

Verification of Asymmetric Cost Behavior in Merged Local Public Enterprises

Shohei Nagasawa

Graduate School of Social Sciences, Department of Business Administration

Tokyo Metropolitan University, Japan

Japanese Association of Management Accounting, Japanese Cost Accounting Association, and Japanese Accounting Association

E-mail: nagasawa-shohei@ed.tmu.ac.jp

Abstract

In this study, the author verifies how the cost behavior of Japanese local public enterprises changes before and after municipal amalgamations, and also clarifies the effect of the amalgamation of municipalities on their cost management. While it is expected that merged public organizations acquire advantages (i.e., synergy effects and economies of scale) through expanding the organization size and increasing management resources, these factors affect resource adjustment costs upon the amalgamations, which influence cost behavior. In order to confirm the effect of amalgamations on resource adjustment costs, the author analyzes a panel of 17,049 financial data points from 1999 to 2013 and finds that sticky costs were strengthened after municipal amalgamation. Thus, the administrative capability of resource adjustment declined after municipal amalgamations. The results of this study do not suggest that synergy effects or scale advantages arise in post-merged local public enterprises. These results may be due to three main factors: the possibility that expanding the organization size may increase the inefficiency of the functional organizational structure; the growing scale of management resources may increase committed capacity costs; and the institutional restriction, that public service must be provided even if unprofitable, may be affected from the viewpoint of public interest as a specific problem of public organization.

Keywords

Local public enterprises, Amalgamation, Sticky costs, Anti-sticky costs, Adjustment costs

(1) Introduction

This study examines how public organization administrators manage their costs through municipal amalgamations with a focus on the change in cost behavior as a method for verifying cost management.

Cost behavior is affected by a variety of fac-

tors, such as changes in the external environment, and management decisions. For this reason, it is important to understand cost behavior when managing costs. In traditional studies on cost behavior, changes in cost and activity levels are explained in a linear and symmetric function. Also, in terms of cost

classification, costs consist of fixed and variable costs. However, the capacity costs-related studies have a different perspective from their traditional counterparts. They also confirm that a non-linear relationship appears between costs, which includes the adjustment of management resources and activity levels (Anderson et al., 2003). In other words, an asymmetric cost behavior appears between an increase and decrease in activity. Anderson et al. (2003) coined the term “sticky costs” (or “cost stickiness”) for the phenomenon in which the cost reduction rate when activity falls is smaller than the cost increase rate when activity rises. These studies look at changes in cost behavior from the perspective of capacity costs, including changes in management resources (Noreen and Soderstrom, 1997).

One of the factors that cause sticky costs is the influence of resource adjustment costs (e.g., Anderson et al., 2003; Banker et al., 2013; Günther et al., 2014). Resource adjustment costs are generated when management resources are adjusted to match the activity level. Günther et al. 2014 organized and described the relationship between holding costs and adjustment costs based on the prior cost stickiness literature. In terms of human resources, for example, when activity increases, the costs of hiring and training new employees are incurred; conversely, dismissing employees involves compensation costs, such as retirement allowances according to legal requirements. In terms of material resources, for example, when the facilities or equipment are integrated by mergers, these events may incur disposal expenses, relocation expenses, and repair expenses.

One of the greatest fluctuations in timing of management resources is an event of mergers

and acquisitions (M&A) (Jang et al. 2016). M&A is expected to bring the economies of scale effect of gaining a competitive advantage by acquiring the capabilities of the external organization and converting them to internal resources (Vermeulen and Barkema, 2001). Synergy effects may also be contemplated with the acquisition of the management resources and capacity of the other company following a merger (Capron, 1999; Graebner et al., 2010).

However, few cases of mergers exhibit the expected effect (King et al., 2004). After a merger, the improvement of financial indicators is confirmed in the short term, but a negative effect on innovation is reported then the new organization cannot achieve the competitiveness of long-term companies (Hitt et al., 1991). In the research on empirical cost behavior, Sepasi and Hassani (2015) pointed out that sticky costs are strengthened in the case of both large organization size and large scale of management resources, rather than small ones. Therefore, the firm size is one of the things that can affect cost stickiness. In the case of M&A, Jang et al. (2016) indicated that the association between cost stickiness and synergies could be a negative effect. Especially, the scale of tangible assets also affects sticky costs more negatively after mergers.

In general, municipal amalgamations are also expected to provide the benefits of scale and synergy effects. Furthermore, it is thought that municipal amalgamations can provide efficient and effective public services. From this point of view, the verification of the efficiency of services and the effect of fiscal reduction has been carried out in the fields of public finance and public economics. The various studies in these fields can be categorized according to three claims: those that find

amalgamation effects, those that do not find amalgamation effects, and those that explain that the effect is limited. In other words, these studies have not reached a conclusion on whether the amalgamations of municipalities are effective or not.

Therefore, in this study, the author intends to verify the effects of municipal amalgamations focusing on cost behavior, namely, whether the administrators in merged municipalities manage their costs to improve efficiency or effectiveness from the viewpoint of cost management in comparison with pre-amalgamation costs. At the same time, it means to clarify how the cost behavior fluctuates due to resource adjustment costs changes by amalgamations.

