博士（経営学）学位論文

Asymmetric Cost Behavior in Local Public Enterprises: Exploring the Public Interest and Striving for Efficiency

（邦題：地方公営企業における非対称コスト・ビヘイビアに関する研究

－公益性と経済性の両立を目指して－）

令和３年３月

Shohei Nagasawa（長澤 昇平）

東京都立大学 大学院　社会科学研究

Table of Contents

I Introduction

1 Research Background and Motivation

Understanding cost behavior is essential for improving cost management not only for private sector organizations but also for PSOs, especially those that are operated autonomously, such as LPEs, since these PSOs must strike a balance between efficiency and the public interest. In the last few decades, empirical research on asymmetric cost behavior has established a new area of reconsidering cost behavior through the lens of both managerial decisions and capacity costs in the private sector. Using annual firm financial data, Anderson et al. (2003) empirically clarify that the decrease magnitude of costs when activity decreases is smaller than the increase magnitude of costs when activity increases, and they named this phenomenon "cost stickiness". Conversely, Weiss (2010) establish the anti-cost stickiness phenomenon, which occurs when costs decrease more when activity falls than they increase when activity rises. Many management accounting scholars also shed light on managerial decisions in cost management and examine asymmetric cost behavior with decision-based approaches: managers' future expectations, incentives for managers, and managers' psychological biases (Banker et al. 2018). Further studies develop this decision-based approach in interaction with various constraints: those specific to employee protection laws and regulations (e.g., Banker et al. 2006), industry-specific constraints (e.g., Subramaniam and Weidenmier 2016), ownership-specific constraints (e.g., Holzhacker et al. 2015), country-specific constraints (e.g., Calleja et al. 2006), demand conditions (e.g., Banker et al. 2014b), corporate governance (e.g., Chen et al. 2012), capacity utilization (e.g., Balakrishman et al. 2004), technological constraints (Kama and Weiss 2013), agency conflicts (e.g., Brüggen and Zehnder 2014), managerial overconfidence (e.g., Chen et al. 2013), government regulation (e.g., Holzhacker et al. 2015), national culture (e.g., Calleja et al. 2006), earnings targets (e.g., Dierynck et al.

2012), employee intensity, asset intensity, debt interest intensity, and GDP growth (e.g., Anderson et al. 2003). These studies provide substantial evidence of cost behavior worldwide, discover the determinants of asymmetric cost behavior, and discuss the consequences of cost stickiness.

These asymmetric cost behavior studies mainly target commercial companies in the private sector and exclude PSOs such as (local) government or utilities, since they argue that PSOs adopt a different accounting system (Shust and Weiss 2014) and that cost behavior analysis models apply only to competitive business fields and not to public service fields (Weiss 2010). For these reasons, only a few studies that overcome these problems focusing on PSO cost behavior and find evidence of their asymmetric cost behavior with the concept of bureaucratic nature (e.g., Bradbury and Scott 2018; Cohen et al. 2017; Holzhacker et al. 2015; Nagasawa 2018). Namely, these studies attempt to explain the background and theory specific to public organizations and to apply them to the asymmetric cost behavior view. Bradbury and Scott (2018) analyze the cost behavior of New Zealand municipalities, Cohen et al. (2017) focus on Greek municipalities, and Holzhacker et al. (2015) target German government hospitals. These studies also find evidence of sticky costs in public organizations, and they argue that sticky costs originate from these organizations' public-specific missions. Public organization administrators are pressured by various constraints, such as laws, regulations and politicians, including lobbyists, and must continue to serve even if doing so causes a reduction in revenue. Thus, sticky costs are generally higher among public organizations than among private ones (Holzhacker et al. 2015).

However, much less attention has been given to the important implications of sticky costs for other areas (Weiss 2010). Although there are various forms of PSOs other than government organizations, previous studies have focused mainly on (local)

governments in limited counties or specific industries, such as hospitals. To date, neither public enterprises nor Japanese PSOs have been studied and verified. Additionally, these studies carry out analyses using financial data for only a few years, and they do not capture long-term changes in cost behavior. PSOs require stable cost management over long periods because it is necessary to protect the lives of citizens in the future. Therefore, researchers and practitioners need to verify long-term cost behavior, including various historical backgrounds, to be able to respond flexibly in the face of various problems. It is important to accurately evaluate past management decisions and discuss how decisions should be made to achieve sufficient public services with optimal cost management. Further research is also required to develop a decision-based approach that interacts with both internal factors, including agency conflicts, corporate governance, administrator tenures, cost structure, employee intensity, asset intensity, and debt intensity, and external constraints, including political pressure, demographic demand conditions, organization reform (i.e., amalgamation), GDP growth, laws and regulations, etc. The determinants of asymmetric cost behavior are indispensable for better understanding cost management in PSOs.

By providing empirical research results using rich amounts of both fiscal and physical data, the author aims to help fill these gaps and reveal important alternative explanations that provide a new perspective on asymmetric cost behavior. Therefore, the main objective of my doctoral thesis is to verify the asymmetric cost behavior in LPEs, including MEs, to discover the cost driver mechanism and its determinants and then to explore the consequences for future sustainable management. In both public and private sector organizations, and especially in LPEs, cost management is essential since LPEs are pressured to make their management more efficient and effective (Hefetz and Warner 2007). In recent years, LPEs have faced a difficult phase in which it is necessary to meet

the increasing demands for public services due to the increasing aging population and to address the severe financial difficulties in developed countries, including Japan. Thus, knowledge of and skills in cost management based on the asymmetric cost behavior view continue to be required not only academically but also practically.

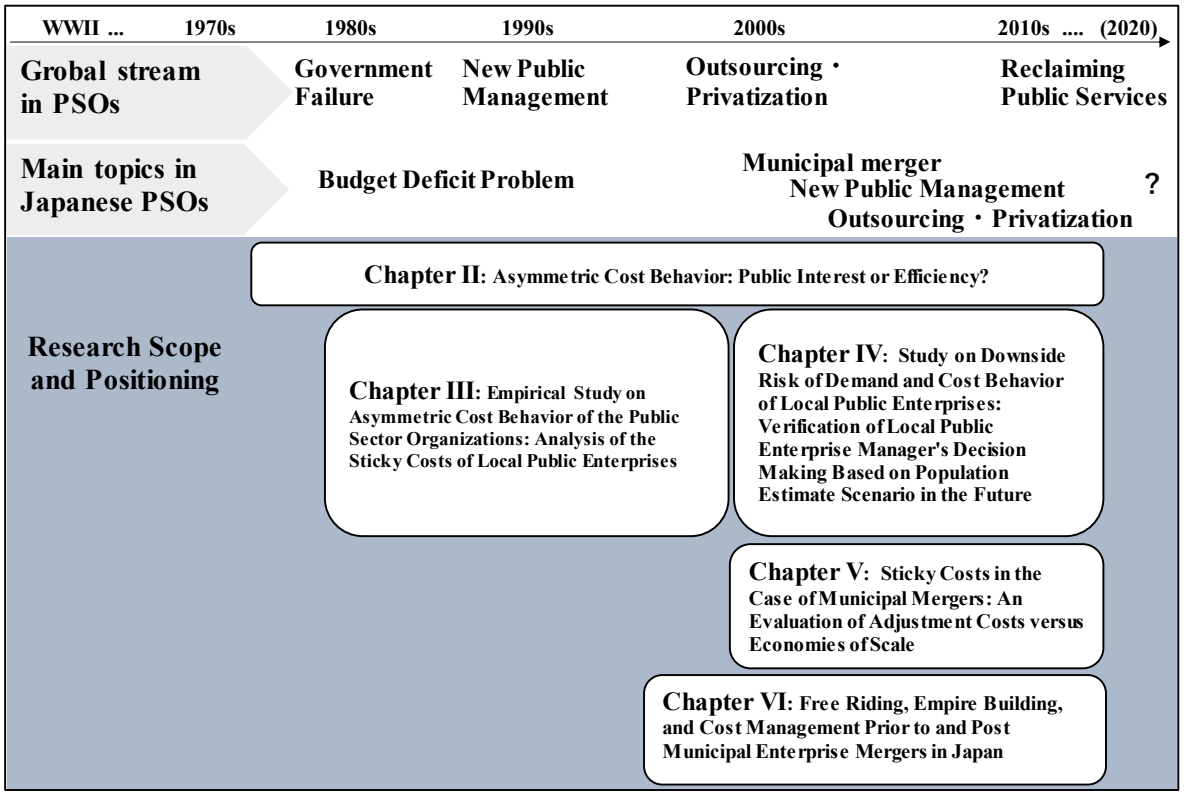
There are two basic reasons to focus on Japanese LPEs as the research object. First, the number of LPEs in Japan is much higher than the number worldwide. In Japan, the Local Public Enterprise Law was enacted in 1948, after World War II, and subsequently, many LPEs were established in every prefecture and municipality. Therefore, it is possible to collect large cross-sectional archival financial data, which makes this empirical research more robust. Second, LPEs have consistently been the main bodies providing public services in Japan over the long term (Ooshima 1971; Kawarata 2005). Therefore, it is possible to collect consistent, long-term time series data. The accounting system for LPEs remained unchanged until 2014. Thus, based on fiscal data from LPEs' financial statements for 40 years from 1974 to 2013, this dissertation can clarify the long-term changes in cost management alongside the domestic trends for each period compared with the global trends. By verifying long-term cost fluctuations and clarifying the cost driver mechanism, this study might provide important implications for administrators of PSOs, especially LPEs, with regard to future public service plans and consensus building among residents.

2 Research Positioning

The doctoral dissertation consists of five studies in the asymmetric cost behavior literature on Japanese LPEs. The five papers are written in the form of separate academic papers for each topic for each era (Figure 1-1). Nevertheless, each paper discusses the different aspects that either explain the contradictory findings or fill the gaps regarding theoretical

development for both the cost management accounting field and the public management field. Focusing on a long-term period of 40 years, the author estimates the characteristics of cost behavior in each period based on the theoretical background.

Figure 1-1. Scope and positioning of each paper in this dissertation



In chapter II, to investigate the research question of whether local public enterprises manage their costs more inefficiently than commercial enterprises, this part of the dissertation is related to establishing evidence on LPEs' asymmetric cost behavior, especially cost stickiness, compared with CEs. The asymmetric cost behavior in LPEs is tested by using both cross-sectional data and time series data. The analysis approach of this paper consists of five steps: analyzing (1) panel data covering 1974 to 2013 (40 years), (2) the change over time, (3) the differences by industry type, (4) the relationship with population changes, and (5) the effect of political influence.

In chapter III, to clarify the research question of whether LPEs' costs robustly show anti-stickiness behavior after decreases in their revenue streams, this part of the

dissertation focuses on the phenomenon of anti-cost stickiness in LPEs. First, to confirm the robustness of the results and to compare the results with the previous literature (Anderson et al. 2003; Hirai and Shiiba 2006) for the same period, the analysis is performed based on 47,920 financial data points for 2,396 LPEs for 20 years from 1979 to 1998. Next, to identify the determinants of anti-sticky costs, the author excludes water supply businesses, which account for approximately 67% of the sample, because of their high impact on the results. It is expected that new findings and knowledge will be created through this analysis.

In chapter IV, to examine the research question “How do LPE administrators adjust their resources in accordance with expectations about the future downside risk of demand?”, this part of the dissertation is related to the interaction between asymmetric cost behavior and the downside risk of demand. Namely, the author aims to discuss the relation between future demographic changes and management decisions in LPEs. To do so, two different approaches are adopted in this chapter. First, the author investigates the relationship between the cost stickiness phenomenon and the market share ratio of each industry. the author hypothesizes that cost adjustments in industries with high market shares are feasible based on accurate demand forecasts, i.e., future population changes. Second, this study clarifies the cost behaviors after 2006 when the population decline becomes apparent. The current study analyzes the 39,803 financial data points for 4,342 LPEs for 15 years from 1999 to 2013. Overall, this part challenges the verification of the drastic changes in asymmetric cost behavior, which manifest as a shift from anti-cost stickiness to cost stickiness around the year 2000.

