d_v \leq d^* < d_c$ is achieved[*18]. Therefore, we obtain the following proposition.

Proposition 5 When the city and village merge, $d_c \leq d_v$ always holds regardless of the existence of the restriction.

This proposition indicates that the village's incentive to issue debt is always stronger than the city's. Since the occurrence and extent of creative accounting increase when debt issuance is large in this model, this result suggests that the village, which has a strong incentive to increase debt, tends to employ creative accounting more fiercely than the city. Moreover, we can derive the following proposition[*19].

Proposition 6 Only the village increases debt d_v and employs creative accounting, while the city reduces debt d_c and does not use creative accounting if the reference point is set as the same level as non-merged municipalities' debt issuance and the difference in the population between the city and village is sufficiently large.

This proposition refers to two conditions. The first concerns the reference point. If this is set as the same level as non-merged municipalities' debt issuance, $d^* = d^B$ holds since non-merged municipalities issue d^B as their debt amount, as we show in the benchmark case. The second condition requires that the difference in the population between the city and village, which is equal to n, is sufficiently large. Proposition 2 shows that the village always increases debt, while the city reduces debt if n is sufficiently

[*18] See Appendix A6 for these proofs.

[*19] We can derive a similar proposition even if we assume that the reference point d^* is endogenously determined. See Appendix A7 on this.

large. Hence, we can derive this proposition because debt issuance above $d^*(= d^B)$ entails creative accounting and only the village's debt issuance is applied to this.

In this model, debt issuance beyond d^B is excessive because d^B is the debt issuance level at which municipalities decide optimally with no distortion. Therefore, it is natural to set the reference point as d^B to eliminate excessive debt. Thus, the result of Proposition 6 is likely to happen in the real world. As explained in the next section, the reference point for Japanese municipalities was indeed considered to satisfy the two conditions of Proposition 6. This means that the results of Proposition 6 can be verifiable by using data on Japanese municipalities. The next subsection discusses the possibility for the verification of this result.

2.5 Applications for the empirical analysis

From the theoretical model, we find that a municipality with a smaller population always employs creative accounting, while the other municipality with a larger population does not when the debt reference point is set. However, there is a problem when we apply this model to the empirical analysis.

Is the reference point set before the municipal merger in reality? This is important, since without the reference point, creative accounting does not occur in the model. The existence of the reference point can be observed in reality, although the real framework is not the same as the model assumes.

Japan[*20], for example, has financial indexes called the real balance ratio and the debt expenditure ratio. When a municipality has excessive debt, capturing the financial conditions, these indexes worsen. If a municipality has sufficiently large debt to lower its index below the reference point of the real balance ratio or debt expenditure ratio, the national government keeps the municipality from issuing new debt[*21]. In addition, Japanese municipalities in 2000s used these financial indexes to judge whether the counterpart in the merger negotiation had sound finances. "The guideline for operating the amalgamation committee" (Ministry of Internal affairs and Communications, 2006) published by the national government provided that "municipalities are expected to disclose their fiscal conditions completely as early as possible and to discuss mergers based on this information" (Ministry of Internal affairs and Communications, 2006, p.57). The fiscal conditions disclosed in the earlier negotiation stage reflect each municipality's fiscal conditions in the previous period. Since many municipalities in Japan followed this guideline during merger negotiations, we can assume that they used the disclosed fiscal information on the previous period as a reference point of the financial conditions. In addition, if the financial conditions of municipalities worsened and this was exposed to their merger counterparts, they might be punished in the merger negotiation[*22]. Thus, it is also reasonable to assume the existence of the punishment K as well as the

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[*20] We deal with the Japanese case here since we use Japanese data in the empirical analysis. However, regulations for borrowing and setting reference points for financial conditions are common globally. For example, such a restriction for subnational governments is set by the national or state governments in Australia, Belgium, Brazil, Germany, Hungary, Korea, Norway, Spain, and the United States.

[*21] Nakazawa (2016) shows that municipalities with a high debt expenditure ratio refrain from issuing new debt before their mergers, verifying the result of Proposition 3. We utilize the real balance ratio in the regression instead of the debt expenditure ratio. Both these ratios can be manipulated if the scheme we explain later is utilized.

[*22] For example, the reduction in public services has been one controversial problem in merger negotiations in Japan, as such services were expected to be integrated. Hence, if considerable debt issuance by a municipality was exposed

existence of the reference point d^* in the model.

Considering these factors, we can assume that Japanese merged municipalities set their reference point for the fiscal deficit as their previous fiscal conditions[*23]. Therefore, throughout the empirical analysis, we assume that Japanese municipalities followed the guideline (Ministry of Internal affairs and Communications, 2006) and referred to their previous fiscal conditions (i.e., they set their reference point exogenously)[*24].

3 Empirical analysis

In this section, the institutional background of Japanese municipal mergers, data, methodology, and results of the analysis are explained. We focus on the massive Japanese municipal mergers in the 2000s since Japanese municipalities may have employed creative accounting at that time. By using DID analysis, we verify the result of Proposition 6, which shows that only small municipalities employ creative accounting, while large municipalities reduce their debt.

3.1 Institutional background

3.1.1 Local public finance in Japan

The Japanese government system consists of three tiers: the national government, prefectural governments, and municipal governments. As Figure 1 shows, there were 47 prefectures in Japan and 1727 municipalities at the end of FY2010.

Figure 1 is here.

Municipalities provide most local public services. However, since the scale of municipalities varies from villages with under 200 people to cities with millions of people, the work of municipalities are different by their types. There are two main categories of municipalities and three subcategories of cities as Figure 1 shows. Although the names (i.e., "town" and "village") are different, the role of towns and villages is the same and they are usually small and in rural locations. A "city" is a large municipality that provides wider local public services than a town or village does. Cities are subcategorized into "designated cities," "core cities," and "special cities." All three categorizes have larger populations and wider works than ordinal cities. The criteria to become a city or a categorized city are different and becoming a designated city is the most difficult.

during a negotiation, that municipality would lose its bargaining power and public service provision would reduce in its area. As this decreases the benefit for residents, we can consider that the municipality receives a punishment as a result.

[*23] Even if municipalities endogenously set the reference point as they like, the result obtained from period 0 of the model is realized as shown in Appendix A7, although this is not considered to happen in reality.

[*24] Here, the previous period is equivalent to the pre-treatment period and the previous financial conditions are the financial conditions during the pre-treatment period in Figure 8 of Appendix B1. In this period, municipalities did not know whether they would merge. By contrast, during the treatment period, they joined the merger negotiation and thus could have expected a merger to occur. Therefore, small municipalities should increase their debt issuance and employ creative accounting in the treatment period, while large municipalities should decrease their debt if their population is sufficiently large.

The revenue of municipalities' general account mainly comprises three parts. First, Local Tax (LT) accounts for about 30% of the revenue of municipalities. While municipalities levy several types of LT, most tax revenue comes from resident tax and property tax. Another main revenue source for municipalities is grants from the national government (approximately 30% of revenue). There are two national grants: Local Allocation Tax (LAT) and national Treasury disbursements. LAT is allocated to municipalities considered to have a money shortage, and can be utilized for general purposes. The amount of LAT is based on the estimated money shortage, which is calculated by the national government[*25]. National Treasury disbursements are an earmarked subsidy that municipalities can only use for specific purposes. The other source is Local Bonds (LB), accounting for 10% of municipal revenue. LB is mainly issued for construction purposes. Usually, although municipalities have to ask whether they might issue LB to the upper government such as the prefecture government or national government, they could issue LB virtually freely if they had sound finances. However, if the debt expenditure ratio or real balance ratio of a municipality is evaluated as bad, the issuance of LB is regulated. Therefore, municipalities have an incentive to employ creative accounting to improve their financial index and thus evade this regulation.

3.1.2 The great Heisei mergers and merger negotiations

Japan experienced large-scale municipal mergers called "the great Heisei mergers" in the 2000s. Before this series of mergers, the Municipal Amalgamation Law (the old law) was enacted in 1965. Although the old law tried to promote mergers, only 147 mergers were implemented from 1965 to 1999.

However, in 1999, the old law was radically amended and many incentives for mergers were offered. For example, merged municipalities were guaranteed to receive the same amount of LAT for 15 years, even though this is usually reduced since they are expected to become more efficient. Moreover, other incentives were offered that affected the merger decision, just as the incentive I_{c+v} affects the merger decision in the theoretical model. In Japan, the amount of these incentives, equivalent to I_{c+v}, differed among municipalities based on the particular conditions of each[*26]. This means that the merger decision can be interpreted as determined exogenously since the incentive amount strongly induced municipalities to merge, as the theoretical model showed, even though the merger decision was nominally determined by each municipality. Therefore, we assume that the merger treatment was assigned exogenously[*27].

To accelerate municipal mergers, the national government offered plans and guidelines for use during

[*25] This estimated money shortage is calculated based on the expected revenue and expenditure, which are also calculated by the national government depending on various conditions such as population and land area, which are difficult to be manipulated by municipalities.

[*26] For example, as noted above, the amount of LAT is calculated by the national government depending on the estimated money shortage, which cannot be manipulated by municipalities. Since merged municipalities were guaranteed to receive the same amount of LAT for 15 years, the exogenous determination of LAT can be interpreted as equivalent to the exogenous determination of I_{c+v} in the theoretical model.