As the research subject, this study focuses on local public enterprises (LPEs) in Japan as representative municipalities. Since LPEs adopt the same accounting methods as for-profit enterprises, they are suitable for analyzing public organizations using existing empirical research methods for cost behavior. Furthermore, the management of LPEs is also integrated as part of municipal amalgamations. Under LPE law, LPEs are considered a part of municipal organizations. However, from the viewpoint of business management, the mayors generally give management authority to the LPEs' administrators so that they can manage their LPEs independently from municipalities. LPEs generally provide services, such as water services, and receive service charges. Therefore the LPE administrators have to manage based only on their service charges without depending on taxes from municipalities.

Therefore, by analyzing LPEs, it is possible to understand not only public organizations' cost behavior, but also the changes in cost

management due to municipal amalgamations.

The article proceeds as follows. Section 2 discusses the characteristics of LPEs and the effect of municipal amalgamations. Section 3 presents a review of the literature on public organization cost behavior and develops the research hypotheses. Section 4 describes the research methodology, including the sample data, the variable measures, and the models. Section 5 presents and discusses the results. Finally, Section 6 concludes with a discussion of the limitations of this study and suggestions for future research.

(2) Characteristics of LPEs and Effects of Municipal Amalgamations

1. Characteristics of LPEs

LPEs in Japan deal with functions, such as the water supply, industrial water supply, sewer, automobile transportation, railways, electricity, gas, and hospitals, and each municipality deals independently with its own businesses. These services can be provided not only by LPEs, but also by commercial enterprises. However, before starting such businesses, government approval and authorization are required, since these services are critical necessities for living. In other words, LPEs provide public goods and services based on public interest and operate mainly in the areas where commercial enterprises do not do business because they are not profitable or they need to large investment (Oshima, 1971).

The organizational forms of LPEs have some unique characteristics. Since a LPE is an internal bureau of a municipal organization, it is not completely independent from a municipality under the law. However, LPEs have their own business administrators apart

from the mayors who are the heads of the municipalities. Therefore, administrators manage LPE businesses independently from municipalities. This business system is intended to allow LPE administrators to make quick and flexible cost management decisions since their services should be provided efficiently and effectively (Kawarata, 2005). Additionally, LPEs' settlements and budgets are also separate from those of municipalities. Thus, LPEs have to continue to provide stable services to residents based only on the service charges without depending on taxes from municipalities. On the other hand, LPEs are not fully independent from municipalities because the management of the LPE administrator must be monitored by the local parliament and the mayor to ensure that the public services are provided safely and continuously. For this reason, LPE administrators cannot make important management decisions on their own but rather must get approval from the mayors and local parliament. In other words, the mayor and councilors who are elected as representatives oversee the state of LPE management. LPE administrators have their own stakeholders, and their main purpose is to maintain their businesses efficiently and effectively; they are different from commercial enterprises, whose main objective is the maximization of profit (Eldenburger et al., 2004; Holzhaecker et al., 2015).

Next, since this study focuses on resource adjustment costs, it is important to understand the features of LPE management resources. Among LPEs' material resources, the ratio of fixed assets to net assets and that of fixed assets to equity capital are both high.

Hence, the material resources of a LPE might mainly consist of high committed capacity costs. Furthermore, a LPE may be in charge of social infrastructure facilities, such as dams and piping for the water supply or rolling stocks and rails for transportation, which require large-scale equipment. Thus, given these ratios, one of the problems for LPE management is a low fixed asset turnover rate¹. Therefore, LPE administrators should manage in the direction of reducing the idle capacity in material resources in order to manage their LPEs more efficiently. They also have to reduce their equipment repair or maintenance costs.

Finally, it is important to understand the features of human resources in the context of LPEs. LPE employees are guaranteed almost the same status as that of public officers. By law, LPE administrators must continue to employ their workers. For this reason, even if the business situation deteriorates, the dismissal of LPE employees is difficult for LPE administrators. Even after municipal amalgamations, LPE administrators are obliged to continue the employment of both their own employees and the employees of the merged LPE. Thus, LPE human resources have a high committed capacity cost and a low managed capacity cost.

2. Effects of Municipal Amalgamations

In Japan, since 1999 and with a peak in 2004, many amalgamations have been conducted among municipalities. As a result, the number of municipalities decreased from 3,232 organizations in 1999 to 1,719 organiza-

rate is 0.11% (Local Public Enterprise Yearbook No. 61).

¹ The fixed asset component ratio is 91.6%, the fixed ratio is 146.7%, and the fixed asset turnover

tions in 2013. Since LPEs are one of the internal divisions of municipalities, they were also integrated as part of municipal amalgamations. The number of LPEs decreased from 11,712 businesses in 1999 to 8,703 businesses in 2013².