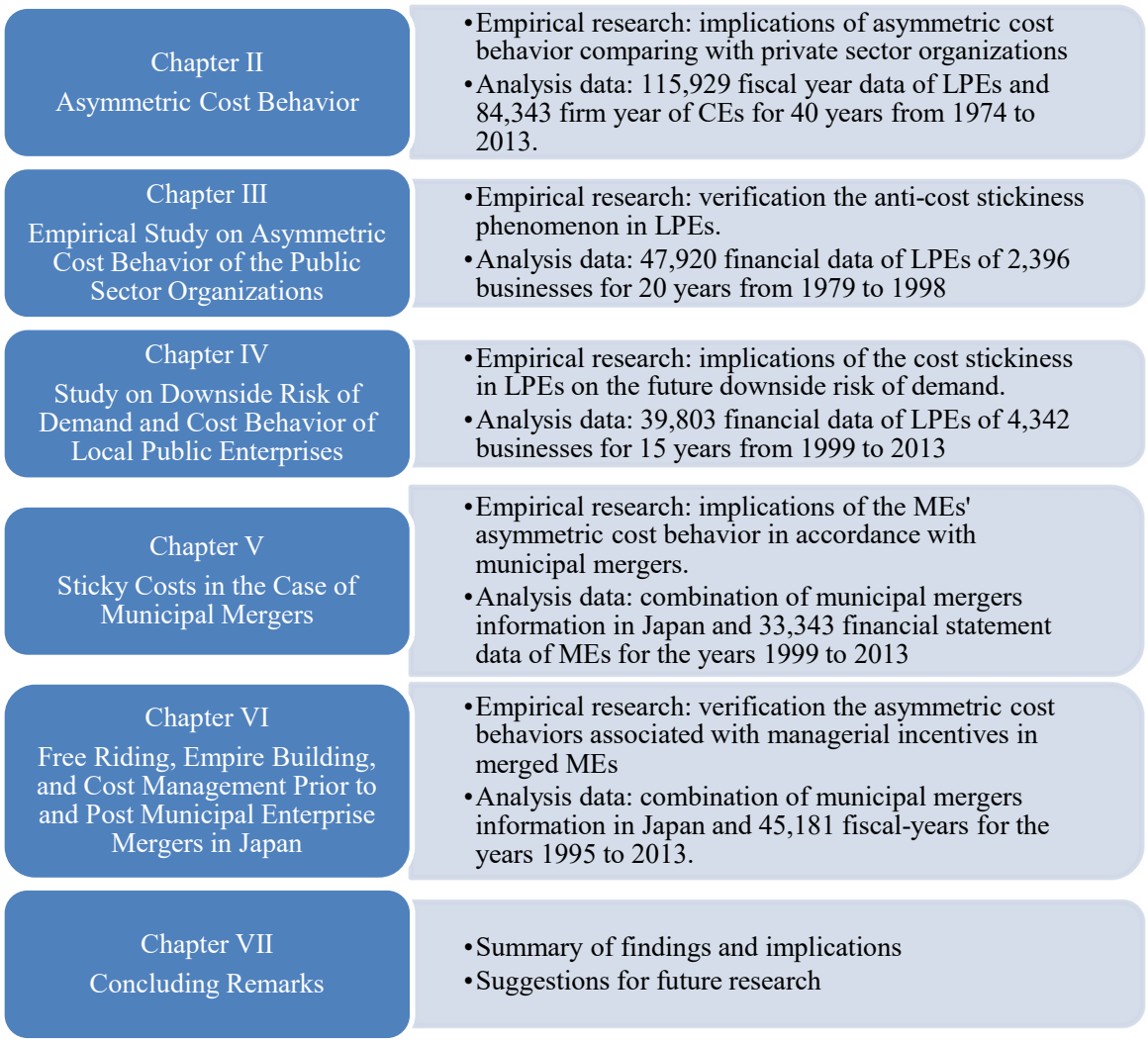
In chapter V, to clarify the research question of whether the positive effect of mergers might overcome the negative effect of adjustment costs in merged municipal enterprises, this part of the dissertation aims to verify the effects of mergers from the

viewpoint of cost management. To test whether merging public organizations acquire advantages (e.g., synergy effects and economies of scale), the current study applies the difference-in-differences approach before and after merging the data on MEs. Focusing on mergers, the author analyzes a panel of 33,343 financial data points from 1999 to 2013. Since municipal mergers also expand the organization size and increase management resources, these factors might affect resource adjustment costs, which influence cost behavior.

In chapter VI, to clarify the research question of whether opportunistic overspending tendencies induce inflexible cost adjustments and encourage bad cost stickiness in merged municipal enterprises, this part of the dissertation tests the asymmetric cost behaviors associated with managerial incentives in merged Japanese MEs, including (1) free riding and (2) empire building. To examine the cost driver mechanism through empirically observed resource adjustment decisions, the current study investigates both merged and nonmerged MEs in Japan with a large number of samples with long-term windows while carefully addressing and assessing the sensitivity of the results. Then, the author analyzes the role of management discretion in resource adjustment decisions, which are especially necessary during the period of PSO mergers. The current study extends the understanding of asymmetric cost behavior in the context of both other PSO types and PSO mergers by identifying each causal link with the premerger free-riding effect and the postmerger empire-building effect.

In summary, this dissertation is organized into long-term windows in accordance with the literature on PSOs' cost management and is structured according to each topic on Japanese LPEs (including MEs) (Figure 1-2).

Figure 1-2. Structure of this dissertation



3 Theoretical Approach

To explain asymmetric cost behavior, many researchers embrace economic theory (e.g., resource adjustment costs theory and agency theory) to formulate their hypotheses. To better understand the consequences of asymmetric cost behavior on management decisions in PSOs, this dissertation first discusses economic concepts, such as adjustment costs and agency costs, with regard to asymmetric cost behavior since the previous theoretical research concepts are fundamentally reliable for PSOs. Furthermore, public economic theoretical concepts and other research field theories are also introduced to illustrate PSO cost behavior in this dissertation. The five papers written in the form of separate academic

papers for each topic of each era are commonly framed in light of the asymmetric cost behavior view; however, each paper also embraces other theoretical applications to corroborate the hypotheses.

In chapter II and III, these parts are framed according to both the asymmetric cost behavior view and institutional theory. Because LPEs are required to behave according to the restrictions of LPE law, LPEs are more vulnerable to institutional pressure than CEs, which aim only to maximize profits. Notably, LPEs have two different normative institutional constraints: (1) efficiency and (2) the public interest (i.e., the responsibility to support people's everyday lives). Sometimes, these normative institutional constraints pressure LPEs; LPEs must provide certain services even if they are unprofitable. To explore whether normative institutional pressure causes LPEs' managerial decisions to be cost inefficient, the asymmetric cost behavior view is adopted as the fundamental perspective.

In chapter IV, this part is organized according to the asymmetric cost behavior view in light of linkages with both the market share level and risk management (demand uncertainty). As an external environmental factor affecting asymmetric cost behavior, Japan became a superaging society in 2005, and PSOs have faced pressure to expand public services for elderly citizens. First, this study assumes that the downside risk of demand leads to a high level of cost stickiness since LPEs must provide certain services even though the number of elderly people who cannot afford to pay for the service increases. Second, the administrators of LPEs, especially in industries with high market shares, might expect precise demand forecasting and could adjust their management resources in accordance with future expectations. The current study hypothesizes that in this case, the administrators of LPEs in industries with high market shares might not need

to keep slack management resources in preparation for demand uncertainty, and the sticky costs would be smaller than those in industries with low market shares.

In chapter V, due to the focus on ME mergers, the topic discussed in this part is derived from the asymmetric cost behavior view with regard to the relationship between mergers and resource adjustment costs. The study utilizes the managerial cost accounting concepts of asymmetric cost behavior through the lens of the economic theories of resource adjustment costs and the resource-based view. To clarify whether merging MEs acquire advantages (e.g., synergy effects and economies of scale) through their mergers or lose flexibility due to expanding the organization size and increasing management resources, the current study examines the asymmetric cost behavior changes in terms of how they interact with the integration process of management resources in mergers; it also adopts the theoretical background of both the resource-based view and resource adjustment costs.

In chapter VI, due to the study's focus on ME mergers, the author utilizes the managerial cost accounting concepts of cost behavior through the lens of the economic theories of both the common pool problem and the agency problem to obtain insights into how the cost management of merged MEs affects (1) administrators' free-rider incentives premerger and (2) administrators' empire-building incentives postmerger. Opportunistic overspending tendencies induce inflexible cost adjustments and encourage bad cost stickiness. To examine whether this perspective applies to PSOs and mergers, the current study tests the asymmetric cost behaviors associated with managerial incentives in merged Japanese municipal enterprises, including (1) free riding and (2) empire building.
Above all, the results of this dissertation provide valuable insights for decision making in LPEs (including MEs) not only from economic theory but also alternative theories that do not underlie the discussed constraints.

4 Methodological Approach

Many asymmetric cost behavior studies use observed cost behavior to learn about the fundamental properties of managerial decisions, thus gaining insights that can be generalized beyond the specific context of cost behavior. To observe cost behavior empirically, Anderson et al. (2003) develop the asymmetric cost behavior model (hereafter ABJ model) and apply the Cobb-Douglas cost function. Theoretically, the cost function is based on the production function and is derived by minimizing total costs given that the firm produces a specified quantity of output. The Cobb-Douglas production function can be written as

$$y = a\prod_{i}^{n} x_i^{\alpha_i} \tag{1.1}$$

where a and α_i are parameters. The coefficient y indicates output, and x_i indicates the input of $_i$. The case of two factors of production, capital, K, and labor, L, for example, is

$$y = aK^{\alpha} L^{\beta} \tag{1.2}$$

where a, α, and β are parameters. Based on the duality approach, the Cobb-Douglas cost function can be converted using a production function. Specifically, the cost function can be written as

$$C = \gamma y^{\frac{1}{(\alpha+\beta)}}\left(P_K^{\alpha} P_L^{\beta}\right) \tag{1.3}$$

where γ is a function of the parameters and the factor P indicates price. To investigate how cost changes over time in response to changes in output, the cost function can be added to time subscripts, t, where the costs are equal to

$$C_t = \gamma_t y_t^{\frac{1}{(\alpha+\beta)}}\left(P_{Kt}^{\alpha} P_{Lt}^{\beta}\right) \tag{1.4}$$

The ABJ model is set based on the assumption that the price is constant in competitive output markets, and factor prices can be considered exogenous, so in theory, regression analysis can be used to estimate the cost function once a functional form is specified.

$$C_t = \gamma_t y_t^{\frac{1}{(\alpha+\beta)}} \tag{1.5}$$

To capture the change in costs, the ABJ model utilizes the equation describing the one-period growth in costs:

$$\frac{C_t}{C_{t-1}} = \frac{\gamma_t}{\gamma_{t-1}} \left(\frac{y_t}{y_{t-1}}\right)^{\frac{1}{(\alpha+\beta)}} \tag{1.6}$$

Taking the natural logarithm of both sides of the equation, Anderson et al. (2003) transform the model to the basic estimating equation:

$$ln\left(\frac{C_t}{C_{t-1}}\right) = \beta_0 + \beta_1 ln\left(\frac{y_t}{y_{t-1}}\right)$$

$$\text{where } \beta_0 = ln\left(\frac{\gamma_t}{\gamma_{t-1}}\right) \text{ and } \beta_1 = \frac{1}{\alpha+\beta} \tag{1.7}$$

Anderson et al. (2003) specify output as an activity, sales revenue, and costs, SG&A costs, as a function of sales revenue. This model begins by calculating the ratios of current SG&A costs (revenues) to previous period SG&A costs (revenues) and transforms these variables by taking natural logarithms. Anderson et al. (2003) conjecture that, because of managerial decisions, the decline in costs when activity falls is not as great as the increase in costs when activity increases (Anderson and Lanen 2007). To test the cost stickiness assumption, they introduce an indicator variable (Decrease_Dummy), which takes a value of one when current period revenues are lower than previous period revenues. This indicator variable is then multiplied by the log of the ratio of current to previous period revenue. Thus, the ABJ model examines asymmetric cost behavior by using the following equation:

$$ln\left(\frac{C_{i,t}}{C_{i,t-1}}\right) = \beta_0 + \beta_1 * ln\left(\frac{R_{i,t}}{R_{i,t-1}}\right) + \beta_2 * Dec\_D_{i,t} * ln\left(\frac{R_{i,t}}{R_{i,t-1}}\right) + \varepsilon_{i,t} \quad (1.8)$$

where *C* and *R* are SG&A costs and sales revenue, respectively, *Dec_D* indicates the dummy variable that takes a value of one when the sales revenue decreases between period *t* and the previous period and a value of zero otherwise.

Notably, using a change model instead of a level model aggravates the discovery of significant effects. In the case of a cost change model, a regression coefficient is significant only if it predicts how the independent variable influences the change in the dependent variable. As Anderson et al. (2003) note, the change in SG&A costs is associated with a 1% change in sales revenue in this model. Therefore, this model can estimate the coefficient β_1 when sales revenue has increased from the previous period and the total coefficients ($\beta_1 + \beta_2$) when sales revenue has declined. Thus, a negative value for β_2 indicates sticky costs.

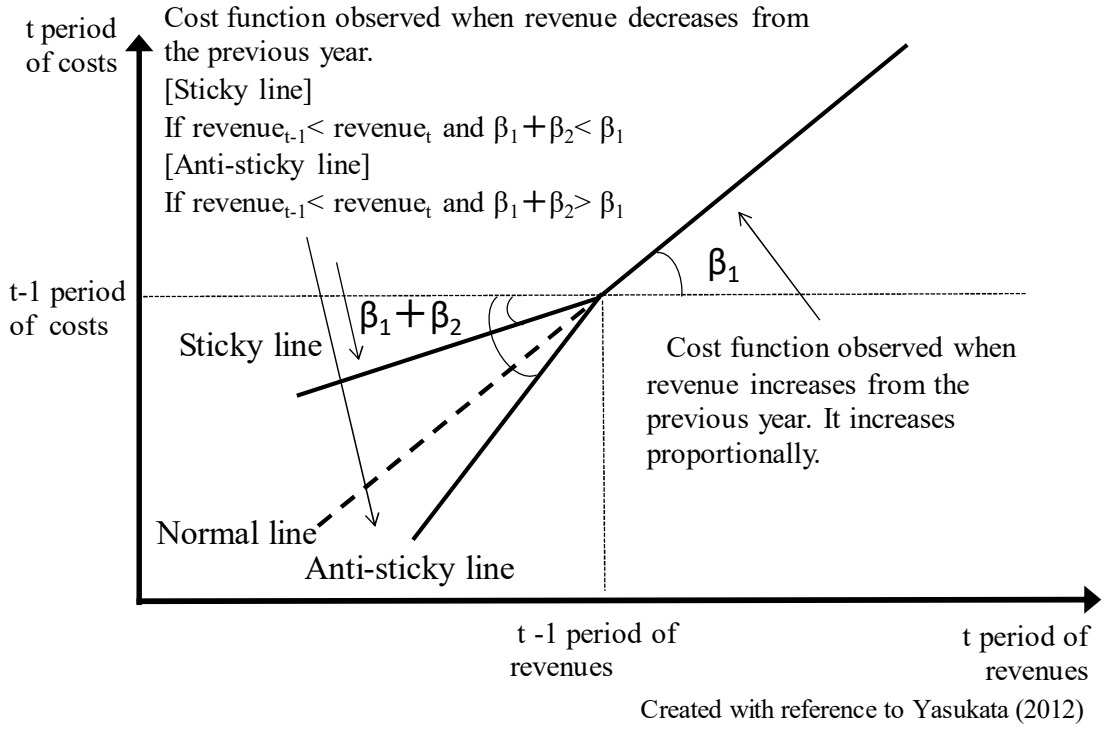
In line with the asymmetric cost behavior model introduced by Anderson et al. (2003), all hypotheses in this dissertation are examined based on panel data using multiple linear regressions, which are referred to and arranged based on the ABJ model. Multilinear regression allows the incorporation of several predictors while maintaining the interpretability of the results. In addition, this approach helps identify how the independent variable affects the change in the dependent variable. Furthermore, the statistical outcome is captured by incorporating interactions in the regression model. The current study adopts an interaction term with the cost stickiness indicator and control variables to estimate the effects on cost behavior (Hoffman 2017).