[*27] Most previous studies of municipal mergers assume that the merger decision is exogenously assigned even if they deal with voluntary mergers (Hinnerich, 2009; Jordahl & Liang, 2010; Hansen, 2014; Saarimaa & Tukiainen, 2015; Fritz & Feld, 2015; Nakazawa, 2016). By using the theoretical model, we can justify this view when the incentive amount for merger I_{c+v} is different among municipalities, as in the Japanese case. Thus, we adopt this view in the empirical analysis.

negotiations. These guidelines obligated municipalities to take 20 to 22 months for negotiations; indeed, the actual negotiation time was 20.2 months on average (Ministry of Internal affairs and Communications, 2006; Nakazawa & Miyashita, 2016). Moreover, it was announced that the incentives to promote mergers would stop at the beginning of FY2006, when the amended old law would be replaced by the new law. As a result, most series of mergers were conducted until FY2006 (see Figure 2.). These promotions strongly induced municipal mergers and led to many municipalities initiating merger negotiations. Eventually, the number of municipalities reduced from 3229 (at the end of FY1999) to 1727 (at the end of FY2010).

Figure 2 is here.

As Figure 2 shows, mergers in FY2004 and FY2005 were particularly common because negotiations were expected to take about two years and most municipalities could not take actions quickly after the amended old law was published. The typical process of these mergers started from the formation of an amalgamation committee among the municipalities. If municipalities wanted to merge and receive the incentives from the national government, they had to create a statutory amalgamation committee. On these committees, municipalities discussed how and when they would merge in detail. Committees were usually dissolved when they failed to negotiate a merger[*28].

3.1.3 Municipal fiscal rules and creative accounting

In Japan, "the law for local public financial reconstruction" (the previous reconstruction law) enacted in 1955 obliged all local governments to publish a real balance ratio every year. This index is calculated based on the general account, with most special accounts not considered[*29]. Under the previous reconstruction law, municipalities were supposed to keep their real balance ratio above -20% every year. If they failed to do so, they would be designated financial reconstruction bodies and put under the control of the national government[*30]. Although the new law for sound finances[*31] enacted in 2008 added indexes to capture the financial status from several dimensions including all special accounts, the financial status of special accounts was not grasped precisely under the previous reconstruction law. Thus, municipalities were assumed to employ creative accounting more easily before 2008 than after.

Figure 3 is here.

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*28 See Nakazawa & Miyashita (2016), Nakazawa (2016), and Hirota & Yunoue (2017b) for more details.

*29 According to the White Paper on Local Public Finance (e.g., Ministry of Internal affairs and Communications, 2010), the composition of this index is below:

$$\text{Real balance ratio} = \frac{\text{Real budget balance of the general account and etc.}}{\text{Standard financial scale}}.$$

The real budget balance is found by subtracting carry-over expenditure in the next year from the budget balance of the current year, which reduces as LB issuance increases. Although the number of special accounts differs by municipality, only a few special accounts are usually considered in the real balance ratio among about 20 special accounts. The share of these special accounts was only 3.4% of all the special accounts of all municipalities in 1997. See Akai & Ishikawa (forthcoming) in detail.

*30 While many municipalities were designated financial reconstruction bodies before the 1970s, only 17 were designated thus from 1975 to 2007. These 17 municipalities failed to transform industrial structures and made huge deficits (Doi, 2007).

*31 This is the same law as Hirota & Yunoue (2017a) investigate.

All municipalities divide their accounts into two broad categories, as Figure 3 indicates: the general account and special accounts. Special accounts consist of three accounts for public health and several accounts for public enterprises. The number of special accounts varies by municipality since each has different public enterprises. There are approximately 20 types of special accounts and most are excluded when calculating the real balance ratio. Municipalities freely decide the money transfer between the general account and special accounts. Large transfers from the general budget to special budgets are usually used to compensate for deficits in special accounts. In particular, special accounts related to public health are negatively affected by the aging population[*32].

The typical method of creative accounting was to reduce the money transfers from the general budget to special budgets[*33]. According to anecdotal evidence, a mayor of a municipality in Osaka prefecture confessed that his municipality had employed such a creative accounting scheme and struggled with the repayment of accumulated debt in special accounts as a result[*34]. This implies that some municipalities may have employed it before their mergers.

3.2 Hypotheses

From the theoretical analysis, we derive $d_c^M < d^B < d_v^R$ and $\Delta_v = d^*$, where d_c^M and d_v^R represent the debt issuance per person of a large and a small merged municipality, respectively, d^B is the debt issuance per person of the non-merged municipality, and Δ_v is the observable false debt issuance of the small municipality. In addition, since municipalities set the reference point as high as their previous deficit levels before their mergers, $d_c^M < d^* < d_v^R$ is assumed. As a result, the theoretical result suggests that only small municipalities employ creative accounting and increase their debt, while large municipalities do not employ creative accounting and reduce their debt before the merger.

Considering this, we can make the following hypotheses.

Hypothesis 1 Small municipalities to be merged increase debt issuance before their mergers and large municipalities to be merged reduce it compared with non-merged municipalities.

This hypothesis concerns real debt issuance (i.e., the amount of LB issuance). We use this variable, called “LB issuance per capita,” to capture the movement of debt issuance by each municipality.

While LB issuance indicates real debt issuance, the financial conditions and punishment such as regulation for borrowing were judged by the real balance ratio in Japan, although this ratio could be manipulated by reducing money transfers. Therefore, we investigate money transfers and the real balance ratio to check whether creative accounting existed. If the theoretical model is right, the following hypotheses will hold.

[*32] Special accounts are expected to be managed by the benefit principle and earn their revenue by collecting a service fee, although their revenue tends to be lower than their expenditure. Nishizawa (2015) points out that most money transfers in local governments are chronic since special accounts usually run deficits.

[*33] Akai & Ishikawa (forthcoming) explain the scheme in detail and point out municipalities can use this scheme easily. Yano (2008) finds that municipalities could utilize this scheme easily in Japan. Iwamoto (1996) also points out that a similar creative accounting scheme was adopted by the national government of Japan.

[*34] Refer to his speech on February 11, 2017 at the Kansai public economics workshop.

Hypothesis 2 Small municipalities to be merged reduce their money transfers from the general account to special accounts before their mergers.

Hypothesis 3 The real balance ratio of small municipalities to be merged is almost the same as that of non-merged municipalities.

Hypothesis 2 focuses on the extent to which municipalities employed creative accounting. If municipalities manipulated their fiscal indexes by reducing money transfers to special accounts, the reduced amount would correspond to $d_v^R - \Delta_v$, which is the gap between the real debt amount and false debt amount, and only small merged municipalities would reduce money transfers. Hypothesis 3 captures the outcome of creative accounting. If small merged municipalities manipulate their real balance ratio, the trend of the real balance ratio should be similar to that of the others. This corresponds to the results of the theoretical model, which showed that villages manipulate their own financial conditions.

In addition, how we determine small and large is important. In the baseline analysis, we use the relative size of the population in the merged municipality to assess whether a merged municipality is large or small. The relative size of the population is calculated as

$$\text{The relative size of the population}_i \equiv \frac{\text{population}_i}{\sum_j \text{population}_j} \tag{10}$$

, where i, j shows the index of the merged municipality. By using this, we define a large merged municipality as a municipality whose relative population is larger than 0.5 because the verification of the theoretical model requires that the relative population of a large merged municipality exceeds 0.5[*35]. Such a criterion is set in previous research (For example Hirota & Yunoue, 2017b) and is natural to verify the result of the theoretical model. For the robustness check, we implement regressions with changing the definition by determining cities as large municipalities and villages and towns as small municipalities. However, these changes in definition do not affect the main results of the empirical analysis[*36].

3.3 Data and method

To verify the three hypotheses, we employ linear regressions with three variables as the dependent variables: LB issuance per capita, money transfer per capita, and the real balance ratio. Thus, we set the DID linear regression model as follows:

$$\begin{aligned}
Y_{i,t,j} =& \alpha_j + \beta_{1j} Post_t \times Treatment_{i,t} + \beta_{2j} Post_t \times Treatment_{i,t} \times Large_i \\
&+ \beta_{3j} Treatment_i + \beta_{4j} Large_i + \beta_{5j} Post_t \\
&+ \boldsymbol{\beta_{6j}' Citysize}_{i,t} + \beta_{7j} Pop_{i,t} + \beta_{8j} Area_{i,t} \\
&+ \beta_{9j} LAT_{i,t-1} + \beta_{10j} LT_{i,t-1} + \varepsilon_{i,t,j}.
\end{aligned} \tag{11}$$

[*35] To verify the result of Proposition 6, the population of large municipality n must be sufficiently large. Moreover, from Appendix A2, we can find that n such as $n > 1 + \delta$ is sufficiently large if the utility function is the natural logarithm function. Since $\delta \in (0, 1]$, n should be in $(1, 2]$ at least. In this situation, the relative population of a sufficiently large municipality should be more than $(0.5, \frac{2}{3}]$ because the population of a small municipality is normalized to 1. Therefore, we adopt 0.5 as the criterion. In addition, even if we use 2/3 as the criterion, the result does not change a lot.

[*36] The results of this analysis are available upon request.

In this model, i and t show each municipality and year, respectively since the data are balanced panel data. In addition, because three regressions are investigated in this study, $Y_{i,t,j}$ represents LB issuance per capita, money transfer per capita, and the real balance ratio, and j corresponds to each dependent variable in this equation[*37]. Since the data on these three dependent variables are publicly disclosed, we can obtain a comprehensive overview of creative accounting that utilizes special accounts without depending on detected data, which may fail to capture some creative accounting. Moreover, these data are published annually and usually released at the end of the next financial year. In other words, the time lag to identify creative accounting is at least one year. Therefore, each municipality could hide creative accounting for at least one year.