The nationwide increase in municipal amalgamations occurred for three reasons: the pressure for efficiency improvements caused by the long-term downturn of the Japanese economy, the influence of the population decline and the expansion of the depopulated area, and the requirement of effective and high-quality public services. First, the long-term downturn of the Japanese economy caused the deterioration of the financial status of municipalities. For this reason, small- and medium-sized municipalities had to strengthen their financial basis through amalgamations; specifically, municipal amalgamations aimed to achieve economies of scale. Second, due to the expansion of the depopulated area, demand for public services changed significantly. In other words, in order to secure profitability, municipalities had to provide services to wider areas. Thus, amalgamations also aimed to achieve economies of size. Finally, municipalities were expected to share knowledge through amalgamations and enhance synergy effects. Moreover, when municipal amalgamations were carried out, subsidies from the Japanese government increased, which created incentives for stakeholders in municipalities.

The Japanese government reported the effectiveness of municipal amalgamations in 2008 and 2010. These reports stated that the

effects of municipal amalgamations appeared in the expansion of the financial scale, the reduction of service costs, and improvements in the quality of service. However, academic studies in the field of public economics, public administration, and public finance argue for various opinions regarding the effects of municipal amalgamations, and their evidences are mixed (Liner, 1992; Edwards and Xiao, 2009; Drew et al., 2017). These studies mainly focus on the correlation between municipal amalgamations and municipal expenditures. So far, no previous studies have focused on changes in cost management due to municipal amalgamations. In other words, this study is the first to verify the effects of municipal amalgamations from the viewpoint of the management accounting field.

(3) Prior Research and Development of Hypotheses

In recent years, empirical research on cost behavior has focused on capacity costs. In other words, researchers are focusing on cost fluctuations, including changes in management resources (Banker and Byzalov, 2014). Anderson et al. (2003) clarify that the relationship between costs and activities is not proportional or linear, and they call this phenomenon sticky costs. Resource adjustment costs are one of the factors that cause sticky costs. For example, the costs of human resource development, such as training costs or the costs for dismissal compensation, need to be adjusted depending on the activity level. Similarly, in the case of material resources, maintenance costs or repair costs for facilities

² There are several reasons why the rate of decrease in the number of municipalities due to the amalgamation differs from the rate of decrease in the number of local public enterprises.

One of the major reasons is that some local public enterprises started their operations after the amalgamation of municipalities.

or equipment need to be adjusted according to the increase or decrease in the activity level. In situations where resource adjustments must be made in accordance with changes in activities, adjustment costs, as represented by agency costs, are generated.

These studies on cost fluctuations mainly target commercial companies and exclude public services, such as utilities, since the authors argue that public services adopt a different accounting system (Shust and Weiss, 2014), and that cost behavior analysis models only apply to competitive business fields and not to public service fields (Weiss, 2010). For this reason, only a few studies focus on public organizations. However, these studies insist that there is evidence of asymmetric cost behavior among public organizations (Yasukata et al. 2011; Bradbury and Scott, 2014; Cohen et al., 2014; Holzacker et al., 2015). Bradbury and Scott (2014) analyze the cost behavior of New Zealand municipalities, Cohen et al. (2014) focus on Greek municipalities, and Holzacker et al. (2015) target German hospitals. These studies also find evidence of sticky costs in public organizations, and they argue that sticky costs originate from the mission of public interest. In other words, public organization administrators are pressured by institutional constraints and have to serve constantly even if doing so causes a reduction in revenue. Thus, sticky costs are strengthened among public organizations (Holzacker et al., 2015). Since LPEs in Japan are also public organizations, my prediction is that sticky costs will strongly appear for merged LPEs.

Furthermore, Sepasi and Hassani (2015) clarify that sticky costs are stronger for large organizations than for smaller organizations, and they argue that organization size affects cost management. Specifically, managers of

large organizations have to get agreement from many stakeholders before making cost management decisions. In other words, resource adjustment costs are greater for large organizations than they are for small ones. In the case of M&A, sticky costs also increase after the amalgamations, since resource adjustment costs are increased by amalgamations (Jang et al., 2016).

Thus, first of all, I focus on the change in organization size. When the organization scale is expanded due to an amalgamation, LPE administrators should have more difficulty adjusting to their management resources. In the case of merging LPEs, because the scale of the organization becomes larger after the amalgamation, the sticky costs should be stronger after an amalgamation than they are before an amalgamation.

Hypothesis 1: Sticky costs after amalgamation are stronger than before in merged local public enterprises.

The merging LPE should provide more effective and efficiency through an improvement in its management resources with the passage of time after the amalgamation. However, amalgamations have the expected effect in few cases (King et al., 2004). After an amalgamation, the improvement of financial indicators is generally confirmed in the short term, but amalgamations may negatively influence innovation, and companies cannot acquire a competitive advantage in the long term (Hitt et al., 1991). There is concern that an amalgamation makes it difficult to make long-term adjustments to cost management.

Hypothesis H2: Sticky costs increase as time passes after an amalgamation.