5 Overview of Cost Stickiness Literature

Asymmetric cost behavior is defined as when the magnitude of a change in costs for increases in activity is different than the magnitude of a change in costs from decreases in

activity. The conventional concept of cost accounting assumes that costs are proportional to the cost drivers; however, this cost-to-activity relationship arises in two forms: sticky costs or anti-sticky costs. The sticky costs are defined as the decrease rate of the cost when the activity decreases being smaller than the increase rate of the cost when the activity increases (Anderson et al. 2003). Conversely, Weiss (2010) found the anti-cost stickiness phenomenon when costs decrease more when the activity falls than when they increase when activity rises (Figure 1-3).

Figure 1-3. Image of sticky costs and anti-sticky costs



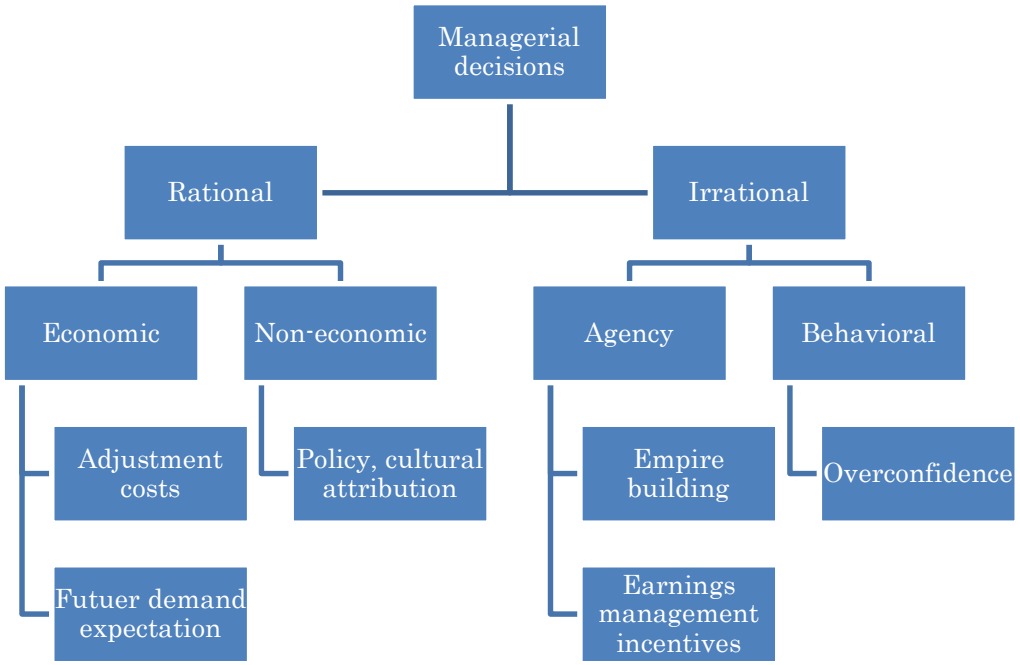
Created with reference to Yasukata (2012)

Many management accounting scholars also shed light on managerial decisions in cost management and examine asymmetric cost behavior with decision-based approaches: managers' future expectations, incentives for managers, and psychological biases for managers (Banker et al. 2018). Further studies develop this decision-based approach in interaction with various constraints. These studies provide substantial evidence of cost behavior worldwide, discover the determinants of asymmetric cost behavior, and discuss the consequences of cost stickiness.

5.1 Theoretical Consideration of Asymmetric Cost Behavior

Refinements of the traditional view recognized that costs are caused by resources and that these resources are decided by managerial discretion as the fundamental driver of costs (e.g., Cooper and Kaplan 1988). Therefore, decision-based approaches have explanatory power for asymmetric cost behavior and give researchers a new consideration of the constraints for cost management through the lens of managerial decisions (Banker et al. 2018). This new concept of cost behavior opens up the mechanism not only for asymmetric cost behavior but also for cost management. The main two streams considerations of theoretical are incurred from the asymmetric cost behavior literature: rational management decisions or irrational management decisions (Figure 1-4).

Figure 1-4. Classification of managerial decisions that affect asymmetric cost behavior



Created with reference to Reimer (2019)

5.1.1 Rational management decisions and asymmetric cost behavior

The theoretical concept of rational management decisions on asymmetric cost behavior is classified into basic economic rationale and noneconomic concepts. Furthermore, the

economic concept provides two concepts: resource adjustment costs and demand forecasts. These two concepts are the proposition modeled in the dynamic factor demand and uncertainty literature (e.g., Treadway 1969). The asymmetric cost behavior literature embraces economic theory to underpin their hypotheses.

First, the theory of resource adjustment costs is explained as a result of a rational deliberate management decision that aims to maximize organizational value for the future. The background of resource adjustment costs is derived from demand uncertainty. Namely, managers must evaluate and decide whether demand decreases temporarily or over the long term. The consequence of rational management action incurs further holding costs rather than cutting costs to adjust the precise activity level. Cost stickiness arises when the assessed future value of resources overcomes the present value of retaining slack resources. These findings consistently reject the traditional model of fixed and variable costs in favor of sticky costs.

The second concept is explained as the result of future expectations for demand forecasts. The theoretical background of this concept illustrates the consequence of managerial discretion for optimistic expectations. Optimist expectations for future demand forecasts arise when managers have primarily positive future expectations; then, they are reluctant to reduce redundant resources during activity decreases and retain unused resources since they predict the demand rebound in the near future and need to use these resources. The seminal paper on asymmetric cost behavior by Anderson et al. (2003) adopts GDP as the proxy for future demand expectations and finds this evidence. Thus, positive future demand expectations that are explained as a psychological aspect of managerial discretion incur further capacity costs as retaining slack resources. Therefore, these concepts advocate that cost stickiness should increase with the magnitude of resource adjustment costs or future optimistic expectations.

Next, the noneconomic concept varies, such as firm policy or cultural attribution. The degree of cost stickiness and anti-stickiness varies predictably with the determinants of managers' resource commitment decisions. Some of the papers in this area seek to test and refine the theory of asymmetric cost behavior by finding good empirical proxies for other determinants. The rich literature on asymmetric cost behavior explains the cost stickiness or the anti-cost stickiness in interaction with unutilized resources as the result of the various constraints based on the social condition or organizational environment. These studies provide not only evidence of asymmetric cost behavior but also their determinants, such as employee protection law regulation, reputation, working morale, and the work climate. Researchers also document the different evidence of sticky costs across the firm level, industry level and country level. The results of asymmetric cost behavior are derived not only from economic reasons. These results demonstrate that a researcher should tailor the theory to match the specific incentives and constraints in his/her research context, recognizing that these economic details can change the predictions. Therefore, researchers are required to deeply consider various constraints with managerial decisions.

5.1.2 Control variables Irrational management decisions and asymmetric cost behavior

Rational managerial decisions are sometimes overturned by the concept of individual profit-maximizing explanations or limited information (e.g., Smith 2015). The seminal paper on asymmetric cost behavior written by Anderson et al. (2003) identifies that the managerial decision made by a self-interested manager positively affects cost stickiness instead of contributing to shareholders. Another paper also takes a closer as important driver of sticky cost behavior associated with earning management incentives. The categories of these psychological incentives for managers are further divided into two dimensions. The former is the empire building incentive for managerial decisions derived from agency costs, and the latter is the earnings management incentives such as

compensation or managerial reward systems that lead to managerial actions to meet short-term earnings and avoid losses, consequently reducing cost stickiness. Researchers argue that the major determinant of asymmetric cost behavior depends not only on managerial incentives but also on their governance, regulation, and ownership.

The empire-building incentives that involve managers' engagement in activities for their own benefit rather than for the benefit of the organizations' shareholders can lead to excessive cost stickiness for the organizations because of the agency problem between managers and shareholders (Anderson et al. 2003; Chen et al. 2012). Some studies have asserted that managers make acquisitions for their own interests at the expense of the organizations' shareholders, which is consistent with conglomerate mergers or mergers and acquisitions (e.g., Amihud and Lev 1981; Morck et al.1990). Additional studies have shown that expanding the size of an organization via a merger provides managers with opportunities to engage in private rent-seeking activities, such as overly generous employment terms, overinvestment in assets and fringe benefits (e.g., Bertrand and Mullainathan 2003). The empire-building incentives demonstrate that decision makers are driven to spend more opportunistically, even when they have fiscal problems. The results in these papers imply the existence of a "bad" cost stickiness that destroys value through opportunistic overspending by managers, in contrast to a "good" cost stickiness, relative to the value-maximizing level of cost stickiness for organizations through more efficient resource planning based on controlling adjustment costs and expectations for future uncertainty.

The findings that the earnings managerial incentive is associated with asymmetric cost behavior suggest instead that agency-driven incentives to meet earnings or avoid losses diminish the degree of cost stickiness rather than induce cost stickiness. Previous studies have thus noted that any effort to infer the sources of sticky costs should be

undertaken considering the motivations for managers' resource adjustments (e.g., Dierynck et al. 2012; Kama and Weiss 2013). Therefore, their research provides another potential driver of sticky costs, namely, resource adjustment incentives made by self-interested managers to cut resources faster and greater for meeting short-term earnings to obtain more compensation. They argue that earnings management is associated with stronger incentives to decrease an organization's resource level after decreasing sales, i.e., lower cost stickiness.

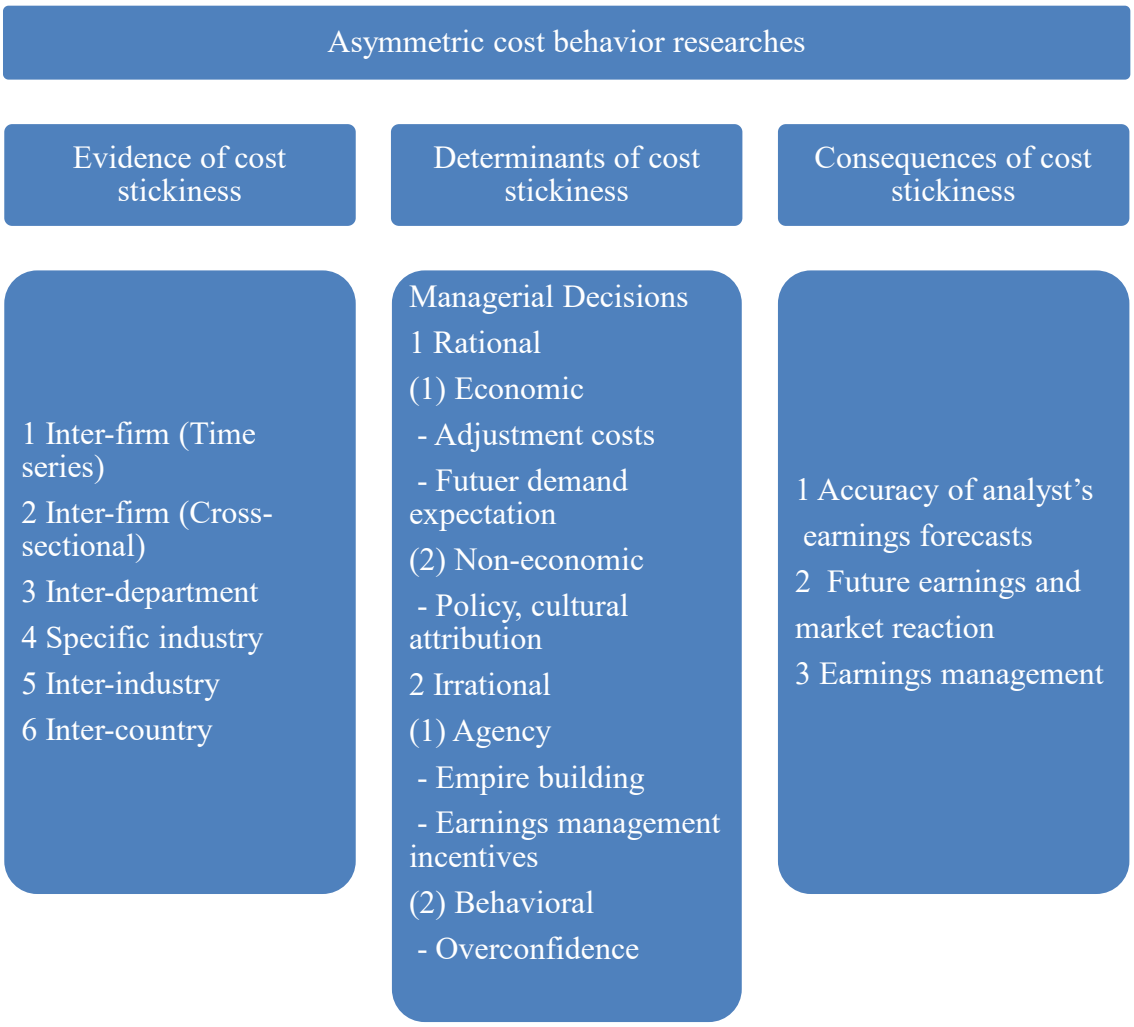
Finally, managerial incentives are also affected by managers' personal characteristics and behavioral biases. Namely, overconfidence bias leads to optimistic expectations for future uncertainty and then overestimates future sales. Thus, these managers have greater psychological incentives to keep slack resources during sales decreases, resulting in greater cost stickiness. Asymmetric cost behavior studies find positive associations between overconfidence and cost stickiness. These studies find an incremental influence. These two psychological incentives are also associated with organizational behavior, such as governance, cultural attribution and ownership.