The treatment effects are captured by the terms $Post_t \times Treatment_i$ and $Post_t \times Treatment_i \times Large_i$. $Treatment_i$ is a dummy variable coded one if municipality i merges. $Large_i$ is a dummy taking one if the relative size of the municipality exceeds 0.5[*38]. $Post_t$ takes one if that year is one or two year(s) before the merger because the negotiation period was assumed to range from 20 to 22 months[*39]. Figure 8 in Appendix B1 summarizes the timings and stages of the municipal mergers in the 2000s in Japan. In addition to the cross-terms, we add $Treatment_i$, $Large_i$, and $Post_t$ to the model, which are necessary for the DID analysis.

Hypothesis 1 is verified if the signs of the regression for LB issuance per capita correspond to $\beta_{1bond} > 0$ and $\beta_{2bond} < -(\beta_{1bond}) < 0$. This is because small merged municipalities are expected to increase their debt, whereas large merged municipalities are presumed to reduce their debt. In the regression for money transfer per capita, the signs should be $\beta_{1transfer} < 0$ and $\beta_{2transfer} = -(\beta_{1transfer}) > 0$ to verify Hypothesis 2 because small merged municipalities reduce money transfers to special accounts to improve the real balance ratio, while the money transfers of large merged municipalities remain the same as before. To verify Hypothesis 3, the sign should be $\beta_{1real} = 0$ in the regression on the real balance ratio because the real balance ratio of small merged municipalities should remain the same if creative accounting is successful. On the contrary, the coefficient for β_{2real} should be positive or zero because the real balance ratio of large merged municipalities improves since they reduce their LB issuance (their real balance ratio will not move if the reduction in LB issuance is insufficient). Table 1 summarizes the expected results.

Table 1 is here.

The control variables in this model are $Pop_{i,t}$, $Area_{i,t}$, $LAT_{i,t-1}$, $LT_{i,t-1}$, and $\boldsymbol{Citysize}_{i,t}$. $Pop_{i,t}$ and $Area_{i,t}$ show the population and area of each municipality, respectively. $LAT_{i,t-1}$ and $LT_{i,t-1}$ are the previous year's LAT and LT, respectively. These variables capture the fiscal conditions of each municipality. $\boldsymbol{Citysize}_{i,t}$ consists of four dummy variables: the designated city dummy, core city dummy, special city dummy, and city dummy. The designated city (core city/special city/city) dummy takes one

[*37] Hence, j takes $j = bond$ in the regression on LB issuance per capita, $j = transfer$ in the regression on money transfer per capita, and $j = real$ in the regression on the real balance ratio.

[*38] See footnote*35 for the determination of this criterion.

[*39] See p.16 for more details. In addition, since Hirota & Yunoue (2017b), who investigate the same Japanese municipal mergers as this study and the fiscal common pool problem, set the treatment period as two years for their DID analysis, this treatment period should be reasonable.

if a municipality is a designated city (core city/special city/city) and zero otherwise. These dummies capture the specific role of each municipality. α_j and $\varepsilon_{i,t,j}$ represent the constant term and error term, respectively.

In this study, panel data are employed to investigate the regressions of the LB issuance per capita, money transfer per capita, and real balance ratio. Since we examine the behaviors of municipalities before their mergers, the utilized data should be pre-mergers' data[*40]. For the analysis, we use two datasets: one contains data on 3068 municipalities for FY1997–2003 and the other contains data on 2249 municipalities for FY1997–2004. For each dataset, the treatment group consists of municipalities that merged just after the end of the data period. For example, the treatment group for FY1997–2003 consists of the municipalities that merged in FY2004. Each dataset starts from FY1997, since the major LT reform was implemented in FY1997, implying that the structural change may affect the result if data before FY1997 are utilized.

Table 2 and Table 3 show the summary statistics by treatment group and control group[*41]. Table 4 summarizes the data sources.

For the parallel trend assumption for the DID method, the employed data seem to satisfy the assumption according to Figure 4 and Figure 5. The left, center, and right graphs show the trend of LB issuance per capita, money transfer per capita, and the real balance ratio, respectively. These figures show that the parallel trend started to be broken two years before the mergers, which correspond to the treatment period. Only small merged municipalities increase their debt and radically decrease their money transfers compared with non-merged municipalities, while their financial indexes retain the same trend. By contrast, large merged municipalities seem to decrease their debt compared with non-merged municipalities; however, they keep their money transfer level and the financial index the same.

The parallel trend can also be ensured by using a placebo test. Appendix B3 presents the results of the placebo test of each regression, which satisfy the parallel trend assumption.

Table 2, Table 3, and Table 4 are here.

Figure 4 and Figure 5 are here.

3.4 Empirical results

Table 5 and Table 6 show the empirical results. In general, these results verify the expected signs and coefficient values for each regression.

Firstly, for the regression on LB issuance, $\beta_{1bond} > 0$ and $\beta_{2bond} < -(\beta_{1bond}) < 0$ are expected from the theoretical model. Although there is an exception in the result for the FY1997–2004 data, the expected results are obtained in the FY1997–2003 data. Therefore, Hypothesis 1 is verified: small municipalities increased debt issuance before their mergers.

Secondly, $\beta_{1transfer} < 0$ and $\beta_{2transfer} = -(\beta_{1transfer}) > 0$ are expected for the regression on money

[*40] Appendix B1 explains the data construction.

[*41] Appendix B2 presents the summary statistics by small and large municipalities within the treatment group.

transfers. Since these results can also be observed from Table 5 and Table 6, we can verify Hypothesis 2. Thus, only small municipalities employed creative accounting, while large municipalities did not.

Finally, $\beta_{1real} = 0$ is expected for the regression on the real balance ratio. This result supports Hypothesis 3: the financial indexes of small municipalities did not worsen because they employed creative accounting. In addition, corresponding to the expectation of $\beta_{2real} = 0$, the coefficients of β_{2real} are not significant in Table 5 and Table 6. These results correspond to the expected results.

These results generally show that only small merged municipalities employed creative accounting and issued excessive debt, while large merged municipalities did not. In particular, the result from the FY1997–2003 data shows that large merged municipalities reduced their debt before their mergers, which corresponds to the results of the theoretical model. This finding is a novel contribution to previous research. To summarize, we generally show results that concur with the theoretical model.

Table 5 and Table 6 are here.

3.5 Robustness check

As a robustness check, we analyze the model without control variables and the fixed effect model. The results obtained from the former show similar results to the baseline model. In the latter, variables with collinearity with the fixed effects are omitted; however, the results are similar. Therefore, we can conclude that the results obtained are robust.

Table 7, Table 8, Table 9, and Table 10 are here.

3.6 Possibility of alternative mechanisms

The empirical results obtained here verify the results of the theoretical model. However, there may be alternative explanations for the empirical results. In this part, we consider these alternatives and show that they cannot explain the empirical results obtained here.

Firstly, Milesi-Ferretti (2003) suggests that myopia causes the use of creative accounting. However, we cannot justify that only the governments of small merged municipalities suddenly became myopic before their mergers. Thus, this explanation is unlikely to hold.

The second possibility is the background of mayors, as Clemenceau & Soguel (2017) show. However, this cannot explain the fact that small merged municipalities did not employ creative accounting in the pretreatment period because many mayors were the same in the both pretreatment period and treatment period.

The third explanation is the introduction of new financial rules (Koen & van den Noord, 2005; von Hagen & Wolff, 2006). In Japan, new financial rules for municipalities were gradually introduced from FY2007. However, because these rules started to be discussed from FY2006 (Akai & Ishikawa, forthcoming), the municipalities in our dataset (FY1997–2003/2004) must not have been affected by their introduction.

To summarize, other explanations cannot be provided for our empirical results. Therefore, we conclude that the incentive to increase debt issuance causes the use of creative accounting before mergers, as the theoretical model shows.

4 Discussion

The theoretical model and empirical analysis allow us to clarify that small municipalities utilize creative accounting before their mergers. However, some points remain to be considered.

For example, the theoretical model has two asymmetric municipalities (large and small). However, mergers with more than three municipalities occur in reality. That said, a similar result can be obtained even if the number of municipalities in the model rises because a merger with even more municipalities disperses the burden of issued debt and causes a more serious fiscal common pool problem. In other words, when the number of merged municipalities is high, each municipality can free-ride more easily[*42]. Therefore, the incentive to increase and hide debt will be strengthened. This fact might explain why our results from the empirical analysis concur with those of the theoretical model even though the used dataset contains mergers with more than two municipalities. Another possible point is about the appropriateness of assuming a symmetric endowment per person. In reality, municipalities in Japan utilize revenue such as LT and LAT, but not endowments, to provide public services. Since Japanese municipalities can receive LAT to bridge their estimated money shortage, revenue per capita cannot vary a lot. Therefore, the assumption of a symmetric per capita endowment used in the theoretical model is considered to be appropriate.