Next, as management resources are consolidated and eliminated by the amalgamations, the author needs to consider the impact of resource adjustment costs on cost behavior. Dalla Via and Perego (2014), and Sepasi and Hassani (2015) describe the relationship between the scale of the organization and the change in resource adjustment costs, and clarify the evidence of stronger sticky costs on larger organizations than on smaller organizations. One factor in highly sticky costs in large organizations is committed capacity cost. The larger scale of the organization creates less flexibility in adjusting to material resource costs and human resource costs. Therefore, when management resources are greater, the committed capacity cost increases, and managers have more difficulty in flexibly adjusting to material resources or human resources costs. In addition, Jang et al. (2016) focus on the M&A of enterprises and clarify that the sticky costs will also increase for enterprises with a large scale of material resources. LPEs should integrate their facilities and equipment through amalgamations, so the scale of material resources should expand. Therefore, as material resources increase, resource adjustment costs increase, and sticky costs are strengthened.

Hypothesis H3: The influence of the scale of material resources may affect cost behavior by strengthening sticky costs as compared with those before the amalgamation.

Next, I examine the influence on the cost behavior accompanying the adjustment of human resources. Prior researches confirm that human resources adjustment costs act to strengthen sticky costs by using the labor

costs or the number of staff as a proxy for human resources (Anderson et al., 2003; Banker et al., 2013). One reason for these high sticky costs is worker protection laws. Namely, worker protection laws require managers to retain human resources even when sales decrease since they cannot dismiss employees easily in order to protect workers. Therefore, human resources adjustment costs act to increase sticky costs (Banker et al., 2013). Thus, sticky costs strengthen as the scale of an organization expands, since adjusting to human resources costs becomes more difficult for managers (Sepasi and Hassani, 2015).

In the case of LPEs, worker protection laws also make it difficult for management to dismiss employees easily. If the LPE administrators dismiss employees, then there are still huge resource adjustment costs, such as an increase in compensation costs or the prolongation of adjustment by litigation. For this reason, amalgamations of LPEs may increase the committed capacity cost of human resources, so LPE administrators will likely lose the flexibility of cost adjustment.

Hypothesis H4: The influence of the scale of human resources may affect cost behavior by strengthening sticky costs as compared with those before the amalgamation.

(4) Research Method

1. Sample Selection

To verify these hypotheses, I run a panel data analysis. The analysis period begins in fiscal year 1999, when municipal amalgamations started, and ends in fiscal year 2013, giving a time period of fifteen years.

Analytical samples were collected from the "Local Public Enterprise Yearbook" edited by

the Local Public Finance Bureau of the Ministry of Internal Affairs and Communications. This yearbook lists the financial data for eight industries (i.e., the water supply, industrial water supply, transportation, gas, hospital, sewerage, marketing, and parking lot businesses) for each municipality. The financial data used for the analysis are classified as per year, municipality, and service. Additionally, data from each profit and loss statement and balance sheet were used. Also, operating revenue, operating expenses, total assets, and labor costs were used as proxy indices for activity amount, cost, material resources, and human resources, respectively.

The collected data represent 17,471 firm-years. To control for the effect of outliers, I delete the top and bottom 1% of observations. The final sample data includes data for 17,049 firm-years. Therefore, the panel data is unbalanced. Looking at the breakdown of the sample data, the sample of pre-merger LPEs includes 7,888 data points, and 9,161 data points post-merger.

2. Method of Analysis

Anderson et al. (2003) develop the empirical research method of cost behavior based on a Cobb-Douglas type cost function. They also clarify asymmetric cost behavior using their models. This model has been adopted in many subsequent studies (Banker and Byzalov, 2014). Therefore, hypothesis 1 of this study will also be examined with this model.

Model I

$$\ln\left(\frac{Cost_{i,t}}{Cost_{i,t-1}}\right) = \beta_0 + \beta_1 * \ln\left(\frac{Revenue_{i,t}}{Revenue_{i,t-1}}\right) + \beta_2 * Decrease_Dummy_{i,t} + \beta_3 * \ln\left(\frac{Revenue_{i,t}}{Revenue_{i,t-1}}\right) + \varepsilon_{i,t}$$

LPEs' operating expenses are substituted for Cost (hereafter "C" in the models). Additionally, Revenue takes operating revenue (hereafter "R" in the models) as a proxy for the activity amount. Decrease_Dummy (hereafter "Dec_D" in the models) is a dummy variable that takes the value of 1 when operating revenue decreases between the t period and the previous period, and 0 otherwise. All the data are natural logarithms ("ln" in the models).

Using this model, it can be confirmed that when operating revenue increases by 1%, the cost changes by the value indicated by β_1 . Additionally, because of the Decrease Dummy, when operating revenue decreases by 1%, the cost decreases by $\beta_1 + \beta_2$, whereas β_2 indicates the value of the sticky or anti-sticky costs. Therefore, when there is cost stickiness, β_2 will be negative, and when cost stickiness is not present (anti-sticky costs), β_2 will be positive. If the sticky costs are strengthened after the amalgamation, $\beta_1 > \beta_1 + \beta_2$ should hold true.

In order to verify hypothesis 2, it is necessary to capture the changes in cost behavior due to the passage of time after amalgamations. Holzhaecker et al. (2015) adopt a time trend dummy to reflect changes over time, so the same method is used in this analysis.