5.2 Domain of Cost Stickiness Literature

To organize the literature review, Malik (2012) classifies the area of cost stickiness research into three main domains: evidence of cost stickiness, determinants of cost stickiness and consequences of cost stickiness (Figure 1-5). The first category of research is inter alia focused on finding evidence of cost stickiness. Most of them are either extensions or modifications of the Anderson et al. (2003) model. They provide evidence of both sticky costs and anti-sticky costs in various business circumstances. As the second category, subsequent studies contribute to the literature by investigating the determinants of cost stickiness and developing this decision-based approach in interaction with various constraints. As mentioned above (5.1 theoretical consideration of asymmetric cost

behavior), the author identifies the factors that affect asymmetric cost behavior and discover the cost driver mechanism. As the last category, the cost stickiness literature works progressing in the area of sticky cost behavior investigate how cost stickiness relates to earnings forecast accuracy. Findings from these studies document that forecasting models that incorporate the issue of stickiness have more predictive power and fewer forecasting errors. These studies document that firms with more symmetric cost behavior (less stickiness) practice more earnings management than firms with more sticky cost behavior (e.g., Dierynck et al. 2012; Kama and Weiss 2013).

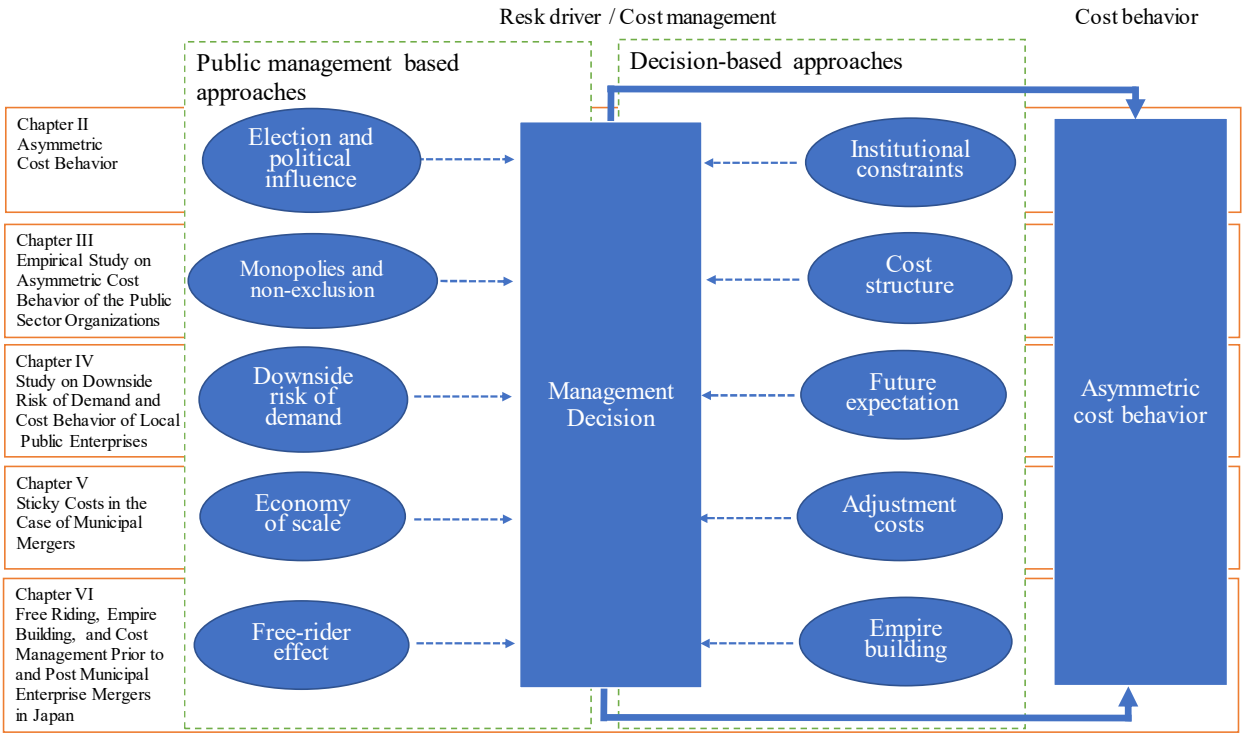
Figure 1-5. Area of cost stickiness research



Created with reference to Malik (2012)

Overall, asymmetric cost behavior should be consistent with either rational resource management in the long-term firm value by avoiding excessive adjustment costs (i.e., good cost stickiness) or unnecessary overspending due to the manager's personal benefit maximization (i.e., bad cost stickiness) (e.g., Banker and Byzalov 2014; Reimer 2019). Therefore, the rationale underlying cost stickiness is that managers do not always make decisions that result in the best outcomes for shareholders. Previous studies provide substantial evidence of cost behavior worldwide, discover the determinants of asymmetric cost behavior, and discuss the consequences of cost stickiness. However, scant data could be a constraint; therefore, more field-based investigations could be a potential source of research inputs (Malik 2012). To date, only a small number of studies have combined the asymmetric cost behavior view with PSOs. The following chapter from II to VI intends to fill the gap by addressing the fruitful amount of LPEs', including MEs', fiscal and physical data (Figure 1-6).

Figure 1-6. Analysis framework in this dissertation



II Asymmetric Cost Behavior: Public Interest or Efficiency?

1 Introduction

After World War II, public enterprises (PEs) were created in both developed and developing countries to address market deficits and capital shortfalls, promote economic development, reduce mass unemployment and/or ensure national control over the overall direction of the economy (UN, 2008). Over the long term, PEs provided public services that were directly managed by governments. However, management inefficiencies, overstaffing, inflation and rising current account deficits in the 1980s exposed serious "government failures" and the limitations of PEs as major players in economic development (UN, 2008). Subsequently, new public management (NPM) led public organizations (including PEs) to change their behavior from reflecting administrative aspects to reflecting managerial aspects (Van Genugten 2008). From the perspective of fiscal finance, the operations of public organizations switched from recognizing soft budget constraints to recognizing hard budget constraints (Bertero and Rondi 2000). Furthermore, in the 1990s, many public services provided by public sector organizations were outsourced or the organizations were privatized and became commercial enterprises (CEs) because of pressure to improve their efficiency and effectiveness (Hefetz and Warner 2007). Thus, public service costs in public sector organizations were initially reduced through outsourcing or privatization (Domberger and Jensen 1997; Domberger and Rimmer 1994; Hodge 2000), but the cost reduction effects gradually decreased over the long term (Bel and Costas 2006; Dijkgraaf and Gradus 2011). Therefore, in the 2000s, the responsibility for outsourced public services shifted again to corporatized PEs, which emphasize efficiency and have greater independence from the government than PEs that are directly managed by governments (Hefetz and Warner 2007; Wollmann et al. 2010). Currently, various public services are provided by corporatized local public enterprises

(LPEs) in every region of the world (Saussier and Klien 2013) (Table 2-1).

Table2-1. LPEs in selected countries

Country	Number of municipalities	Number of LPEs*	Sectors of activities
Austria	2,359	149	Electricity, gas, heating, public transport, water, sewerage, waste, telecommunications, public equipement, cemeteries, public areas, health
Belgium	589	243	Electricity, gas, communication networks, funding, economic development, water, waste, health, social care
Czech Republic	6,258	339	Public transport, electricity, gas, heating, water, waste
Denmark	275	224	Economic development, electricity, gas, heating, water, waste, public transport, leisure, computing, housing
Estonia	247	224	Electricity, gas, water, housing, public transport, heating, health, social services, trade, waste
Finland	448	944	Economic development, energy, water, sewerage, waste, public transport, ports, telecommunications
France	36,565	1,198	Tourism, planning, housing, public transport, economic development, water, sewerage, waste, environment, leisure, culture, telecommunications, parking spaces
Germany	13,854	3,500	Energy, economic development, water, waste, public transport, public equipment, housing, banks, telecommunications
Greece	900	1,116	Water, sewerage, culture, tourism, training, careers
Italy	8,101	963	Regions: economic development, planning, public equipment, public transport, Provinces: commercial events, tourism municipalities: energy, water, waste, pharmacies, cemeteries
Japan	1,727	9,379	Residential water, industrial water, transport, electricity, gas, hospitals, and other businesses that are run by each local government according to its own rules
Latvia	547	669	Health, heating, waste, real estate operations, sport, public transport, pharmacies, water, social care, radio & TV, auditing, training, tourism, electricity
New Zealand	85	257	-
Poland	2,489	2,415	Water, construction, waste, real estate operations, electricity, gas, heating, public transport, trade, leisure, culture, sport
Portugal	4,037	76	Energy, public transport, tourism, environment, planning, commercial and industrial infrastructures, health, education, food industry
Slovakia	2,920	239	Waste, water, sewerage, heating, public spaces, health, public transport, public lighting, sport, housing, cemeteries, local television, tourism
Slovenia	193	60	Water, waste, road, cemeteries, public transport, public spaces, electricity, heating
South Korea	232	306	-
Spain	8,106	770	Municipalities and provinces: public transport, water, real estate, planning, economic development, cemeteries
Sweden	290	1,750	Energy, water, waste, public transport, housing, tourism, economic development
United Kingdom	326	185	Economic development, tourism,public equipment, health, social care

Created with reference to Saussier and Klien (2013)
* LPEs include not only corporatized LPEs but also directly managed LPEs.

Recently, corporatized LPEs[1] have been found to be more efficient than LPEs directly managed by local governments (Voorn et al. 2017). Nevertheless, LPEs are generally considered to be more cost inefficient than CEs since the former face stronger institutional pressure (i.e., normative, coercive, and mimetic) than CEs (Frumkin and Galaskiewicz 2004). In particular, from the viewpoint of normative institutional constraints, LPE administrators are pressured by law to achieve efficiency and serve the public interest. However, it is very difficult for LPE administrators to do both simultaneously. If LPE administrators prioritize cost reductions due to the influence of efficiency pressures, the risk of declining public service quality increases. Conversely, pursuing the public interest can lead LPE administrators to manage their costs more inefficiently. Thus, LPE administrators must strike a balance between efficiency[2] and the public interest[3] under the pressure of these two normative institutional constraints (Kawarata 2005). By contrast, CE managers aim only to maximize profits; since they are subject to fewer institutional pressures than LPEs, they have greater flexibility in making management changes (Eldenburg et al. 2004; Balakrishnan et al. 2010; Holzhacker et al. 2015). However, to date, research on whether public services are more inefficiently performed by LPEs than CEs is lacking.

Therefore, my research question is whether LPEs manage their costs more inefficiently than CEs. In this research, the author focuses on LPEs in Japan and clarify their cost management. In addition, the author compares my results with those for CEs

---

[1] Hereafter, in Section 1, "LPEs" refer to corporatized LPEs.
[2] The concept of efficiency is used differently in each study focusing on the public sector (Voorn et al. 2017). In this chapter, efficiency refers to cost efficiency.
[3] The concept of the public interest can be defined not only as a specific conceptualization of the term "public interest" but also with a variety of meanings from very specific to very broad definitions (Pesch 2006; Van Genugten 2008). Therefore, in this research, following De Bruin et al. 2004, "public interest" is defined as both the importance of services (i.e., necessary and convenient for everyday lives) and the roles and responsibilities of governments.

based on the theoretical background of institutional theory. the author chooses Japanese LPEs for two reasons. First, the number of LPEs in Japan is very high compared to the number worldwide (Table 2-1). In Japan, the Local Public Enterprise Law was enacted in 1948, after World War II, and subsequently, many LPEs were established in each municipality. Therefore, it is possible to collect data from a large cross-sectional sample, making this empirical research more robust. Second, LPEs are consistently the main bodies providing public services and have been continuously engaged in this important role supporting civil life in Japan over the long term. Therefore, it is possible to collect consistent, long-term time series data. The accounting system for LPEs remained unchanged until 2014[4]. Therefore, in this chapter, the author was able to collect fiscal data from 1974[5] to 2013 and verify the long-term changes in cost management alongside the global trends for each period, for example, the trends in NPM since the 1980s, outsourcing or privatizing into CEs since the 1990s, and the revival of LPEs since the 2000s.