For the empirical analysis, we use two datasets to examine how small and large municipalities issued LB and transferred money to special accounts as well as to check how the fiscal index moved. The obtained result generally shows that only small merged municipalities increase LB issuance and reduce money transfers before their mergers, while their real balance ratio remains the same; large merged municipalities reduce LB issuance. However, in the FY1997–2004 data, although $\beta_{1bond} > 0$ is realized, not $\beta_{2bond} < -(\beta_{1bond}) < 0$ but $0 > \beta_{2bond} > -(\beta_{1bond})$ is observed, which is different from the expected result. This means that large merged municipalities increased their debt in the treatment period, while the increase was not as large as that of small merged municipalities. This is perhaps because the difference in the size of the population between large and small merged municipalities was insufficient for the former to reduce their bond issuance. Table 11 and Table 12 show that the difference in population between them is larger in the FY1997–2003 data than in the FY1997–2004 data. In addition, although $\beta_{2bond} < -(\beta_{1bond}) < 0$ is not obtained from the FY1997–2004 data, we can confirm that LB issuance is larger in small merged municipalities than in large merged municipalities. Thus, this finding largely verifies the results of the theoretical model.

[*42] See Akai & Goto (2018) for more details.

5 Conclusion

This study investigates whether creative accounting tends to be employed before municipal mergers. We build a theoretical model and verify its results by using balanced panel data on Japanese municipalities. The theoretical model shows that only a small municipality employs creative accounting since it has a strong incentive to increase debt because of the fiscal common pool problem. The empirical analyses show that small merged municipalities issue more debt and reduce money transfers to special accounts to hide debt, while their fiscal indexes remain the same thanks to creative accounting.

Although this study thus sheds light on the mechanism of creative accounting caused by municipal mergers, research on creative accounting is scant and several points still need to be solved. Hence, more sophisticated future research is needed.

Appendix A

Appendix A1

The proof of $nd_c^M + d_v^M > (n+1)d^B$ and $d_v^M > d^B$.
(Proof)
Assume $nd_c^M + d_v^M \leq (n+1)d^B$. Under this assumption, we can derive

$$nd_c^M + d_v^M = \frac{n+1}{1+r}(\omega_2 - x_2^M) \leq \frac{n+1}{1+r}(\omega_2 - x_2^B) = (n+1)d^B.$$

This holds if and only if

$$x_2^M \geq x_2^B. \tag{A1}$$

Since the utility function is concave, this can be transformed to

$$(1+r)\delta u'(x_2^M) \leq (1+r)\delta u'(x_2^B).$$

Thus, by using (2) and (5), we can obtain $u'(x_{c1}^M) + u'(x_{v1}^M) \leq u'(x_1^B)$. This means that $u'(x_{c1}^M) < u'(x_1^B)$ and $u'(x_{v1}^M) < u'(x_1^B)$ hold here (See (5).). Therefore, this leads to

$$x_{c1}^M > x_1^B, x_{v1}^M > x_1^B. \tag{A2}$$

Considering the resource constraint of this economy, from (A1) and (A2), we can derive that

$$\begin{aligned}(n+1)(\omega_1 + \frac{1}{1+r}\omega_2) &= nx_{c1}^M + x_{v1}^M + \frac{n+1}{1+r}x_2^M \\ &> (n+1)(x_1^B + \frac{1}{1+r}x_2^B) = (n+1)(\omega_1 + \frac{1}{1+r}\omega_2).\end{aligned}$$

This inequality is obviously wrong since the left- and right-hand sides have to be equal. This is a contradiction. Therefore, $nd_c^M + d_v^M > (n+1)d^B$ holds here. In addition, since $d_c^M < d_v^M$ is already shown, we can derive that

$$(n+1)d_v^M > nd_c^M + d_v^M > (n+1)d^B$$

and $d_v^M > d^B$ can be shown. (Q.E.D.)

Appendix A2

In this section, we show that $d^B < d_c^M$ is not always satisfied and that $d^B > d_c^M$ can be obtained when the city's population n is sufficiently large.

Since $nd_c^M + d_v^M > (n+1)d^B$ is satisfied, $x_2^M < x_2^B$ can be derived (see (A1)). By using this fact, we firstly show that $d_c^M > d^B$ does not always hold. Assuming $d_c^M > d^B$ holds, we can derive that

$$\omega_1 + d_c^M = x_{c1}^M > x_1^B = \omega_1 + d^B$$

and, since the utility function is concave, this is

$$u'(x_{c1}^M) < u'(x_1^B).$$

By substituting (2) and (5), we can obtain

$$\frac{n}{n+1}u'(x_2^M) < u'(x_2^B). \tag{A3}$$

However, since $x_2^M < x_2^B$ always holds and $u'(x_2^M) > u'(x_2^B)$ can be drawn here, the inequality (A3) will not always be satisfied (e.g., consider $n \to \infty$). Therefore, $d_c^M \leq d^B$ can occur.

Next, we show that $d_c^M \leq d^B$ holds if the city's population n is sufficiently large. When the utility function is a natural logarithm function, $u(x_{i\tau}) = \log(x_{i\tau})$, $d_c^M \leq d^B$ is satisfied when $n \geq 1+\delta$. This can be shown as follows:

If $u(x_{i\tau}) = \log(x_{i\tau})$ holds, $u'(x_{i\tau}) = \frac{1}{x_{i\tau}}$ can be obtained. When $d_c^M \leq d^B$ is satisfied, we can derive that

$$\omega_1 + d_c^M = x_{c1}^M \leq x_1^B = \omega_1 + d^B$$

and the concavity of the utility function leads this to

$$u'(x_{c1}^M) \geq u'(x_1^B).$$

By substituting (2) and (6) into this, we derive

$$\begin{aligned} \frac{n}{n+1}u'(x_2^M) &\leq u'(x_2^B) \\ nx_2^B &\leq (n+1)x_2^m. \end{aligned} \tag{A4}$$

From the budget constraint, (2), and (5),

$$\begin{aligned} &(n+1)(\omega_1 + \frac{1}{1+r}\omega_2) = nx_{c1}^M + x_{v1}^M + \frac{n+1}{1+r}x_2^M = \frac{(n+1)(2+\delta)}{(1+r)\delta}x_2^M \\ =&\frac{(n+1)(1+\delta)}{(1+r)\delta}x_2^B = (n+1)(x_1^B + \frac{1}{1+r}x_2^B) = (n+1)(\omega_1 + \frac{1}{1+r}\omega_2). \end{aligned}$$

Therefore, we obtain $x_2^B = x_2^M \frac{\delta+2}{\delta+1}$. By substituting $x_2^B = x_2^M \frac{\delta+2}{\delta+1}$ into (A4) and summarizing, we obtain $n \geq 1+\delta$.

Appendix A3

This section shows that in the restriction case $\frac{\gamma}{2}(d_i - \Delta_i)^2 < 1$ is ensured for the presence of large K.

Total utility in the restriction case is

$$W_i^R = \psi_i u(x_{i1}) - \psi_i K p + \delta \frac{\psi_i}{n+1} V + \mu_i \psi_i (\omega_1 + d_i - x_{i1}). \tag{A5}$$

p follows (8) and V is defined as (3) here.

If $\frac{\gamma}{2}(d_i - \Delta_i)^2 < 1$ holds in the restriction case, from (A5), the total utility of area i is

$$W_i^{R*} \equiv W_i^R(x_{i1}^R, x_{i2}^R, d_i^R),$$

where $(x_{i1}^R, x_{i2}^R, d_i^R)$ follows (1) and (9).

On the contrary, if $\frac{\gamma}{2}(d_i - \Delta_i)^2 \geq 1$ holds in the restriction case, the total utility of area i is

$$W_i^{R**} \equiv W_i^R(x_{i1}^M, x_{i2}^M, d_i^M) = W_i^M(x_{i1}^M, x_{i2}^M, d_i^M) - K,$$

where $(x_{i1}^M, x_{i2}^M, d_i^M)$ follows (1) and (5). This is because $Kp = K$ holds in (A5) and the first-order conditions of this case give us the same result as in (5).

In the restriction case, municipality i decides (x_{i1}, x_{i2}, d_i) and maximizes W_i^R. In such a situation, if K is larger than $\underline{K} \equiv W_i^M - W^{R*}$, municipality i will choose not $(x_{i1}^M, x_{i2}^M, d_i^M)$ but $(x_{i1}^R, x_{i2}^R, d_i^R)$ since $W_i^{R*} > W_i^{R**}$ holds here. Moreover, municipality i does not deviate from choosing $(x_{i1}^R, x_{i2}^R, d_i^R)$ since W_i^{R*} and W_i^{R**} provide the maximum utility when $\frac{\gamma}{2}(d_i - \Delta_i)^2 < 1$ and $\frac{\gamma}{2}(d_i - \Delta_i)^2 \geq 1$, respectively. Therefore, a sufficiently large K ensures that a municipality chooses $(x_{i1}^R, x_{i2}^R, d_i^R)$.

To summarize, in the restriction case, $\frac{\gamma}{2}(d_i - \Delta_i)^2 < 1$ is ensured for the presence of a large K[*43].

Appendix A4

In this section, we show that when a municipality issues more debt than the reference point, the existence of the restriction reduces debt issuance.

(Proof)

With the restriction, the debt level is d_i^R, while the debt level is d_i^M without the restriction. From now, we show $d_i^R < d_i^M$. Assume $d_i^R \geq d_i^M$. Under this condition, we derive that

$$\omega_1 + d_i^R = x_{i1}^R \geq x_{i1}^M = \omega_1 + d_i^M.$$

Therefore, marginal utility is $u'(x_{i1}^R) \leq u'(x_{i1}^M)$ since the utility function is concave. By utilizing (5) and (9), this equation can be transformed into

$$\delta \frac{\psi_i}{n+1}(1+r)u'(x_2^R) + K\gamma(d_i - d^*) \leq \frac{\psi_i}{n+1}(1+r)\delta u'(x_2^M).$$

[*43] Actually, assuming that K is sufficiently large to satisfy $K > \underline{K}$ is natural. This is because a small $K(\leq \underline{K})$ leads to excessive debt issuance as well as in the merger case and it is thus meaningless to be set to prevent excessive debt issuance even though the purpose of K is its prevention.