Model II

$$\ln\left(\frac{C_{i,t}}{C_{i,t-1}}\right) = \beta_0 + \beta_1 * \ln\left(\frac{R_{i,t}}{R_{i,t-1}}\right) + \beta_2 * Dec_D_{i,t} * \ln\left(\frac{R_{i,t}}{R_{i,t-1}}\right) + \beta_3 * timet_trend + \beta_4 * Dec_D_{i,t} * \ln\left(\frac{R_{i,t}}{R_{i,t-1}}\right) * timet_trend + \varepsilon_{i,t}$$

In this model, *time_trend* is 1 in the year of the amalgamation and increases by 1 in the subsequent years. The use of the time trend can show the change in the degree of sticky costs over time. The other variables are the same as in model I.

Next, in order to verify hypotheses 3 and 4, total assets are used as a proxy for material resources, and labor costs are used as a proxy for human resources. Therefore, the author verifies the effect on cost behavior using Model III.

Model III

$$\begin{aligned} \ln\left(\frac{C_{i,t}}{C_{i,t-1}}\right) = & \beta_0 + \beta_1 * \ln\left(\frac{R_{i,t}}{R_{i,t-1}}\right) + \beta_2 \\ & * Dec_{D_{i,t}} * \ln\left(\frac{R_{i,t}}{R_{i,t-1}}\right) \\ & + \sum_{m=3}^4 \beta_m Resources_{i,t,m} \\ & + \sum_{n=5}^6 \beta_n Resources_{i,t,n} \\ & * Dec_{D_{i,t}} * \ln\left(\frac{R_{i,t}}{R_{i,t-1}}\right) + \varepsilon_{i,t} \end{aligned}$$

Resources represent total assets divided by operating revenue and labor costs divided by operating revenue, respectively. The other variables are the same as in model I.

(5) Analysis Result

1. Descriptive Statistics

Table 1 shows the descriptive statistics. The first rows are the total sample, the second rows are the sample of pre-amalgamated LPEs, and the third rows are the sample of

post-amalgamated LPEs respectively. Each row includes data on cost (operating expenses), revenue (operating revenue), total assets, labor costs, and the natural logarithms of each of these items. The revenue, total assets, and labor costs include 0 yen as the minimum value, which means that the sample includes financial data for the periods of preparation for start-up and preparation for discontinuance. Some studies exclude such data points, but in this study, the author includes them in the analysis³, taking into consideration the influence of survival bias when they are excluded.

Based on the descriptive statistics, there are three notable characteristics of the data for the whole sample. First is that the operating balances of the LPEs are not in deficit on average, which confirms the soundness of the LPEs' financial conditions. Second is that the scale of the total assets is large on average. LPEs mainly operate in the field of living infrastructure businesses, such as water supply and transportation, so they require a large scale of facilities. Third, the differences can illustrate between LPEs before and after merging sample. After amalgamations, each descriptive statistic increases.

The descriptive statistics as a whole do not indicate any serious defect points that would affect the subsequent data analysis.

³ For robustness check, similar results were obtained when analyzing excluding 0 yen sample.

Table 1. Descriptive statistics

(*Scale: 1,000Yen)

		Mean	Standard deviation	Minimum	Lower quartile	Median	Upper quartile	Maximum	Number
Total	Cost*	2,024,249	4,015,146	896	199,571	569,507	1,828,052	49,143,211	17,049
	Revenue*	2,134,425	4,409,089	0	208,549	596,456	1,921,935	53,791,218	
	Assets*	19,209,685	65,935,863	77	2,011,582	4,824,222	13,375,953	1,026,677,522	
	Labor costs*	653,136	1,482,802	0	32,005	88,453	469,751	19,582,768	
	ln C t/C t-1	0.0073	0.0824	-0.4951	-0.0265	0.0035	0.0344	0.5015	
	ln R t/R t-1	0.0043	0.0749	-0.5630	-0.0221	-0.0012	0.0236	0.5567	
	ln A t/R t	2.1570	1.2003	-4.4576	1.4875	2.2847	2.7311	10.4686	
	ln L t/R t	-1.6390	0.8651	-9.4928	-2.1810	-1.7226	-0.9029	4.8141	
Before amalgamation	Cost*	1,494,557	3,380,642	1,677	153,665	333,526	1,087,361	33,444,824	7,888
	Revenue*	1,617,380	3,863,543	0	175,802	377,021	1,166,930	53,791,218	
	Assets*	13,024,617	57,061,789	25,770	1,557,399	3,028,554	6,946,847	959,833,266	
	Labor costs*	506,584	1,217,538	0	29,388	57,420	330,520	18,609,940	
	ln C t/C t-1	0.0049	0.0832	-0.4829	-0.0312	0.0023	0.0362	0.4994	
	ln R t/R t-1	0.0046	0.0716	-0.5331	-0.0219	-0.0002	0.0243	0.5567	
	ln A t/R t	1.9983	1.0481	-1.2580	1.5540	2.1825	2.5709	7.2456	
	ln L t/R t	-1.5987	0.7529	-6.7757	-2.0658	-1.6674	-1.1141	1.3749	
After amalgamation	Cost*	2,480,336	4,440,046	896	301,784	848,920	2,461,973	49,143,211	9,161
	Revenue*	2,579,622	4,785,358	0	288,278	848,640	2,519,457	47,581,762	
	Assets*	24,535,284	72,294,581	77	3,172,107	7,801,138	18,753,095	1,026,677,522	
	Labor costs*	779,323	1,667,716	0	38,454	129,653	652,896	19,582,768	
	ln C t/C t-1	0.0094	0.0816	-0.4951	-0.0227	0.0043	0.0328	0.5015	
	ln R t/R t-1	0.0041	0.0777	-0.5630	-0.0223	-0.0019	0.0228	0.5522	
	ln A t/R t	2.2940	1.3023	-4.4576	1.3406	2.3696	2.9307	10.4686	
	ln L t/R t	-1.6748	0.9526	-9.4928	-2.3051	-1.7783	-0.7692	4.8141	