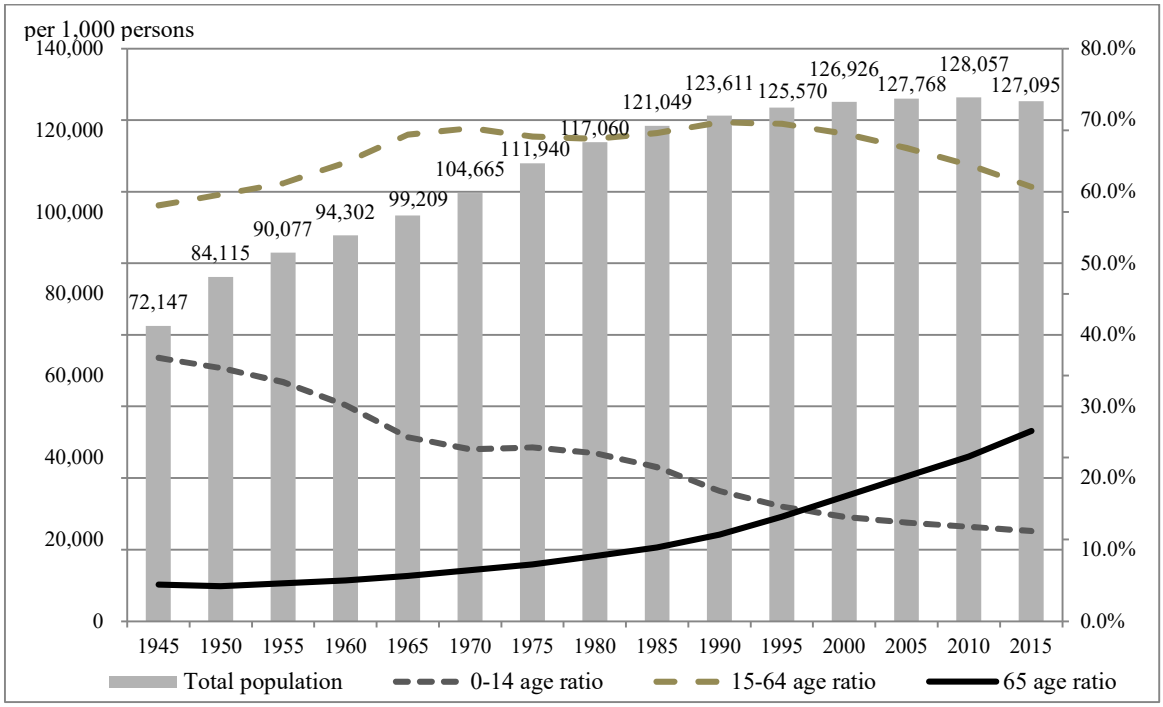
Additionally, the author discusses how LPEs' cost management should be sustainably controlled in the future not only in theory but also in practice. LPEs in Japan have encountered two main issues in recent years that have intensified the institutional constraints of achieving efficiency and serving the public interest: population changes and a deteriorating financial situation. According to Japan's population census, the country's population had reached its upper limit and entered a stage of decline (Figure 2-1). In Japan, the proportion of elderly people in the total population exceeded 14% in 1995, and Japan

[4] LPEs in Japan adopted almost the same bookkeeping method as CEs beginning in 1966. After 2014, the accounting standards of LPEs have changed. Many of them are based mainly on changes in the balance sheet that this research does not pay attention to. On income statements (P/L) that the author pays attention to in this study, the method of amortizing fixed assets when purchased with subsidies has been changed. Before 2013, the amortizing fixed assets were accounted for only in expenses; on the other hand, after 2014, the amortizing fixed assets were accounted for not only in expenses but also in revenue, as the long-term advances received.

[5] 1974 is the first year for which data collection was possible.

became an aging society. Furthermore, in 2007, this proportion exceeded 21%, representing a super-aging society. In conjunction with this shift, the population of youth and of those in the productive ages has continued to decline. Additionally, Japan's suburban population has decreased dramatically. The Japanese government reported that the percentage depopulated areas[6] of Japan has increased from 40.7% in 1972 to 58.7% in 2015. The number of depopulated municipalities also increased from 32.3% in 1972 to 46.4% in 2015. LPEs must continue their businesses despite the institutional constraint of serving the public interest, even if the costs of idle capacity rise due to a declining number of users caused by population decreases. Conversely, the aging population, who need more public services (e.g., medical services, care services) at a low cost, will continue to increase in the future.

Figure 2-1. Population changes in Japan



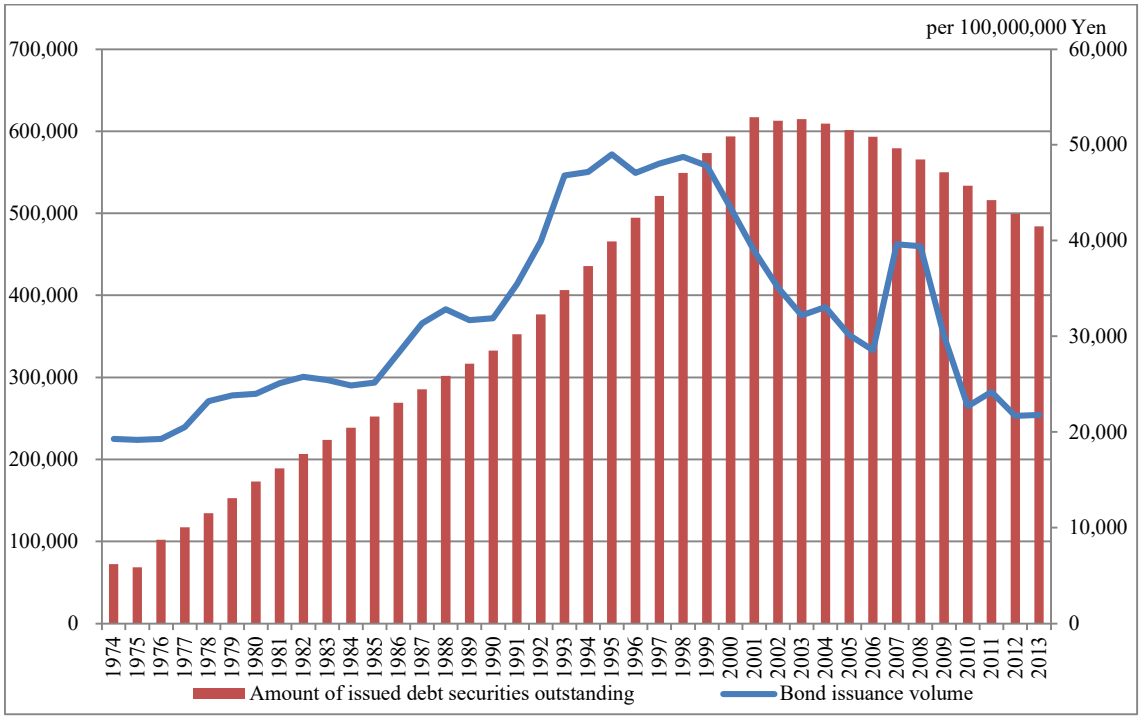
Created based on Japan's population census for the year 2015

[6] The depopulated areas in Japan are defined in the Act on Special Measures for Promotion for Independence for Underpopulated Areas. There are many requirements for specifying depopulated areas: one is that the population declined more than 33%.

A final issue is the difficulty LPEs experience in repaying bonds (Panel A of Figure 2-2). LPEs issue bonds to finance new public service projects (including both maintenance and renovation projects) or to improve the quality or expand the quantity of public services. In examining LPEs' financial statements, although operating revenues and expenses may be in surplus, non-operating revenues and expenses often show deficits (Panel B and C of Figure 2-2). This difference is due mainly to the repayment of bonds and interest payments. Since interest payments are a fixed cost, LPE administrators must reduce other variable costs. However, cost adjustment flexibility decreases with increases in LPE bonds. Namely, the repayment of LPE bonds requires LPE administrators to further enhance their organizations' efficiency.

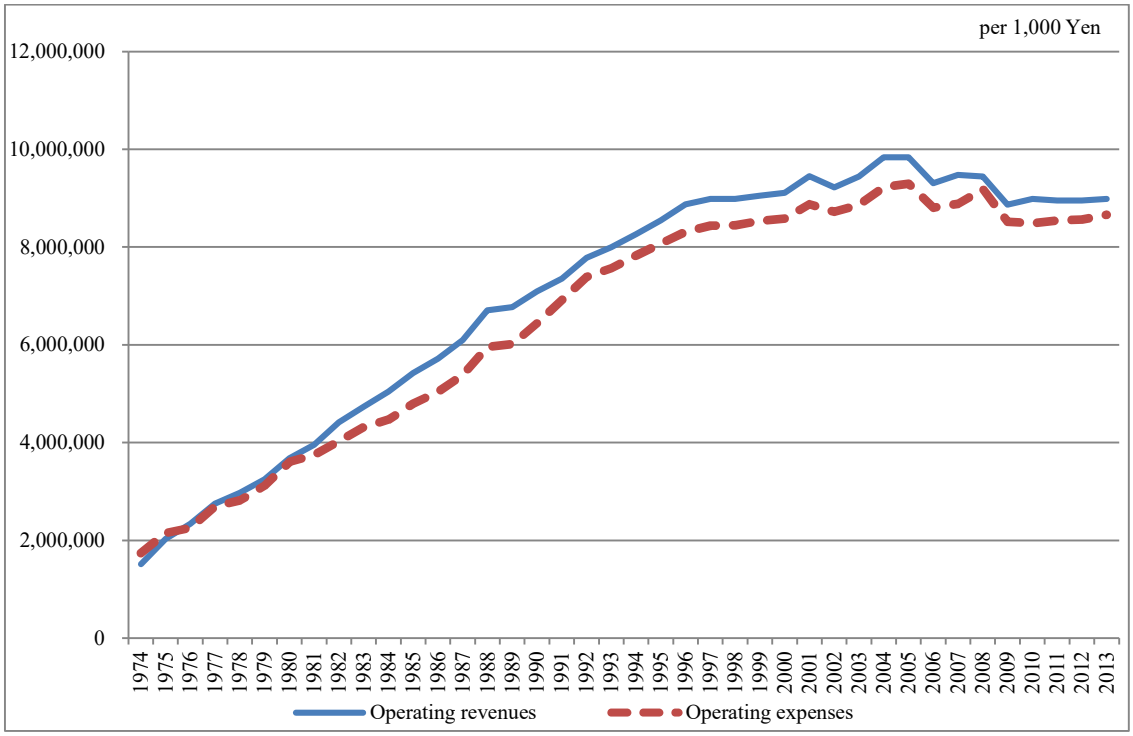
Figure 2-2. LPE bonds, operating and non-operating revenues and expenses

Panel A: LPEs' bonds



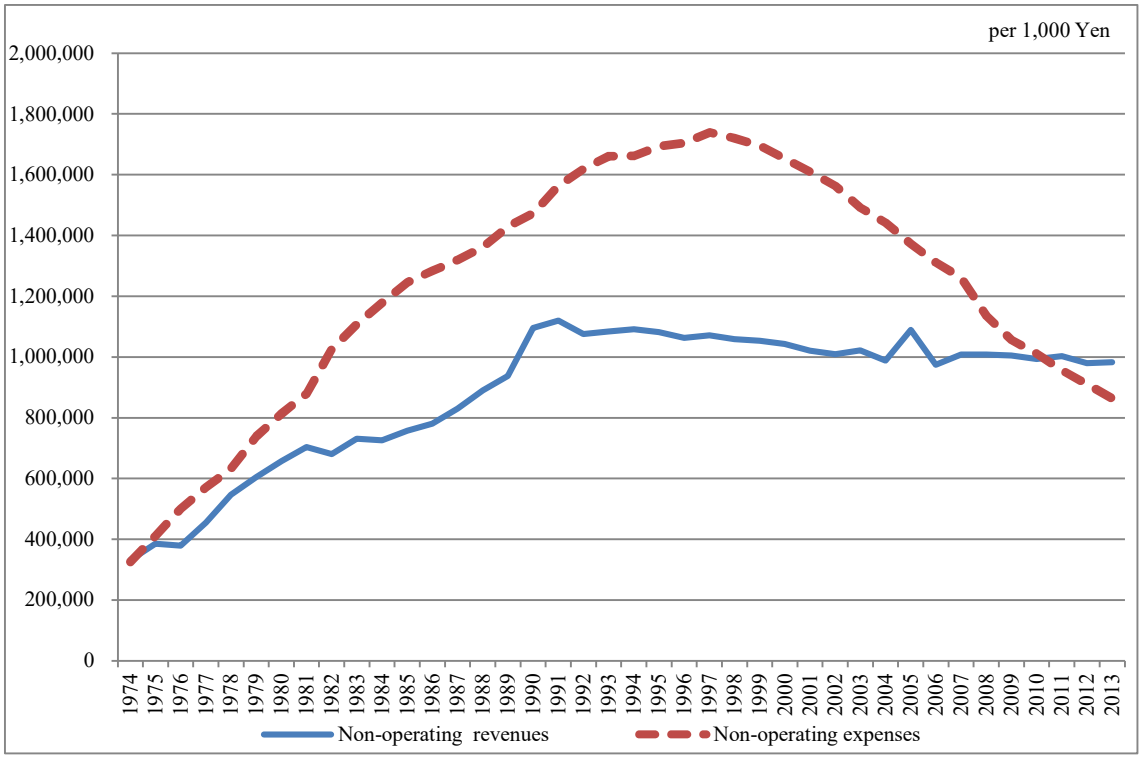
Created with reference to LPEs' yearbooks

Panel B: LPEs' operating revenues and expenses



Created with reference to LPEs' yearbooks

Panel C: LPEs' non-operating revenues and expenses



Created with reference to LPEs' yearbooks

For LPEs to improve their efficiency, it is essential to consider further developing their cost management. Thus, clarifying LPEs' cost behavior and understanding its movement is important for improving LPEs' cost management. In research on cost behavior, German studies identified "Kostenremanenz" in the 1920s. Over the past 20 years, this phenomenon has again attracted the attention of empirical researchers in management accounting and is now known as "sticky costs (cost stickiness)" (Anderson et al. 2003). Sticky costs increase proportionally as activities increase, but when activities decrease, the costs do not decrease symmetrically. In subsequent studies, sticky costs were found to exist in each region, country and industry (Calleja et al. 2006; He et al. 2010; Subramaniam and Weidenmier 2016). Conversely, it has also been verified that a change in cost may exceed the change in activity (Weiss 2011). Subsequent empirical research showed that cost behavior includes not only sticky costs but also anti-sticky, i.e., asymmetric, costs when activity increases and decreases (Banker and Byzalov 2014). However, most previous studies have focused on CEs (Malik 2012; Günther et al. 2014), and only a few studies have focused on public sector organizations' cost behavior (Yasukata et al. 2011; Bradbury and Scott 2018; Cohen et al. 2017; Holzhacker et al. 2015). Therefore, the goal of this chapter is to examine LPEs' cost behavior, which has not yet been analyzed. In addition, the author examines whether LPEs' cost behavior reflects high or low sticky costs when compared to CEs from the viewpoint of institutional theory through a long-term empirical analysis.