Since $K\gamma(d_i - d^*) > 0$, this can be reduced to

$$\delta\frac{\psi_i}{n+1}(1+r)u'(x_2^R) < \frac{\psi_i}{n+1}(1+r)\delta u'(x_2^M).$$

Therefore, the scale of x_2 in each case is $x_2^R > x_2^M$. This means

$$\omega_2 - (1+r)d_i^R = x_2^R > x_2^M = \omega_2 - (1+r)d_i^M$$

and we can obtain $d_i^R < d_i^M$. However, this contradicts $d_i^R \geq d_i^M$. Therefore, $d_i^R < d_i^M$ is shown. (Q.E.D.)

Appendix A5

In this section, we prove that higher transparency and a heavier punishment reduce the debt amount and creative accounting more.

(Proof)

From the budget constraint, we obtain $x_{i1} = \omega_1 + d_i$ and $x_2 = \omega_2 - \frac{1+r}{n+1}(nd_c + d_v)$. By substituting them into (9), we can derive

$$u'(\omega_1 + d_i) = \delta\frac{\psi_i}{n+1}(1+r)u'(\omega_2 - \frac{1+r}{n+1}(nd_c + d_v)) + \Gamma(d_i - d^*).$$

$\Gamma \equiv K\gamma(> 0)$ here. The differentiation of d_c and Γ is

$$\begin{aligned} u''(\omega_1 + d_c)dd_c &= \{-\delta(\frac{n}{n+1}(1+r))^2 u''(\omega_2 - \frac{1+r}{n+1}(nd_c + d_v)) + \Gamma\}dd_c + d_c d\Gamma \\ \Leftrightarrow \frac{dd_c}{d\Gamma} &= \frac{d_c}{u''(\omega_1 + d_c) + \delta(\frac{n}{n+1}(1+r))^2 u''(\omega_2 - \frac{1+r}{n+1}(nd_c + d_v)) - \Gamma} < 0. \end{aligned}$$

We can also show $\frac{dd_v}{d\Gamma} < 0$. Since Γ shows the degree of transparency and punishment such as $\Gamma = K\gamma$, higher transparency and a heavier punishment reduce the debt amount more. In addition, since the extent of creative accounting is measured as $d_i - d^*$ in this model, less d_i means that the amount of creative accounting is lower. (Q.E.D.)

Appendix A6

In this section, we show that $d_i^* < d_v < d_c$ and $d_v \leq d^* < d_c$ cannot hold.

(Proof to show that $d_i^* < d_v < d_c$ cannot hold.)

Assume $d_c > d_v$ in the restriction case. Under this condition, we obtain

$$\omega_1 + d_c = x_{c1} \geq x_{v1} = \omega_1 + d_v$$

and the concavity of the utility function leads this to

$$u'(x_{c1}) \leq u'(x_{v1}).$$

By substituting (9), we obtain

$$\delta\frac{n}{n+1}(1+r)u'(x_2) + K\gamma(d_c - d^*) \leq \delta\frac{1}{n+1}(1+r)u'(x_2) + K\gamma(d_v - d^*). \tag{A6}$$

From $\frac{n}{n+1} > \frac{1}{n+1}$ and $d_c > d_v$, (A6) is

$$\delta \frac{n}{n+1}(1+r)u'(x_2) + K\gamma(d_c - d^*) \le \delta \frac{1}{n+1}(1+r)u'(x_2) + K\gamma(d_v - d^*).$$

Since $d_c > d_v$ is assumed here, we obtain

$$\delta \frac{1}{n+1}(1+r)u'(x_2) + K\gamma(d_v - d^*) < \delta \frac{1}{n+1}(1+r)u'(x_2) + K\gamma(d_v - d^*). \tag{A7}$$

However, the left- and right-hand sides of (A7) have to be equal. Thus, (A7) is a contradiction. Therefore, $d_c \le d_v$ holds in the restriction case. (Q.E.D.)
(Proof to show that $d_v \le d^* < d_c$ cannot hold.)
Assume $d_c > d^* \ge d_v$. Under this condition, we obtain

$$\omega_1 + d_c = x_{c1} > x_{v1} = \omega_1 + d_v.$$

Since the utility function is concave, we find

$$u'(x_{c1}) > u'(x_{v1})$$

and, using (9),

$$\delta \frac{n}{n+1}(1+r)u'(x_2) + K\gamma(d_c - d^*) \le \delta \frac{1}{n+1}(1+r)u'(x_2) \tag{A8}$$

should hold. From $\frac{n}{n+1} > \frac{1}{n+1}$ and $K\gamma(d_c - d^*) > 0$, (A8) is a contradiction. Therefore, $d_c > d^* \ge d_v$ does not hold. (Q.E.D.)

Appendix A7

In this section, we extend the model and examine what happens when the reference point d^* is endogenously determined by municipalities in period 0.

We consider that municipalities decide d^* by a negotiation between them in period 0 assuming their utility is higher if they merge. The realized reference point d^* is determined as $d^* = \beta d_c^* + (1-\beta)d_v^*$, where d_i^* is i's desired reference point and $\beta \in (0,1)$ is an exogenous weight that represents bargaining power. The higher β, the higher is the city's bargaining power. Each municipality simultaneously sets d_i^* to maximize i's utility before the negotiation. We assume that the incentive I_{c+v} is sufficiently large that both municipalities decide to participate in the merger. Under these settings, the objective function of municipality i in period 0 is

$$\max_{d_i^*} W_i^R \quad \text{s.t.} \quad W_i^R \ge W_i^B, d^* = \beta d_c^* + (1-\beta)d_v^*, \tag{A9}$$

where the optimal x_{i1}^R, x_2^R, d_i^Rs are determined by (9) and can be denoted as $x_{i1}^R(d^*), x_2^R(d^*), d_i^R(d^*)$. The Lagrangian about (A9) is

$$\hat{W}_i^R \equiv W_i^R + \nu_i(W_i^R - W_i^B).$$

Before solving, we have to obtain the conditions about the differentiations. The total differentiation of (9) is

$$u''(x_{i1}^R)dx_{i1} = \delta\frac{\psi_i}{n+1}(1+r)u''(x_2^R)dx_2 + K\gamma dd_i^R - K\gamma dd^*$$

and we can obtain

$$\begin{cases} \frac{\partial x_{i1}^R}{\partial d^*} = -\frac{K\gamma}{u''(x_{i1}^R)} \\ \frac{\partial x_2^R}{\partial d^*} = \frac{K\gamma}{\gamma\frac{\psi_i}{n+1}(1+r)u''(x_2^R)} \\ \frac{\partial d_i^R}{\partial d^*} = 1 \end{cases}.$$

Furthermore, we can obtain the following differentiation about d_i^*:

$$\begin{cases} \frac{\partial d^*}{\partial d_c^*} = \beta \\ \frac{\partial d^*}{\partial d_v^*} = 1-\beta \end{cases}.$$

Denote $\bar{\beta}_i$ as the variable that shows $\bar{\beta}_c = \beta$ and $\bar{\beta}_v = 1-\beta$. By using the differentiations and this notation, the first-order condition is

$$\begin{aligned} \frac{\partial \hat{W}_i^R}{\partial d_i^*} =& (1-\nu_i)\psi_i\bar{\beta}_i[u'(x_{i1})\frac{\partial x_{i1}^R}{\partial d^*} - K\gamma(d_i^R - d^*)\{\frac{\partial d_i^R}{\partial d^*} - \frac{\partial d^*}{\partial d^*}\} + \\ & \frac{\delta}{n+1}\{\frac{\partial V}{\partial x_2^R}\frac{\partial x_{i2}^R}{\partial d^*} + \frac{\partial V}{\partial d_i^R}\frac{\partial d_i^R}{\partial d^*}\} + \mu_i(\frac{\partial d_i^R}{\partial d^*} - \frac{\partial x_{i1}^R}{\partial d^*})] = 0. \end{aligned}$$

You can substitute $K\gamma = 0$ if $d_i(d^*) < d^*$ is expected here, although this does not affect the result. Since $\frac{\partial V}{\partial x_{i2}^R} = 0$, $\frac{\partial V}{\partial d_i^R} = -(1+r)\psi_i\lambda$, $u'(x_{i1}) = \mu_i$, $u'(x_2) = \lambda$, and $\frac{\partial d_i^R}{\partial d_i^*} = 1$ can be used here, we obtain

$$\begin{aligned} \frac{\partial \hat{W}_i^R}{\partial d_i^*} &= (1-\nu_i)\psi_i\bar{\beta}_i[u'(x_{i1}) - \frac{\delta}{n+1}(1+r)\psi_i\lambda] = 0 \\ \Rightarrow u'(x_{i1}^R) &= \frac{\psi_i}{n+1}(1+r)\delta u'(x_2^R). \end{aligned}$$

This condition corresponds to (5). Therefore, each municipality sets its desired reference point as $d_i^* = d_i^M$[*44]. This may be a surprising result because the village can set a higher d_v^* to escape from the reference point and, although the city can choose a lower d_c^* to reduce its debt, they do not do so. As a result, this condition shows that each municipality has an incentive to set d_i^* as d_i^M. One possible explanation is that if the city sets a lower d_c^*, the realized d^* may become lower than d_c^M, where the city may receive a punishment.