2. The results of analysis

In the panel data analysis, three models were used for verification: the pooled model, the fixed effect model, and the random effect model. Then, the author conducts a Hausman test to confirm the result of the most effective model. The results of these analyses using models from I to III are shown in Tables 2 to 4, respectively.

Beginning with the confirmation of the analysis results of model I in Table 2, the Hausman test indicate that the most effective model before the amalgamation is the random effect model, while after the amalgamation, the fixed-effect model is most effective. In the samples before the amalgamation, β_1 is 0.5117 and $\beta_1+\beta_2$ are 0.6788. This result shows that when revenue increases 1%, then costs are increased 0.5177%, conversely the

revenue decreases 1%, then costs are decreased 0.6788%.

Thus, costs changes ratio when revenue increases are larger than 1 when revenue decreases (i.e., anti-sticky costs). Meanwhile, in the samples after the amalgamation, β_1 is 0.6746 and $\beta_1+\beta_2$ are 0.3380, which indicates the occurrence of sticky costs. Therefore, costs changes ratio when revenue increases are smaller than 1 when revenue decreases (i.e., sticky costs). These analysis results suggest that the cost adjustment capabilities decreased after the amalgamation, which supports hypothesis 1.

Table 2. The before / after cost behavior results using Model I

	Before amalgamation	After amalgamation
β_0	0.0058 *** 5.50	0.0000 0.02
β_1	0.5117 *** 30.33	0.6746 *** 44.35
β_2	0.1671 *** 5.58	-0.3366 *** -12.49
Adj.R ²	0.2515	0.2711
N	7,882	9,128
DW	2.2055	2.3959
H-Test p-value	0.6827	0.0000
Model	Random effect	Fixed effect

For β_0 , β_1 , and β_2 , the upper value is the coefficient estimate and the lower value is the t-statistic, *significant at the 10% level, **significant at the 5% level, ***significant at the 1% level, N=Number of observations, Adj.R²= Adjusted R², DW = Durbin-Watson ratio, H-Test = Hausman Test.

Next, the author confirms the change in post-amalgamation cost behavior. The analysis results are shown in Table 3. Changes in sticky costs over time can be confirmed by β_4 and it indicates a negative value of -0.0381. Thus, sticky costs are strengthened as time passes following amalgamations, supporting hypothesis 2.

Table 3. The results of time trend tests using Model II

β_0	0.0039 *** 3.90
β_1	0.6019 *** 49.29
β_2	-0.0238 -0.91
β_3	-0.0006 ** -2.27
β_4	-0.0381 *** -7.82
Adj.R ²	0.2431
N	17,010
DW	2.4361
H-Test p-value	0.0037
Model	Fixed effects

For β_0 , β_1 , β_2 , β_3 , and β_4 , the upper value is the coefficient estimate and the lower value is the t-statistic, *significant at the 10% level, **significant at the 5% level, ***significant at the 1% level, N=Number of observations, Adj.R²= Adjusted R², DW = Durbin-Watson ratio, H-Test = Hausman Test.

Next, the author verifies whether resource adjustment costs with expanding management resources due to the amalgamations affect the amalgamated LPEs' cost behavior using Model III. The results are shown in Table 4.

The author performs a panel data analysis on the samples before and after the amalgamation, and this analysis shows that the fixed effect model is supported both before and after the amalgamation.

Regarding hypothesis 3, the influence of total assets is verified in terms of β_5 . The negative value of -0.0641 before the amalgamation increased to -0.1328 afterwards. This result

reveals that the influence of material resources on sticky costs strengthened after the amalgamation, which supports hypothesis 3.

Lastly, regarding hypothesis 4, the influence of human resources is indicated by β_6 . The negative value of -0.2253 before the amalgamation decreases to -0.0809 afterwards, which confirms that the influence of human resources on sticky costs weakens after the amalgamation. Therefore, hypothesis 4 is not supported.