Through this study, the author contributes five findings to the cost behavior research. First, the author finds that LPEs' cost management is not necessarily inefficient compared to CEs from the perspective of cost behavior. Namely, the author finds that sticky costs exist in CEs' cost behavior, and conversely, anti-sticky costs are revealed in LPEs through a panel data analysis covering 40 years. In addition, the author discovered

that LPEs' cost behavior contrasts with that of CEs. However, these results also contrast with the expected conclusions in general. the author believes that the lack of support for this expectation might be driven by accounting system (regulations on dividends and retained earnings) and management system (redundancies; e.g., preparation for disasters) differences between CEs and LPEs.

Second, the author discovered that after a certain period of time has passed from LPEs' establishment, inefficient risks in LPEs' cost management are caused by institutional pressure to protect the public interest. Through a timeline (year by year) analysis over 40 years, the author finds that LPEs' cost behavior gradually shifted from anti-sticky costs to sticky costs. This result also contrasts with CEs' cost behavior, which did not drastically change. the author discovered that the adjustment ability of management resources in LPEs was gradually lost over the long term. From the viewpoint of securing the public interest, obsolete equipment must be repaired or replaced to maintain the quality of public services, even if revenues decrease. the author conjectures that cost-inefficient risk is affected by an increase in the costs of facilities and equipment.

Third, through an analysis by industry type, the author finds various characteristics of LPEs' cost behavior in each industry type, including high material resource industries and high human resource industries. The diversity of cost behavior in LPEs might be caused by the resource adjustment costs in various business environments and the various institutional restrictions, including the non-exclusion of public services and the influence of monopolies.

Fourth, the author discovered that depopulation and structural changes in the population influence LPEs' cost behavior. Since population change is closely related to public service demand, the administrators of LPEs need to manage those costs that respond

sensitively to population changes. the author can show how public service providers should adjust their costs due to population changes, which suggests that the influence of population changes must be taken into consideration to preserve LPEs' cost adjustment ability.

Finally, the author clarifies how LPE administrators adjusted their costs based on changing activity levels over four years, which equals politicians' term in office, and verify the differences between LPEs and CEs. the author finds the cost behaviors' differences in both the speed of change and the direction of movement can be compared. Regarding the changing speed of cost behavior, LPE administrators try to adjust their costs so that they remain proportional over four years, as they aim to operate their services in a stable manner and attempt to balance the public interest and efficiency sustainably. Regarding the direction of movement, one might assume that LPE administrators are subject to institutional pressure from politicians, who respond to public opinion, and social demands, which require the enrichment of public services rather than excessive cost efficiency. the author conjectures that LPE administrators intend to adjust their costs to balance their proportions during politicians' term in office.

In addition, by understanding the characteristics of LPEs' cost behaviors from an academic perspective, it will be possible to contribute to public administrators' ability to manage their future costs. the author also contributes to practical aspects of LPE cost management in the future sustainability plans called the Compact City and Intermunicipal Cooperation.

This chapter proceeds as follows. Section 2 discusses the characteristics of LPEs from the viewpoint of institutional theory, reviews the literature on public organization cost behavior and develops my research hypotheses. In Section 3, the research

methodology is described, including the sample data, the variable measures, and the models. Section 4 presents and discusses the results. Finally, Section 5 summarizes the results and concludes with a discussion of the limitations of this study and suggestions for future research.

2 Research Background

2.1 Characteristics of LPEs

Since World War II, LPEs have been an important public service provider not only in developed countries throughout the world but also in developing countries (UN, 2008). LPEs are called various names within each country and region, such as “municipally owned enterprises”, “municipal corporations”, “local public companies”, “municipal corporatizations”, and “state-owned enterprises” (Collin et al. 2009; Saussier and Klien 2013; Voorn et al.2017).

A UN (2008) report defined public enterprises as follows: a “public enterprise can be considered an organization established by the government under public or private law, as a legal personality which is autonomous or semi-autonomous, that produces/provides goods and services on a full or partial self-financing basis, and in which the government or a public body/agency participates by way of having shares or representation in its decision-making structure”.

However, in the academic field, there is no definite and common definition of a public enterprise to date (Collin et al. 2009; Saussier and Klien 2013) because LPE regulations differ from country to country and LPEs’ service content differs from region to region. Thus, it can be stated that LPEs exist in an institutional twilight area, as they are both public administrators and private companies (Collin et al. 2009). Because of the

existence of various forms and types of LPEs in each country and region, academics to date have not recognized common LPE issues. Based on a taxonomy, Saussier and Klien (2013) classified LPEs based on decision-making rights, organizational control, and property rights. They distinguished between directly managed LPEs and corporatized LPEs. Additionally, Voorn et al. (2017) described the unique features of directly managed LPEs and those of corporatized LPEs (Table 2-2).

Table 2-2. Characteristics of directly managed LPEs and corporatized LPEs

	Directly managed LPEs	Corporatized LPEs
Decision rights	Local government	LPE management
Legal status	Local government	Corporation
Governed under	Public municipal law	Public municipal law and municipal ordinances
Organisation form	Multi-purpose	Single-purpose
Governed by	Local bureaucracy	Appointed executive board
Funded through	Taxes	User fees
Cooperative flexibility	Medium	High

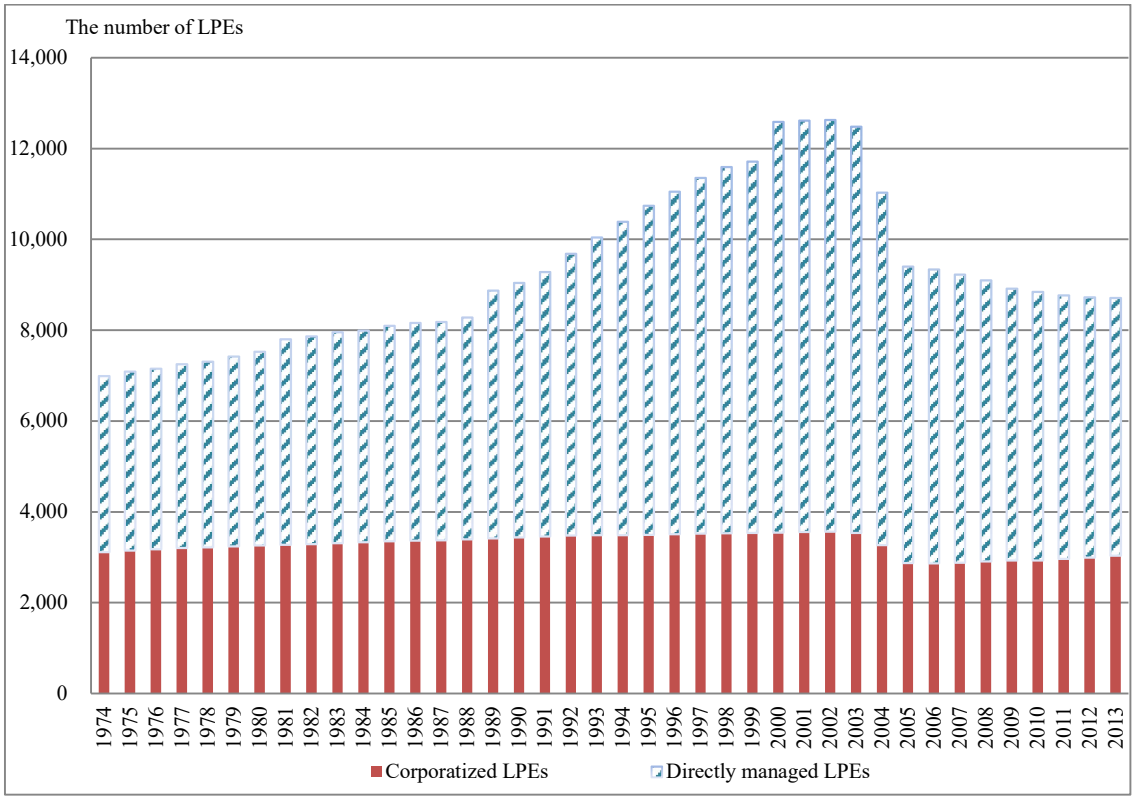
Created with reference to Saussier and Klien (2013) and Voorn et al. (2017)

Saussier and Klien (2013) explained that Japanese LPEs are part of the local public government and are not independent organizations. Therefore, they argued that Japanese LPEs are not suitable as subjects of empirical research because they are not financially and organically separate from local public governments. LPEs in Japan are certainly a type of public organization owned by local governments. However, the author asserts that the researchers' argumentation is partly correct and partly wrong. According to their taxonomy, LPEs in Japan are classified into directly managed LPEs and corporatized LPEs. The former are part of local public bodies, as these authors claim, but the latter are run independently. The services provided by corporatized LPEs are funded by user fees, and the entities must be profitable independently of local public bodies. Thus, corporatized LPEs have weaker regulations than directly managed LPEs and can be managed flexibly

using their income from utilities. It is expected that the efficiency and effectiveness of the services provided by corporatized LPEs will be promoted over services provided by directly managed LPEs (Ooshima 1971). Therefore, the author argues that corporatized LPEs in Japan are suitable for empirical analysis because they are financially and organically separate from local public governments.

In Japan, legislation established LPEs in each municipality after World War II. The number of LPEs increased with the increase in population: there were 6,995 enterprises in 1974, 12,629 enterprises in 2002, when they reached a peak, and recently, after a decline due to privatization or amalgamation, there were 8,712 enterprises in 2013 (Figure 2-3). In addition, there are more directly managed LPEs than corporatized LPEs. However, the number of directly managed LPEs has decreased substantially since 2004 under the influence of privatization based on the institutional pressure of NPM. By contrast, the number of corporatized LPEs has not changed drastically for 40 years. the author argues that corporatized LPEs are also appropriate for empirical analysis because the number of such organizations is larger than that in other countries, and data collection is possible over a longer period. For this reason, the author focuses on corporatized LPEs for this analysis.

Figure 2-3. Trends in the number of LPEs in Japan



Created with reference to LPEs' yearbooks

Corporatized LPEs (hereafter, LPEs) are governed by an administrator appointed by the mayor and approved by congress for a four-year term in office. Dismissal is restricted during this term. The administrator has decision rights regarding the management of an LPE. Therefore, the administrator is similar to the CEO of a CE. However, unlike CEOs, LPE administrators are not allowed to receive dividends from the organization's profits. Therefore, from the perspective of agency costs, there is little incentive for administrators to declare a high amount of dividends. However, if the administrator achieves a high level of performance (e.g., high evaluation of the service, cost reductions), the mayor can reappoint the administrator. Therefore, the administrators of LPEs may strive to achieve high performance with regard to serving the public interest and achieving efficiency. In other words, administrators may be indirectly influenced by politics (congress and the mayor). Additionally, LPEs' budget must be approved by both

congress and the mayor, which means that LPE administrators are accountable to both parties. Therefore, the administrators of LPEs may face institutional pressure from stakeholders such as congress and the mayor.

LPEs are responsible for various public service businesses that complement the public services offered by local governments (Ooshima 1971; Kawarata 2005). More specifically, LPEs in Japan are businesses that act under the LPE law and municipal ordinances. Examples of businesses in which LPEs operate include residential water supply, industrial water supply, transportation (e.g., tramway, bus, and subway), electricity, gas power, hospitals, and other businesses that are run by local governments according to their own rules (Table 2-1). These businesses not only require a large amount of investment that cannot be procured by the private sector but also will not necessarily be profitable for CEs. Therefore, LPEs provide essential, lifesaving activities that cannot be managed as CEs based on economic principles. For these reasons, administrators must attempt to recover the invested funds appropriately and make decisions that prevent losses (Yasukata et al. 2011). Additionally, they must be accountable to congress and the mayor in terms of securing profits and improving benefits for the public (Eldenburg and Krishnan 2008).