The realized reference point is

$$d^* = \beta d_c^* + (1-\beta)d_v^* = \beta d_c^M + (1-\beta)d_v^M \in (d_c^M, d_v^M).$$

From this, firstly, we can obtain $d_c^M < d^* < d_v^M$. However, the realized debt amount of d_v is d_v^R here, since the village's debt issuance above d^* should be d_v^R[*45]. As a result, $d_c^M < d^* < d_v^R$ holds in the equilibrium. Summarizing this, we get the following proposition.

[*44] For the second-order condition, we can check $\frac{\partial^2 \hat{W}_i^R}{\partial d_i^{*2}} < 0$ using $\frac{\partial x_{i1}^R}{\partial d^*}$ and $\frac{\partial x_2^R}{\partial d^*}$.

[*45] Firstly, since $d^* < d_v^M$ always holds and the village has an incentive to adopt creative accounting, the objective function will not be (4) and d_v^M is not obtained in the equilibrium. Secondly, assume $d^* \geq d_v^R$. Under this assumption,

Proposition 7 In the restriction case in which the reference point is endogenously set, the village, a municipality with a smaller population, always uses creative accounting, whereas the city, a municipality with a larger population, does not.

The village has a stronger incentive to issue debt than does the city. However, the more debt is above the reference point, which is determined in the negotiation, the higher is the penalty. This leads the village to employ creative accounting to hide its debt and not be punished.

Appendix B

Appendix B1

This appendix explains how we create the dataset. In this study, we focus on the municipalities that are not merged yet since we investigate the strategic behaviors of pre-merged municipalities and the conditions of municipalities change dramatically. In addition, retaining data on municipalities to be merged in the latest year of the dataset creates an unbalanced panel and may lead to poor estimators. Therefore, we omit data on merged municipalities.

Figure 6, Figure 7, and Figure 8 are here.

Appendix B2

Table 11 and Table 12 show the summary statistics for the merged cities and merged villages and towns.

Table 11 and Table 12 are here.

Appendix B3

Table 13 and Table 14 show the results of the placebo test. In this test, we utilize the data from FY1997 to FY2001 for the FY1997–2003 data and from FY1997 to FY2002 for the FY1997–2004 data. As a pseudo-post-treatment period, we use FY2000 and FY2001 for the FY1997–2003 data and use FY2001 and FY2002 for the FY1997–2004 data. The results confirm the parallel trend assumption.

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there is no need to use creative accounting and the objective function will be (4). By solving (4), the solution will be d_v^M and the village prefers d_v^M to d_v^R as the debt amount. This means that d_v^R will not be realized in the equilibrium but d_v^M will. However, this is a contradiction, as d_v^M is not obtained in the equilibrium. Therefore, not $d^* < d_v^m$ but $d^* < d_v^R$ will be realized.

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Figures and tables

Figure1　Three-tier government system

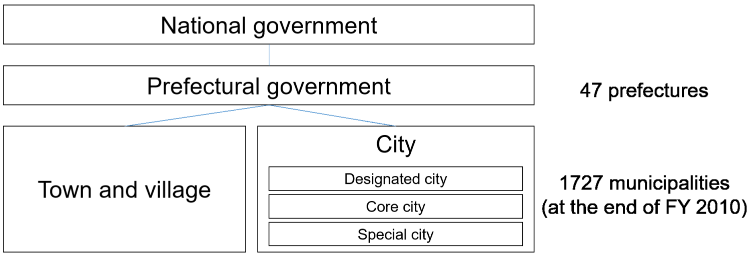
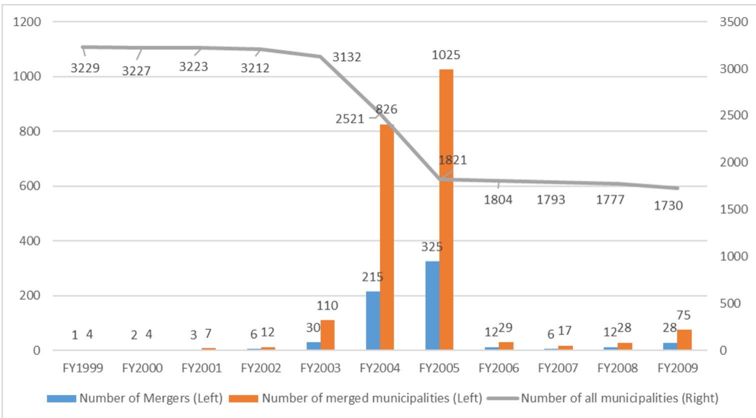
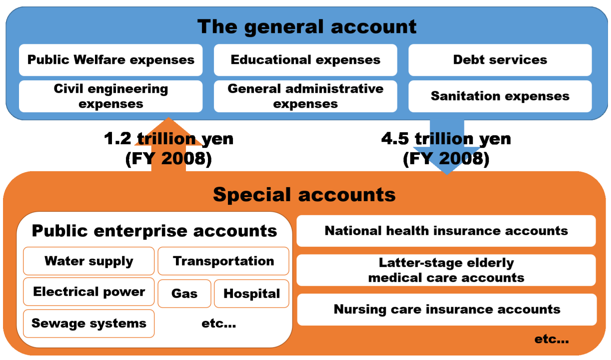


Figure2　Transition in the number of municipalities



Data from Ministry of Internal affairs and Communications (2016)

Figure3　Money transfer between the general account and special accounts



Data from Ministry of Internal affairs and Communications (2010)