Table 4. The influence of total assets and labor costs using Model III

	Before amalgamation	After amalgamation
β_0	0.0216 1.26	0.0590 ^{***} 5.51
β_1	0.5180 ^{***} 23.57	0.7214 ^{***} 48.50
β_2	0.0603 1.08	-0.1566 ^{***} -4.43
β_3	0.0373 ^{***} 5.22	-0.0011 -0.29
β_4	0.0550 ^{***} 9.88	0.0331 ^{***} 10.23
β_5	-0.0641 ^{***} -2.76	-0.1328 ^{***} -9.92
β_6	-0.2253 ^{***} -7.21	-0.0809 ^{***} -4.09
Adj.R ²	0.2255	0.3368
N	7,776	8,722
DW	2.6022	2.4313
H-Test p-value	0.0000	0.0000
Model	Fixed effect	Fixed effect

For β_0 to β_6 , the upper value is the coefficient estimate and the lower value is the t-statistic, *significant at the 10% level, **significant at the 5% level, ***significant at the 1% level, N=Number of observations, Adj.R² = Adjusted R², DW = Durbin-Watson ratio, H-Test = Hausman Test.

(6) Conclusion

In this study, the author examines how the cost behavior of Japanese local public enterprises changes before and after municipal amalgamations, focusing on the relationship between amalgamations and resource adjustment costs as a factor in asymmetric cost behavior.

This study finds some interesting results through the comparison between pre- and post-amalgamation. First, sticky costs are revealed in the sample of post-merging LPEs. Hence, amalgamations tended to strengthen sticky costs on average. Second, it is clarified that the post-amalgamation sticky cost is affected by the adjustment costs of material resources. Third, on the contrary, the influence of human resources adjustment costs weakens the post-amalgamation cost behavior. The author supposes that these results are induced from two aspects; organization size and management resources.

First, I argue that it is difficult to make quick cost management decisions when the size of an organization increases due to an amalgamation because of the inefficiency of the functional organizational structure and the influence of the specific approval system (i.e., the “Ringi” system) in Japanese organizations. In public organizations, including LPEs, a functional organizational system is adopted. Then, as the organization scale expands, job divisions are subdivided and become more specialized. The middle-bottom-up type of decision-making is usually adopted in Japan rather than top down decision-making (Ala and Cordeiro, 1999). For this reason, it is necessary to form a consensus among departments for cost management decision-making, which means that it takes a long time to make decisions (Martinsons and Davison, 2007).

Therefore, coordination of each opinion among departments becomes more complicated. In some cases, there is a possibility that opinions may conflict among departments, and, then, agency costs can also arise. As the result of amalgamations, the size of an organization also grows; the author conjectures that, for the cost management of LPEs, decision-making slows and flexible resource adjustment becomes more difficult after amalgamations.

Secondly, the author argues that the adjustment costs of management resources due to municipal amalgamations will have a negative impact on cost management. As the result of amalgamations, with the integration of management resources, subsequent resource adjustment becomes more difficult than it is before the amalgamation.

Especially, material resources acted to strengthen sticky costs after an amalgamation. This result may be due to the inability to abolish facilities or equipment because LPEs cannot discontinue utility service even if it is inefficient or unprofitable; i.e., the responsibility to support people's everyday lives. In other words, in the case of material resources, municipal amalgamations increase the committed capacity costs for LPEs' cost management.

Conversely, regarding human resources, the analysis yielded results which were surprisingly the opposite of the hypothesis. Namely, the human resource influence on the sticky costs tends to be weakened after amalgamation. LPE administrators manage to

flexibly maintain their cost adjustment capabilities in the case of human resources. In other words, the LPEs managed to cover their cost adjustment ability in human resources in order to compensate for the decline in their cost adjustment ability for material resources. One of the reasons for the analysis results is the reduction in recruiting regular staff and instead adopting a large number of non-regular staff to restructure the administration⁴. Although dismissal of regular recruitment is restricted, the author supposes that at the time of employee retirement, they are converting to hire non-regular staff. As the result, administrators could decrease the adjustment costs of human resources and may be able to maintain the flexibility of cost adjustment.

In future research, regarding with organization size, it is necessary to verify the relationship between sticky costs and the internal (in-corporating) effect of the functional organization system using empirical method. Regarding with management resources, more detailed analysis according to the characteristics of management resources is required to identify factors that affect sticky costs. Furthermore, it is necessary to analyze considering different business environments for each industry of LPEs. There is a continuing need for detailed investigations of and research on public organizations' asymmetric cost behavior, especially that of LPEs.

There is a continuing need for detailed investigations of and research on amalgamated LPEs' asymmetric cost behavior.

⁴ The number of non-regular employees increased from 456,000 in 2005 to 599,000 in 2012 according to "The report on temporary and part-time employees of local public officials" (Dec. 27, 2016), by the

Ministry of Internal Affairs and Communications, Japan.