2.2 Institutional Constraints of LPEs

Institutions are social structures consisting of symbols, social actions and objectives, but institutions are formed not only through social structures but also through the activities in which norms and rules are produced. In its present form, the new institutionalism in organizational analysis provides a wide range of theoretical and methodological benefits (Scott 2001). Neo-institutional theorists, e.g., Meyer and Rowan (1977), noted that organizations engage in normative organizational behavior based on rules, laws, customs,

traditions, and regulations with an emphasis on legitimacy, satisfactory behavior, structural decoupling, and symbols. They also explained that organizations pursue practices that may be of little relevance to maximizing efficiency and that organizations constantly seek ways to respond to pressure from external scrutiny and regulations rather than improving their performance. DiMaggio and Powell (1983) identified three forces that drive institutionalization: (1) coercive isomorphism, which stems from political influence and the need for legitimacy; (2) mimetic isomorphism, which results from standard responses to uncertainty; and (3) normative isomorphism, which is associated with professionalization. Among them, normative institutional pressure constrains both decision-making and organizational behavior (Balakrishnan et al. 2010; Holzhacker et al. 2015).

Public organizations promote mainly normative institutionalization in for-profit and nonprofit organizations since public organizations can establish rules, laws, and regulations and provide licenses and inspections. However, public organizations experience strong institutional pressure with regard to their role governing profit and non-profit organizations (Frumkin and Galaskiewicz 2004). Balakrishnan et al. (2010) also argued that the influences of institutional constraints are stronger for public organizations than for for-profit organizations. The authors showed that normative institutional constraints include political pressure, legal compatibility, the corporate governance system, and financial support. As evidence of normative institutional pressure that constrains both decision-making and organizational behavior, Wollmann (2000) explained that local German governments have changed their organizational structures based on the institutional pressure of NPM. One of the reasons for the strong influence of institutional constraints is that public organizations must respond to multidisciplinary evaluations at all times due to the existence of an unspecified number of stakeholders (Rainey 1997).

Therefore, these organizations act to acquire legitimacy by observing institutional norms such as rules, laws, and regulations (Nee and Cao 2005), which makes them sensitive to normative institutional pressure (Frumkin and Galaskiewicz 2004).

For LPEs, there are two behavioral standards (codes of conduct) mandated by LPE law to stabilize public services and to continue the business over the long term: first, fulfilling public demands to satisfy the public interest, and second, pursuing appropriate profits by focusing on profitability and optimizing costs by improving efficiency. LPEs must adopt a strict code of behavior and conduct their business while confronting these two normative pressures. In particular, from the perspective of the public interest, LPEs offer public services that are essential to citizens' lives. This system covers the provision of public goods and services in a comprehensive manner that complements the public services provided by local governments from the public interest perspective. In addition, the level of public service must always be kept constant since declining quality can threaten livelihoods. Thus, LPEs have a responsibility to support everyday lives and provide improved public benefits through their organizational behavior. Additionally, the evaluation of public services is conducted by all citizens, that is, an unspecified number of people. Because such evaluations are multifaceted, as Rainey (1997) noted, the administrators of LPEs must be concerned about serving the public interest. Thus, LPEs must provide public services even if they are unprofitable (Ooshima 1971; Kawarata 2005). As a result, institutional pressures also affect the cost-management decisions made by the administrators of government hospitals, which are a type of public organization (Balakrishnan et al. 2010). However, because the public interest must be balanced with efficiency, administrators cannot prioritize one over the other (Eldenburg et al. 2004). Conversely, with regard to efficiency, LPEs must provide services more economically, effectively, and efficiently than local municipalities (Kawarata 2005), which means that

they must operate with limited assistance from the government. Moreover, raising public utility fees is not easy because it will be opposed by residents. Therefore, LPE administrators must manage their organizations to avoid service charge increases as much as possible. As a result, they may have anxiety due to the need for cost management and efficiency.

Because of these normative institutional constraints, LPEs' organizational behavior differs greatly from that of CEs. CEs act to maximize profits; because they are subject to fewer institutional pressures, they have greater flexibility when making changes (Eldenburg et al. 2004; Balakrishnan et al. 2010; Holzhacker et al. 2015). Therefore, institutional constraints more strongly affect the cost behavior of public organizations than that of for-profit organizations (Holzhacker et al. 2015). To confirm the characteristics of public organizations, research methods that compare these organizations with a control group, either for-profit or nonprofit organizations, are generally adopted (Sørensen 2007; Balakrishnan et al. 2010; Holzhacker et al. 2015). Therefore, the author verifies LPEs' cost behavior by comparing these organizations to CEs from the perspective of institutional constraints. Table2- 3 summarizes the differences in the institutional pressure experienced by LPEs and CEs according to Eldeburg et al. (2004) and Balakrishnan et al. (2010).

Table 2-3. Organizational type and expected influence on cost behavior

Institutional Pressures		LPEs	CEs
Governance system	Important constituencies	Rural community members / residents / service user	Shareholders
	Board composition	Officer or publicly elected figure	Business people
	Board size	Small	Large
Legal compliance		Public interests and efficiency	Profit maximization
Political pressure		Maximum pressure	Minimal pressure
Financial performance	Access to capital	Fees, donations, bonds and limited tax support	Net sales, debt and equity financing
	Emphasis on economic returns	Soft budget constraints	Rewards for efficiency
	Charity service*	Lack of cost only for indigent residents	Preference for profits over charity for indigent people

Created with reference to Eldenburg et al. (2004), Balakrishnan et al. (2010)
* No compensation service for needy persons

In their governance systems, LPEs have fewer executives than CEs. Thus, LPEs usually have only one administrator and a few vice administrators. For this reason, the pressure from stakeholders is concentrated on the administrators; therefore, the administrators may focus on maintaining public service standards at a low cost in order to gain legitimacy. In terms of legal compliance, unlike CEs, which aim only to maximize profits, LPEs are required to pursue both the public interest and efficiency. Furthermore, in terms of political pressure, LPE administrators are accountable to residents, the local parliament and the mayor with regard to public service quality and cost management. If LPE administrators prioritize cost reductions due to the influence of efficiency pressures, the risk of declining public service quality will increase. Conversely, pursuing the public interest can lead LPE administrators to manage their costs more inefficiently. Thus, LPE administrators must govern their organizations while considering both the public interest and efficiency, and they must behave in a manner that ensures business continuity (Kawarata 2005).

2.3 Cost Behavior of Public Sector Organizations

The concept of cost stickiness originated in the latter half of the 1920s. In Germany, Brasch (1927) termed this phenomenon "Kostenremanenz", and this notion was clarified through the direct observation of companies' cost information. Recently, "Kostenremanenz" has attracted the attention of empirical analysts; the German term has since been translated to "cost stickiness" ("sticky costs") by Anderson et al. (2003). Those authors examined 7,629 firms over 20 years, from 1979 to 1998, using annual Compustat data. In addition, they verified firms' cost behavior using models based on published financial data to determine the magnitude of change in net sales revenue (a proxy for the activity level as an explanatory variable) and the magnitude of change for selling, general and administrative expenses (a proxy for cost variables and the dependent variable). They found that the magnitude of change for costs when the activity level decreases is smaller than it is when the activity level increases. The cost and revenue change proportionately and linearly with respect to the normal t-1 phase of the slope from the t-1 to the t period, but sticky costs result in a slope that is less steep than the slope near the t-1 period. Thus, "Kostenremanenz" is empirically confirmed as "cost stickiness". With regard to additional evidence of cost stickiness, since Anderson et al. (2003), sticky costs have been verified through additional empirical research using those authors' model and have also been confirmed to exist in other scenarios, such as inter-industry and inter-country scenarios.

In a study focused on inter-industry scenarios, Subramaniam and Weidenmier (2016) examined cost behavior by industry using Compustat data from 1979 to 2000. They showed that cost stickiness is stronger in the manufacturing industry, which has more fixed assets, than in the merchandising, service and finance industries. However, He et al. (2010) examined the cost behavior of Japanese CEs by industry type from 1975 to 2000 using the PACAP database. They showed that the merchandising industry has stickier costs than the service and manufacturing industries. As described above, various cost behaviors have

been confirmed for each industry for CEs. In addition, sticky costs were confirmed not only in industries with high material resources but also in industries with high human resources.

In studies focused on inter-country scenarios, Calleja et al. (2006) performed an analysis using financial data for US, UK, German, and French firms from 1988 to 2004. Their findings confirmed that German and French firms demonstrate stronger sticky costs than firms in the UK and US. The authors noted the possibility that differences in corporate governance and managerial oversight driven by the regulation laws in each country and the characteristics of each firm and each type of industry may also affect sticky costs. Using Compustat data from 1988 to 2008, Banker et al. (2013) showed that the different worker protection regulations in 19 OECD countries affected labor adjustment costs. These studies suggested that as industries become more regulated by law, their cost adjustment flexibility decreases. LPEs that are highly subject to legal institutional restrictions may have a lower degree of freedom regarding cost management than CEs. In previous studies targeting CEs, the analysis period has mainly been set at approximately 20 years or less. Since public service providers are required to have stable management over the long term (longer than 20 years), it is necessary to further understand their long-term cost behavior.

Researchers have classified cost behavior for not only sticky costs but also anti-sticky costs (Weiss 2011). This phenomenon shows that anti-sticky costs also result in a slope that is initially steeper but that grows less steep as it approaches the t period. Thus, anti-stickiness results when the slope of costs for increasing activities is lower than the slope of costs for decreasing activities. Dalla Via and Perego (2014) confirmed the existence of anti-cost stickiness for small and medium-sized enterprises. At the same time, they noted that cost stickiness increases in large firms. Likewise, Sepasi and Hassani

(2015) also showed that cost stickiness is higher in large enterprises when comparing large enterprises to small and medium-sized enterprises. These studies show that sticky costs increase when the adjustment costs (committed capacity costs) for capacity resources such as high-intensity assets or labor in large companies are high. That is, when the resource adjustment cost is high, it is difficult to adjust costs according to changes in the activity level. Conversely, since the capacity resources of small and medium enterprises consists mainly of variable costs, anti-sticky costs emerge. Günther et al. (2014) organized and described the relationship between holding costs and adjustment costs based on the prior cost stickiness literature. The authors explained that the factors influencing cost stickiness can be classified into three relationship types: (1) high adjustment costs attributable to legal requirements or economic and psychological issues; (2) high holding costs attributable to opportunity costs; and (3) high holding costs attributable to social issues.

To date, most studies have focused only on CEs, and only a few empirical studies of cost behavior have focused on public organizations. Bradbury and Scott (2018) conducted an empirical analysis of the cost behavior of New Zealand's public municipalities from 2008 to 2012. In New Zealand, cost management methods similar to those used by CEs have been introduced into public organizations since the 1980s as part of an NPM plan to improve the effectiveness and efficiency of administrative activities. With thirty years having passed since 1980, these authors examined whether cost management improved after 2008. However, the research showed that sticky costs continued to exist in New Zealand's local governments and that the efficiency of local government activities had not yet improved. Cohen et al. (2017) investigated the cost behavior of Greek local governments, which was a cause of the Greek fiscal crisis. These authors verified asymmetric cost behavior for different cost categories. Specifically, they focused on the difference between administrative costs and the costs of service provision

by empirically describing the cost behavior. They found that the costs of service provision (a core competence of local governments) were sticky, and administrative costs were anti-sticky. These authors asserted that this asymmetric cost behavior was influenced by the decisions of local government administrators, who were pressured by politicians and stakeholders. Additionally, they argued that local government administrators cannot decrease the cost of service provision in response to external pressures, even if revenues have decreased because of a fiscal crisis. Holzhacker et al. (2015) focused on the differences between the institutional pressures on government hospitals and those on for-profit and nonprofit hospitals and found differences in cost behaviors. Specifically, sticky costs were prevalent in government hospitals, which were subject to strong institutional pressures. The authors argued that one reason for their research results is that government hospitals need to take normative actions because of stakeholders' excessive pressure. The taxes, subsidies or donations from stakeholders such as local communities or citizens' groups force government hospitals to behave for the public interest. Yasukata et al. (2011) showed the existence of sticky costs in the Japanese National Hospital Organization, suggesting that sticky costs appeared within labor costs because the Japanese National Hospital Organization was strongly influenced by institutional pressures to not dismiss employees.

In analyses of these public organizations, there has been no focus to date on LPEs. LPEs have unique characteristics among public organizations because they are required to act not only in the public interest (similar to public organizations) but also in the interest of efficiency (similar to CEs). Therefore, it is academically interesting to investigate how LPEs' cost behavior has changed because such changes reflect the pressure to act in the interest of both the public and efficiency.

2.4 Hypotheses Development

Based on the model developed by Anderson et al. (2003), asymmetric cost behavior, especially sticky costs, has been evaluated in empirical studies focused on CEs. Using the same method, the asymmetric cost behavior of local governments was confirmed by Bradbury and Scott (2018) and Cohen et al. (2017). Holzhacker et al. (2015) found that the degree of sticky costs was greater in public hospitals than in private hospitals because for-profit organizations have fewer institutional restrictions than do public organizations. Therefore, the latter can change their governance or cost structure to respond flexibly to increase their efficiency (Eldenburg et al. 2004; Eldenburg and Krishnan 2008; Balakrishnan et al. 2010; Holzhacker et al. 2015). Further, public organizations are more strongly influenced by institutional pressure than CEs (Frumkin and Galaskiewicz 2004). Therefore, it is theorized that sticky costs can be confirmed in LPEs, given that these organizations have characteristics similar to both public and private organizations. Additionally, LPEs are subject to the institutional restrictions that service levels must be maintained without generating profits. Therefore, sticky costs will be more prevalent in LPEs than in CEs. Thus, the first hypothesis is as follows:

Hypothesis 2-1: Sticky costs are more prevalent in local public enterprises than in commercial enterprises.