Figure4　Trend of the 1997–2003 data

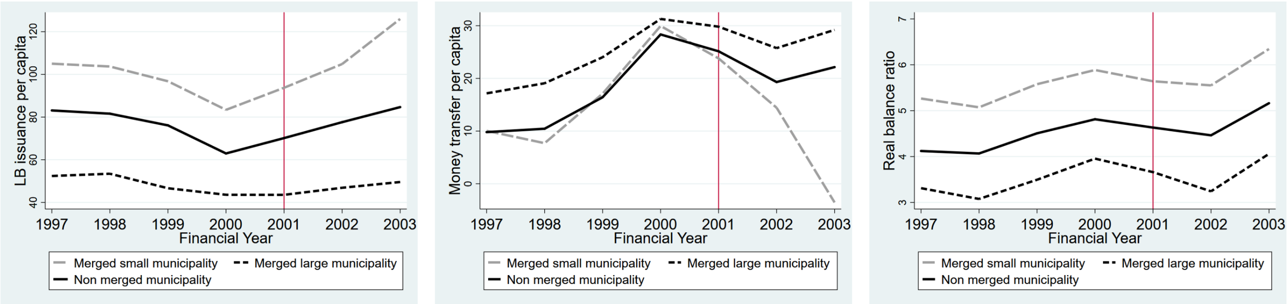


Figure5　Trend of the 1997–2004 data

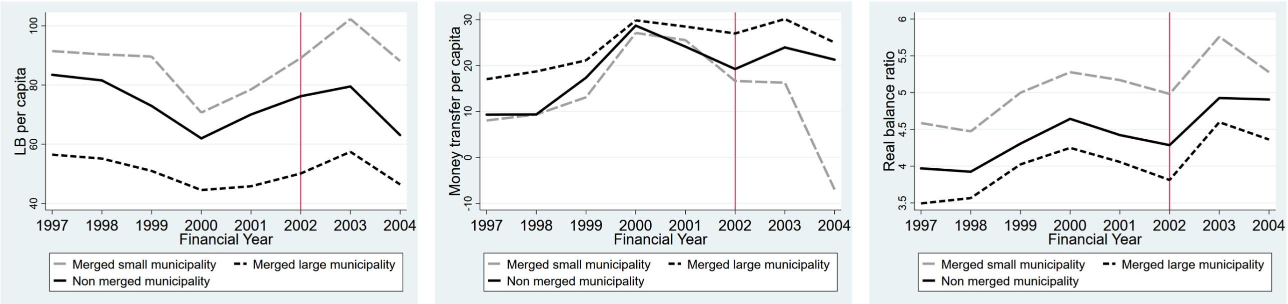


Figure6　Composition of the municipalities data of 1997–2003

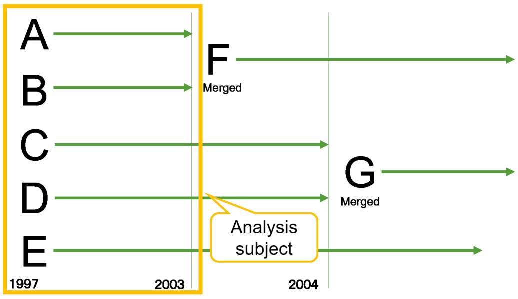


Figure7　Composition of the municipalities data of 1997–2004

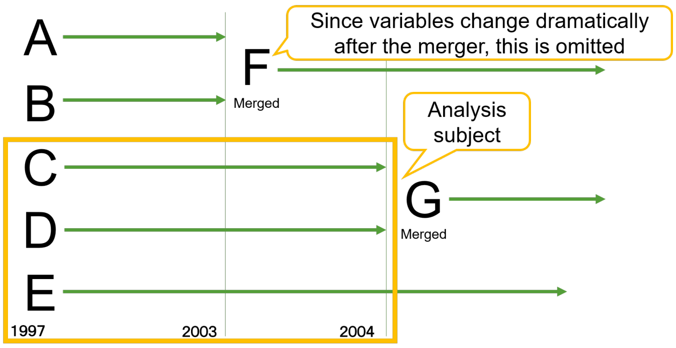


Figure8 The timings and stages of Japanese municipal mergers in the 2000s

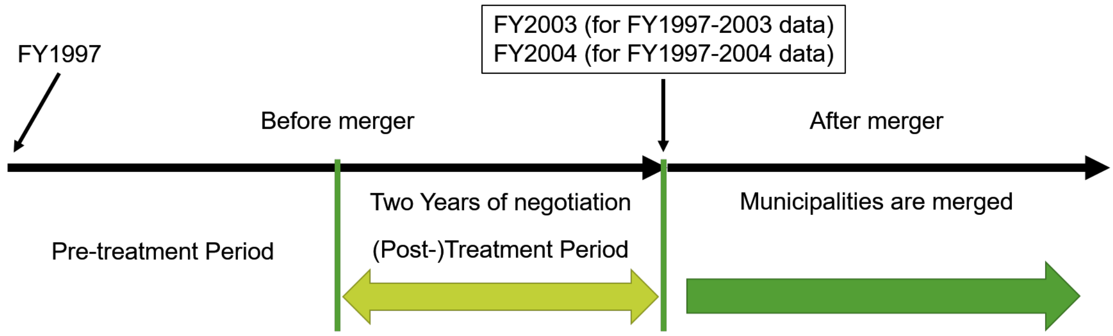


Table1 Expected results of the empirical hypotheses

Dependent variables	LB issuance per capita	Money transfer per capita	Real balance ratio
Expected trends	Decrease(for large)/Increase(for small)	0 / Decrease	Increase or 0 / 0
Expected coefficients	$\beta_{2bond} < -(\beta_{1bond}) < 0$	$\beta_{2transfer} = -(\beta_{1transfer}) > 0$	$\beta_{2real} \geq \beta_{1real} = 0$

Table2 Summary statistics by group (3067 municipalities data of 1997–2003)

	Control			Treatment		
Variable	N	SD	mean	N	SD	mean
LB issuance per capita	15,771	89.58	76.59	5,705	93.80	95.89
Money transfer per capita	15,771	48.34	18.80	5,705	68.03	15.44
Real balance ratio	15,771	3.269	4.538	5,705	3.801	5.388
LT	15,771	2.514e+07	6.082e+06	5,705	9.084e+06	2.757e+06
LAT	15,771	5.697e+06	2.925e+06	5,705	2.902e+06	2.442e+06
Area	15,771	15,131	12,489	5,705	7,666	9,127
Pop	15,771	121,781	40,621	5,705	60,359	22,135
Designated city	15,771	0.0697	0.00488	5,705	0	0
Core city	15,771	0.0600	0.00361	5,705	0.0686	0.00473
Special city	15,771	0.0715	0.00514	5,705	0.0591	0.00351
City	15,771	0.428	0.241	5,705	0.335	0.129
Large	15,771	0	0	5,705	0.390	0.187

Table3 Summary statistics by group (2249 municipalities data of 1997–2004)

	Control			Treatment		
Variable	N	SD	mean	N	SD	mean
LB issuance per capita	9,984	89.92	73.60	8,008	83.76	78.26
Money transfer per capita	9,984	51.40	19.18	8,008	47.31	16.43
Real balance ratio	9,984	3.406	4.423	8,008	3.636	4.801
LT	9,984	3.105e+07	7.962e+06	8,008	1.357e+07	3.658e+06
LAT	9,984	6.614e+06	3.085e+06	8,008	4.109e+06	2.602e+06
Area	9,984	17,502	13,782	8,008	11,341	10,880
Pop	9,984	147,821	51,293	8,008	77,079	27,487
Designated city	9,984	0.0846	0.00721	8,008	0.0447	0.00200
Core city	9,984	0.0647	0.00421	8,008	0.0687	0.00475
Special city	9,984	0.0880	0.00781	8,008	0.0660	0.00437
City	9,984	0.458	0.299	8,008	0.376	0.170
Large	9,984	0	0	8,008	0.435	0.253

Table4 The source and scale of the data

Variables	Source	Scale
LB issuance per capita	The Survey of Local Public Finance	Thousand Yen
Money transfer per capita	The Survey of Local Public Finance	Thousand Yen
Real balance ratio	The Survey of Local Public Finance	
Population	System of Social and Demographic Statistics	
Area	System of Social and Demographic Statistics	Hectare
LAT (lag)	The Survey of Local Public Finance	Thousand Yen
LT (lag)	The Survey of Local Public Finance	Thousand Yen
Designated city	System of Social and Demographic Statistics	
Core city	System of Social and Demographic Statistics	
Special city	System of Social and Demographic Statistics	
City	System of Social and Demographic Statistics	

Table5 The empirical results for the FY1997–2003 data

	(1)OLS	(2)OLS	(3)OLS
Variable	LB issuance per capita	Money transfer per capita	Real balance ratio
Post×Treatment	13.63***	-16.39***	0.101
	(3.538)	(3.044)	(0.152)
Post×Treatment×Large	-19.22***	16.43***	-0.318
	(4.270)	(3.239)	(0.248)
Treatment	18.88***	2.430**	0.659***
	(1.918)	(1.228)	(0.0701)
Large	-19.74***	-1.286	-0.549***
	(2.401)	(1.354)	(0.120)
Post	6.485***	2.954***	0.360***
	(1.403)	(0.860)	(0.0577)
Designated city	123.9***	-28.12***	3.628***
	(13.29)	(5.770)	(0.823)
Core city	33.89***	-3.884**	1.239***
	(6.310)	(1.652)	(0.294)
Special city	25.03***	6.681***	-0.664**
	(3.274)	(1.093)	(0.296)
City	-35.62***	7.786***	-1.135***
	(1.011)	(0.513)	(0.0640)
Area	0.00150***	0.000263***	-3.65e-05***
	(5.47e-05)	(3.59e-05)	(1.45e-06)
Pop	-0.000431***	-6.44e-05***	7.68e-07
	(2.73e-05)	(8.92e-06)	(1.10e-06)
LT	1.51e-06***	2.88e-07***	-7.61e-09
	(1.33e-07)	(4.22e-08)	(4.64e-09)
LAT	1.32e-07	7.06e-07***	-7.32e-08***
	(1.42e-07)	(9.49e-08)	(1.04e-08)
Constant	71.65***	11.71***	5.375***
	(1.144)	(0.628)	(0.0411)
Observations	21,476	21,476	21,476
R-squared	0.122	0.017	0.089

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table6 The empirical results for the FY1997–2004 data

Variable	(1)OLS LB issuance per capita	(2)OLS Money transfer per capita	(3)OLS Real balance ratio
Post×Treatment	12.94***	-16.73***	-0.0389
	(2.979)	(2.051)	(0.164)
Post×Treatment×Large	-9.318***	16.11***	-0.0393
	(2.979)	(1.978)	(0.218)
Treatment	2.979	2.638**	0.0612
	(1.859)	(1.032)	(0.0626)
Large	-15.68***	-0.567	0.104
	(1.841)	(1.014)	(0.0869)
Post	-2.597	4.893***	0.621***
	(1.746)	(1.275)	(0.0817)
Designated city	128.7***	-24.22***	2.960***
	(12.00)	(4.488)	(0.784)
Core city	29.99***	-5.157***	1.454***
	(5.825)	(1.769)	(0.326)
Special city	28.76***	6.453***	-0.600**
	(3.060)	(1.036)	(0.298)
City	-31.56***	8.291***	-1.224***
	(1.067)	(0.593)	(0.0713)
Area	0.00137***	0.000329***	-3.97e-05***
	(5.11e-05)	(2.84e-05)	(1.42e-06)
Pop	-0.000413***	-4.16e-05***	8.38e-07
	(2.39e-05)	(7.72e-06)	(1.09e-06)
LT	1.41e-06***	2.15e-07***	-7.16e-09*
	(1.10e-07)	(3.36e-08)	(4.29e-09)
LAT	2.72e-07**	4.51e-07***	-6.49e-08***
	(1.28e-07)	(6.93e-08)	(9.84e-09)
Constant	72.67***	10.12***	5.373***
	(1.408)	(0.754)	(0.0500)
Observations	17,992	17,992	17,992
R-squared	0.125	0.027	0.085

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table7 The empirical results for the FY1997–2003 data without the control variables

	(1)OLS	(2)OLS	(3)OLS
Variable	LB issuance per capita	Money transfer per capita	Real balance ratio
Post×Treatment	13.74***	-16.29***	0.0936
	(3.656)	(3.042)	(0.154)
Post×Treatment×Large	-17.62***	16.38***	-0.286
	(4.318)	(3.246)	(0.255)
Treatment	24.72***	-0.724	1.169***
	(1.898)	(1.170)	(0.0686)
Large	-45.08***	6.141***	-1.773***
	(2.269)	(1.286)	(0.117)
Post	6.359***	2.692***	0.385***
	(1.495)	(0.861)	(0.0602)
Constant	74.77***	18.03***	4.428***
	(0.872)	(0.452)	(0.0298)
Observations	21,476	21,476	21,476
R-squared	0.024	0.006	0.026

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table8 The empirical results for the FY1997–2004 data without the control variables