References

- Ala, Mohammad and William P. Cordeiro. (1999). Can We Learn Management Techniques From the Japanese Ringi Process? *Business Forum*, 24(1/2), pp. 22-25.
- Anderson, Mark C., Rajiv D. Banker and Surya N. Janakiraman. (2003). Are Selling, General, and Administrative Costs “Sticky”? *Journal of Accounting Research*, 41(1), pp. 47-63.
- Banker, Rajiv D., Dimitri Byzalov and Lei (Tony) Chen. (2013). Employment Protection Legislation, Adjustment Costs and Cross-country Differences in Cost Behavior. *Journal of Accounting and Economics*, 55(1), pp. 111-127.
- Banker, Rajiv D. and Dimitri Byzalov. (2014). Asymmetric Cost Behavior. *Journal of Management Accounting Research*, 26(2), pp. 43-79.
- Bradbury, Michael and Tom Scott. (2014). Do Managers Understand Asymmetric Cost Behavior? Working paper, Massey University.
- Capron, Laurence. (1999). The Long-term Performance of Horizontal Acquisitions. *Strategic Management Journal*, 20(11), pp. 987-1018.
- Cohen, Sandra, Sotirios Karatzimas and Vassilios-Christos Naoum. (2014). The Sticky Cost Phenomenon at the Local Government Level: Empirical Evidence from Greece. Working paper, Athens University of Economics and Business.
- Dalla Via, Nicola and Paolo M. Perego. (2014). Sticky Cost Behavior: Evidence from Small and Medium Sized Companies. *Accounting and Finance*, 54(3), pp. 753-778.
- Drew, Joseph, Michael A. Kortt and Brian Dollery. (2017). No Aladdin’s Cave in New South Wales? Local Government Amalgamation, Scale Economies, and Data Envelopment Analysis Specification. *Administration & Society*, 49, pp. 1450-1470.
- Edwards, Mary M. and Yu Xiao. (2009). Annexation, Local Government Spending, and the Complicating Role of Density. *Urban Affairs Review*, 45(2), pp. 147-165.
- Eldenburg, Leslie G., Benjamin E. Hermalin, Michael S. Weisbach and Marta Wosinska. (2004). Governance, Performance Objectives and Organizational Form: Evidence from Hospitals. *Journal of Corporate Finance*, 10(4), pp. 527-548.
- Graebner, Melissa E., Kathleen M. Eisenhardt and Philip T. Roundy. (2010). Success and Failure in Technology Acquisitions: Lessons for Buyers and Sellers. *Academy of Management Perspectives*, 24(3), pp. 73-92.
- Günther, Thomas W., Anja Riehl and Richard Rößler. (2014). Cost Stickiness State of the Art of Research and Implications. *Journal of Management Control*, 24(4), pp. 301-318.
- Hitt, Michael A., Robert E. Hoskisson, R. Duane Ireland and Jeffrey S. Harrison. (1991). Effects of Acquisitions on R&D Inputs and Outputs. *Academy of Management Journal*, 34(3), pp. 693-707.
- Holzhaecker, Martin, Ranjani Krishnan and Mattias D. Mahlendorf. (2015). The Impact of Changes in Regulation on Cost Behavior. *Contemporary Accounting Research*, 32(2), pp. 534-566.
- Jang, Youngki. (2016). Asymmetric Cost Behavior and Value Creation in M&A Deals. Social Science Research Network.
- Kawarada, Takashi. (2005). *Local public enterprises accounts theory*. Osaka: Seibunsha.

- King, David R., Dan R. Dalton., Catherine M. Daily and Jeffrey G. Covin. (2004). Meta-analyses of the Post-acquisition Performance: Indications of Unidentified Moderators. *Strategic Management Journal*, 25, pp. 187-200.
- Liner, Gaines H. (1992). Annexation Impact on Municipal Efficiency. *Review of Regional Studies*, 22(1), pp. 75-87.
- Martinsons, Maris G. and Robert M. Davison. (2007). Strategic Decision Making and Support Systems: Comparing American, Japanese and Chinese Management. *Decision Support Systems*, 43(1), pp. 284-300.
- Noreen, Eric and Naomi Soderstrom. (1997). The Accuracy of Proportional Cost Models: Evidence from Hospital Service Departments. *Review of Accounting studies*, 2, pp. 89-114.
- Oshima, Kunio. (1971). *Kokigyo no keieigaku zouhoban* (The Business Administration of the Public [enterprise enlarged edition]). Tokyo: Hakuto-shobo.
- Sepasi, Sahar and Hassan. Hassani. (2015). Study of the Effect of the Firm Size on Costs Stickiness: Evidence from Tehran Stock Exchange. *International Journal of Applied Business and Economic Research*, 13(6), pp. 4143-4159.
- Shust, Efrat and Dan Weiss. (2014). Discussion of Asymmetric Cost Behavior-Sticky Costs; Expenses versus Cash Flows. *Journal of Management Accounting Research*, 26(2), pp. 81-90.
- Vermeulen, Freek and Harry Barkema. (2001). Learning through Acquisitions. *The Academy of Management Journal*, 44(3), pp. 457-476.
- Weiss, Dan. (2010). Cost Behavior and Analysts' Earnings Forecasts. *The Accounting Review*, 85(4), pp. 1441-1471.
- Yasukata, K., T. Kajiwara, Y.Sima, T.Kurusu. (2011). Nonprofit organization / Public organization ' empirical analysis of Cost fluctuation –The Moderate effect of occupancy rate for National Hospital Organization. *Journal of Cost Accounting*, 35(1), pp. 141-150.

(Received: July 31, 2018)

(Accepted: April 15, 2019)