	(1)OLS	(2)OLS	(3)OLS
Variable	LB issuance per capita	Money transfer per capita	Real balance ratio
Post×Treatment	13.32***	-16.59***	-0.0534
	(3.145)	(2.065)	(0.167)
Post×Treatment×Large	-8.826***	15.86***	0.00905
	(3.072)	(1.994)	(0.224)
Treatment	10.60***	-1.388	0.656***
	(1.802)	(0.963)	(0.0607)
Large	-34.46***	7.070***	-1.047***
	(1.744)	(0.931)	(0.0813)
Post	-3.078*	4.600***	0.658***
	(1.856)	(1.282)	(0.0858)
Constant	74.37***	18.03***	4.259***
	(1.091)	(0.568)	(0.0373)
Observations	17,992	17,992	17,992
R-squared	0.017	0.010	0.016

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table9 The empirical results for the FY1997–2003 data with the fixed effects

	(1)FE	(2)FE	(3)FE
Variable	LB issuance per capita	Money transfer per capita	Real balance ratio
Post×Treatment	12.63***	-15.05***	0.0654
	(2.336)	(2.538)	(0.113)
Post×Treatment×Large	-18.39***	15.04***	-0.284
	(2.876)	(2.748)	(0.213)
Post	5.580***	3.032***	0.411***
	(1.024)	(0.780)	(0.0403)
Core city	-0.806	3.012***	-0.0223
	(1.650)	(1.004)	(0.172)
Special city	-1.685	3.551***	-0.0991
	(1.862)	(0.881)	(0.181)
Area	-0.00472***	0.00574***	1.43e-05
	(0.00119)	(0.00163)	(4.87e-05)
Pop	-0.000459***	-7.34e-05	1.36e-05
	(0.000139)	(8.65e-05)	(9.47e-06)
LT	-7.28e-07***	3.22e-07***	3.50e-08***
	(2.64e-07)	(1.24e-07)	(9.28e-09)
LAT	-2.42e-06***	1.06e-06***	5.51e-08***
	(4.80e-07)	(3.11e-07)	(1.39e-08)
Constant	161.0***	-50.62***	3.658***
	(14.78)	(19.25)	(0.649)
Observations	21,476	21,476	21,476
R-squared	0.010	0.006	0.011
Number of Code	3,068	3,068	3,068

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table10 The empirical results for the FY1997–2004 data with the fixed effects

Variable	(1)FE LB issuance per capita	(2)FE Money transfer per capita	(3)FE Real balance ratio
Post×Treatment	12.96***	-15.22***	-0.0780
	(2.145)	(1.801)	(0.129)
Post×Treatment×Large	-10.12***	14.98***	0.118
	(2.362)	(1.841)	(0.187)
Post	-3.966***	4.955***	0.718***
	(1.259)	(1.267)	(0.0629)
Core city	2.101	2.510***	0.0156
	(1.854)	(0.902)	(0.233)
Special city	2.716	3.985***	0.0233
	(1.911)	(0.939)	(0.183)
Area	-0.00581***	0.00646***	5.06e-05
	(0.00208)	(0.00224)	(7.24e-05)
Pop	-0.000199	-9.83e-06	3.07e-05***
	(0.000132)	(6.54e-05)	(1.09e-05)
LT	-3.76e-07**	2.06e-07**	5.69e-08***
	(1.85e-07)	(1.00e-07)	(1.49e-08)
LAT	-1.62e-06***	7.27e-07***	9.47e-08***
	(3.44e-07)	(2.41e-07)	(2.70e-08)
Constant	163.0***	-65.56**	1.920*
	(26.49)	(28.21)	(1.026)
Observations	17,992	17,992	17,992
R-squared	0.004	0.008	0.021
Number of Code	2,249	2,249	2,249

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table11 Summary statistics by large and small merged municipalities (FY1997–2003 data)

	Small			Large		
Variable	N	SD	mean	N	SD	mean
LB issuance per capita	4,641	99.78	105.2	1,064	41.29	55.12
Money transfer per capita	4,641	74.67	13.42	1,064	20.04	24.24
Real balance ratio	4,641	3.897	5.734	1,064	2.902	3.880
LT	4,641	902,496	790,005	1,064	1.867e+07	1.134e+07
LAT	4,641	654,243	1.772e+06	1,064	5.728e+06	5.365e+06
Area	4,641	6,380	7,777	1,064	9,746	15,015
Pop	4,641	7,221	8,288	1,064	121,791	82,533
Designated city	4,641	0	0	1,064	0	0
Core city	4,641	0	0	1,064	0.157	0.0254
Special city	4,641	0	0	1,064	0.136	0.0188
City	4,641	0.128	0.0166	1,064	0.486	0.618
Large	4,641	0	0	1,064	0	1

Table12 Summary statistics by large and small merged municipalities (FY1997–2004 data)

	Small			Large		
Variable	N	SD	mean	N	SD	mean
Money transfer per capita	5,984	53.07	13.64	2,024	20.95	24.68
LB issuance per capita	5,984	92.65	87.52	2,024	37.06	50.86
Real balance ratio	5,984	3.826	5.066	2,024	2.863	4.020
LT	5,984	1.145e+06	1.027e+06	2,024	2.539e+07	1.143e+07
LAT	5,984	777,239	1.857e+06	2,024	7.651e+06	4.806e+06
Area	5,984	9,819	9,119	2,024	13,698	16,087
Pop	5,984	9,089	10,457	2,024	140,985	77,836
Designated city	5,984	0	0	2,024	0.0886	0.00791
Core city	5,984	0	0	2,024	0.136	0.0188
Special city	5,984	0	0	2,024	0.130	0.0173
City	5,984	0.161	0.0267	2,024	0.491	0.593
Large	5,984	0	0	2,024	0	1

Table13 Results of the placebo test for the FY1997–2003 data

Variable	(1) OLS Bond per capita	(2)OLS Money transfer per capita	(3)OLS Real balance ratio
Pseudo-Post×Treatment	-0.0788	1.208	-0.0567
	(3.634)	(2.004)	(0.142)
Pseudo-Post×Treatment×Large	4.586	-5.351	0.123
	(4.561)	(4.093)	(0.235)
Treatment	19.33***	1.605	0.718***
	(2.599)	(1.295)	(0.0855)
Large	-23.05***	1.829	-0.691***
	(3.156)	(2.667)	(0.145)
Pseudo-Post	-13.60***	14.50***	0.506***
	(1.616)	(0.957)	(0.0596)
Designated city	103.5***	-25.71*	3.287***
	(14.57)	(13.66)	(0.897)
Core city	33.03***	-9.264	0.940*
	(10.77)	(10.37)	(0.495)
Special city	27.74***	-0.296	-1.003*
	(5.843)	(9.563)	(0.516)
City	-34.50***	7.092***	-1.030***
	(1.183)	(1.272)	(0.0713)
Area	0.00151***	0.000241***	-3.53e-05***
	(6.52e-05)	(3.20e-05)	(1.65e-06)
Pop	-0.000425***	-6.45e-05***	1.00e-06
	(2.87e-05)	(2.21e-05)	(1.18e-06)
LT	1.47e-06***	2.98e-07***	-8.46e-09*
	(1.38e-07)	(9.50e-08)	(4.90e-09)
LAT	3.03e-07*	5.99e-07***	-6.79e-08***
	(1.62e-07)	(1.66e-07)	(1.13e-08)
Constant	76.24***	6.622***	5.114***
	(1.491)	(0.759)	(0.0477)
Observations	15,340	15,340	15,340
R-squared	0.114	0.031	0.092

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Pseudo-Post takes one if FY2000 and FY2001 and zero otherwise. The data are from FY1997 to FY2001.

Table14 Results of the placebo test for FY1997–2004 data

Variable	(1) OLS Bond per capita	(2)OLS Money transfer per capita	(3)OLS Real balance ratio
Pseudo-Post×Treatment	0.0172	1.134	0.0968
	(3.439)	(1.901)	(0.126)
Pseudo-Post×Treatment×Large	-3.060	-0.458	-0.151
	(3.348)	(3.008)	(0.167)
Treatment	3.155	1.906*	0.0675
	(2.361)	(1.141)	(0.0755)
Large	-14.88***	0.254	0.0763
	(2.376)	(1.835)	(0.104)
Pseudo-Post	-1.719	5.623***	0.138*
	(2.132)	(1.168)	(0.0772)
Designated city	115.8***	-25.27**	2.758***
	(13.54)	(12.65)	(0.824)
Core city	22.92***	-7.898	1.354***
	(8.715)	(8.605)	(0.434)
Special city	26.48***	2.952	-0.799*
	(4.557)	(6.981)	(0.439)
City	-31.68***	7.644***	-1.148***
	(1.267)	(1.266)	(0.0766)
Area	0.00147***	0.000300***	-3.75e-05***
	(6.17e-05)	(2.92e-05)	(1.52e-06)
Pop	-0.000424***	-4.42e-05**	1.20e-06
	(2.65e-05)	(2.04e-05)	(1.14e-06)
LT	1.44e-06***	2.26e-07***	-8.91e-09**
	(1.20e-07)	(8.54e-08)	(4.43e-09)
LAT	3.27e-07**	4.62e-07***	-5.87e-08***
	(1.47e-07)	(1.48e-07)	(1.01e-08)
Constant	72.15***	8.874***	5.252***
	(1.697)	(0.846)	(0.0566)
Observations	13,494	13,494	13,494
R-squared	0.120	0.022	0.088

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Pseudo-Post takes one if FY2001 and FY2002 and zero otherwise. The data are from FY1997 to FY2002.