Günther et al. (2014) argued that asymmetric cost behavior is affected by adjustment costs, such as legal requirements. LPEs are legally required by LPE law both to work in the public interest and to maximize efficiency. In addition, LPE administrators are influenced by various stakeholders against the background of the two normative institutional constraints. Therefore, they are required to maintain the public service level at a low, stable cost. In other words, pressures to prioritize efficiency will weaken the sticky costs of LPEs from the cost behavior perspective. Conversely, pressures to prioritize the public interest will boost LPEs' sticky costs because public service quality must be

maintained, even if revenues decrease. To maintain their service level, LPEs must renew or replace aging facilities over the long term, and they must plan for these costs without increasing their service charges. When LPE administrators are subject to strong institutional constraints, they cannot make decisions quickly and will put off these problems to the future. Sometimes, facilities can be repaired early in the business cycle, but after many years, it is often better to replace these facilities than to repair them. In these cases, the replacement or repair costs may drastically increase, and LPEs' resource adjustment ability will gradually be lost. Thus, it is believed that their cost behavior will change based on the influence of institutional constraints, especially the requirement to protect the public interest. Therefore, LPEs may take more time to balance their obligations due to the institutional constraints of both protecting the public interest and achieving efficiency. Thus, the next hypothesis is as follows:

Hypothesis 2-2: Institutional pressures are associated with the change in local public enterprises' cost behavior over time, in contrast to that of commercial enterprises.

Subramaniam and Weidenmier (2016) revealed that sticky costs are stronger in manufacturing industries with more fixed assets than in the commercial, service and finance industries. By contrast, He et al. (2010) showed that the commercial industry's sticky costs are higher than those of the service and manufacturing industries. As described above, various asymmetric cost behaviors have been confirmed for each type of industry for CEs, including cases with both high material resources (high fixed assets) and high human resources (high labor costs). Anderson et al. (2003) argued that sticky costs will increase when asset intensity and labor costs are high. LPEs' businesses include not only high asset-type industries, such as water supply and sewerage, but also high labor cost-type industries, such as transportation and hospitals. Moreover, due to institutional constraints,

various asymmetric cost behaviors should appear in all businesses, as LPEs must balance serving the public interest and achieving efficiency rather than only aiming to maximize profits, which is the goal of CEs. the author conjectures that sticky costs in LPEs will increase when these firms are pressured from the institutional constraint of serving the public interest; conversely, LPEs' sticky costs will decrease when they are pressured from the institutional constraint of achieving efficiency. Thus, the next hypothesis is as follows:

Hypothesis 2-3: Similar to that of commercial enterprises, local public enterprises' cost behavior is associated with the type of industry.

Banker et al. (2014b) found that sticky costs increase when demand uncertainty or the downside risk of demand increases. The demand for public services depends on population changes (Nakai 1988). For this reason, the administrators of LPEs are required to predict changes in public service demand based on population changes. In Japan, the population structure has changed significantly since 1995. The population of youth and those of production age is decreasing; conversely, the elderly population is increasing. Furthermore, the economy and demand are experiencing a depression, and CEs are withdrawing from depopulated regions due to a lack of profitability. Even if public demand decreases due to the declining population, LPEs cannot stop providing services because of the institutional pressure to serve the public interest. In other words, from the perspective of the public interest, LPEs cannot reduce the quality of their public services. In addition, with the increase in elderly people, whose income is derived primarily from pensions, LPEs must maintain the same level of public services at low prices because of the institutional pressure to achieve efficiency. LPEs may experience increased sticky costs due to the downside risk of public demand and public demand uncertainty. By contrast, the market demand for CEs is affected not only by domestic trading but also by overseas trading, so they are less affected by population changes than LPEs. the author theorizes

that LPEs' cost behavior will be more strongly influenced by population changes than that of CEs. Thus, the next hypothesis is as follows:

Hypothesis 2-4: Local public enterprises' sticky costs are strongly influenced by population changes since 1995 in relation to commercial enterprises.

As noted by Bradbury and Scott (2018) and Cohen et al. (2017), local government administrators are influenced by public opinion (demand for both low-cost and high-quality services) when they make cost management decisions. Public organizations, including LPEs, must respond to multidisciplinary evaluations at all times due to the existence of an unspecified number of stakeholders (Rainey 1997). In particular, LPE administrators are appointed by the mayor and approved by congress, who are, in turn, elected by citizens. Therefore, the administrators may be sensitive to not only public opinion but also political opinion (from mayors and local councils) if they wish to be reappointed for the next term, and they may strive to achieve a high level of performance with regard to protecting the public interest and achieving efficiency. As a result, LPE administrators may act to control and adjust their asymmetric cost behavior in the direction of symmetric cost behavior during the political term of mayors and local councils, which is 4 years in Japan. Thus, LPE administrators must aim for a long-term balance between protecting the public interest and achieving efficiency due to political pressure. Conversely, CEs' business managers may decide to control and adjust their costs with a focus on securing profits as quickly as possible, and they may not be as strongly affected by political pressure as LPEs. Thus because of institutional constraints, LPEs' long-term cost adjustments may be more controlled and move more slowly than those of CEs. As a result, it is hypothesized that the administrators of LPEs make decisions that result in asymmetric cost behavior that gradually transforms into a proportional relationship over the long term. The final hypothesis is as follows:

Hypothesis 2-5: Local public enterprise administrators make decisions that result in the long-term, proportional stabilization of cost behavior within a 4-year election period in relation to commercial enterprises.

LPEs are characterized by serving the public interest and achieving efficiency. Thus, LPEs' cost behavior is presumed to change in the context of the tradeoff between the public interest and efficiency. Because of the need to run businesses in a stable manner, LPE administrators make deliberate decisions from a different perspective than that of CE managers.

3 Research Method and Sample Selection

3.1 Research Method

The analytical model of Anderson et al. (2003) is the basis of recent empirical studies of cost behavior; it was adopted in studies following Anderson et al. (2003) and recently used by Bradbury and Scott (2018), Cohen et al. (2017), and Holzhacker et al. (2015) to analyze the cost behavior of public organizations. Therefore, this study assumes that the model can also be applied to the analysis of LPEs' cost behavior. Thus, to verify *Hypotheses 2-1* to *2-3*, the author adopts model 2-1. To examine *Hypothesis 2-1*, all the samples are analyzed through panel data analysis using model 2-1. Next, to verify *Hypothesis 2-2*, the year-to-year changes in cost behavior are analyzed through OLS analysis using model 2-1. OLS analysis was adopted to clarify the cost behavior in prior studies (Anderson and Lanen 2007; Zanella et al. 2015). Thus, the author intends to use not only panel data analysis but also OLS analysis to verify the existence of sticky costs. Finally, for *Hypothesis 2-3*, the samples for each type of industry are analyzed through panel data analysis using model 2-1.

Model 2-1

$$\ln\left(\frac{Cost_{i,t}}{Cost_{i,t-1}}\right) = \beta_0 + \beta_1 * \ln\left(\frac{Revenue_{i,t}}{Revenue_{i,t-1}}\right) + \beta_2 * Decrease\_Dummy_{i,t} * \ln\left(\frac{Revenue_{i,t}}{Revenue_{i,t-1}}\right) + \varepsilon_{i,t} \quad (2.1)$$

LPEs' operating expenses are substituted for *Cost*. Additionally, *Revenue* takes operating revenues as a proxy for the activity amount. *Decrease Dummy* 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.

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.

To examine *Hypothesis 2-4*, the author clarifies the influence of the total population change and the population structure on cost behavior. Therefore, the author focuses on population data from a report on population movement based on a basic resident registration system database[7]. In particular, it is necessary to clarify the influence of depopulation and the increasing ratio of the aging population on the cost behavior of LPEs. For this reason, the author collects population data from 1995, which is the year Japan started to become an aging society. The population data were divided into three stages: 0-14 years old, 15-64 years old, and 65 years old and over. To evaluate *Hypothesis 2-4*, the author adopts the following model 2-2.

Model 2-2

$$\ln\left(\frac{Cost_{i,t}}{Cost_{i,t-1}}\right) = \beta_0 + \beta_1 * \ln\left(\frac{Revenue_{i,t}}{Revenue_{i,t-1}}\right) + \beta_2 * Decrease\_Dummy_{i,t} * \ln\left(\frac{Revenue_{i,t}}{Revenue_{i,t-1}}\right) + \sum_{n=3}^{6} \beta_n \, Pop_{i,t,n} * Decrease\_Dummy_{i,t} * \ln\left(\frac{Revenue_{i,t}}{Revenue_{i,t-1}}\right) + \varepsilon_{i,t} \quad (2.2)$$

[7] Population data in each municipality is published as "Basic Resident Register Annual Population Report" by statistics bureau, ministry of internal affairs and communications in Japan.

The total population represents the natural logarithms of the year-over-year comparison. The young population, the productive age population, and the elderly population are natural logarithms of each respective proportion of the total population.

Next, to examine *Hypothesis 2-5*, it is necessary to confirm the relationship between operating revenues over 4 years and changes in operating expenses. the author extends the model of Anderson et al. (2003) and verify the hypothesis using the following model 2-3.

Model 2-3

$$\ln\left(\frac{Cost_{i,t}}{Cost_{i,t-1}}\right) = \beta_0 + \beta_1 * \ln\left(\frac{Revenue_{i,t}}{Revenue_{i,t-1}}\right) + \beta_2 * Decrease\_Dummy_{i,t} * \ln\left(\frac{Revenue_{i,t}}{Revenue_{i,t-1}}\right)$$
$$+\beta_3 * \ln\left(\frac{Revenue_{i,t-1}}{Revenue_{i,t-2}}\right) + \beta_4 * Decrease\_Dummy_{i,t-1} * \ln\left(\frac{Revenue_{i,t-1}}{Revenue_{i,t-2}}\right)$$
$$+\beta_5 * \ln\left(\frac{Revenue_{i,t-2}}{Revenue_{i,t-3}}\right) + \beta_6 * Decrease\_Dummy_{i,t-2} * \ln\left(\frac{Revenue_{i,t-2}}{Revenue_{i,t-3}}\right)$$
$$+\beta_7 * \ln\left(\frac{Revenue_{i,t-3}}{Revenue_{i,t-4}}\right) + \beta_8 * Decrease\_Dummy_{i,t-3} * \ln\left(\frac{Revenue_{i,t-3}}{Revenue_{i,t-4}}\right) + \varepsilon_{i,t} \quad (2.3)$$

If asymmetric cost behavior terminates over time, the sticky costs value will gradually approach 0. If cost stickiness is confirmed by β_2, it should change, $\beta_2 < \beta_4 < \beta_6$, with time, since LPE administrators are subject to institutional restrictions and will only gradually overcome the sticky costs. In particular, political pressure is strengthened by politicians' 4-year term. Additionally, local elections for congress and the mayor of each municipality in Japan are held almost simultaneously on the same day. Therefore, LPEs' cost behavior may be influenced by political pressure. The analysis begins at $t = 0$, which is an election year, and elections are held in $t = 0$, 4, 8, 12, etc.

3.2 Sample Selection and Descriptive Statistics

No empirical analysis of LPEs' cost behavior has been previously performed. This research is therefore the first to examine LPEs' cost behavior. To obtain robust results, as

much cross-sectional data as possible should be used. the author collected non-consolidated fiscal accounting data on all LPE businesses from LPEs' yearbooks[8]. Thus, the sample population for this analysis is all local public enterprise businesses that are classified as corporatized LPEs. The data include 10 industry types (residential water supply, industrial water supply, sewage, transportation, electric power, gas power, hospitals, wholesale market, toll road, and car parking). In addition, observations must be made over a long period to confirm how cost behavior has changed in accordance with changes in Japan's social environment.

To verify LPEs' cost behavior, long-term cost data are necessary. Therefore, in this study, the analysis period is the 40 years from 1974 to 2013, which is a longer period than that analyzed by any previous empirical studies on cost stickiness. LPEs are legally obligated to release annual financial reports. The financial reporting method has not changed over the 40 years under study, making it possible to collect fiscal data over a very long period. The collected data represent 120,317 firm-years. To control for the effect of outliers, the author removed (deleted) the largest and smallest 1 percent of observations (outliers). the author used list-wise case deletion without winsorized data to delete the observations. That is, if there is even a single outlier in one sample, all the data from that sample are deleted (cleared). This approach is rather conservative as a statistical method, but since there are numerous samples, the author contends that this approach is a valid statistical processing method to obtain robust analysis results. The final sample includes 115,929 firm-years[9]. Therefore, the sample consists of unbalanced panel data.

---

[8] LPEs' yearbooks are edited annually by the ministry of internal affairs and communications in Japan. They include the annual financial statement of each LPE in each municipality. The financial statements include B/S, P/L, the detail information of expenses, etc.; these data are found in electronic databases after 1999.

[9] To test unit root, the author examines Augmented Dickey-Fuller test for the sample of both LPEs and CEs, then the statistics reject the null hyphosis (i.e., $p < 0.01$).

Additionally, to create a comparison with LPEs over the same period, the author collected data provided by Nikkei NEED-Financial QUEST on CEs listed on the Tokyo Stock Exchange. LPEs' financial statements provide non-consolidated accounting data for various industry types, such as water supply and hospitals, so the author also collected CE non-consolidated accounting data from the Annual Securities Reports for comparison. The collected data represent 85,705 firm-years. After excluding (deleting) outliers, the sample includes 84,343 firm-years[9]. The descriptive statistics are calculated after the exclusion of outliers. Table 2-4 shows the descriptive statistics that contain both LPEs and CEs. Further analysis in Table 2-5 tests the variables for the significant factors that could influence the regression, multicollinearity and auto-correlation. The variance inflation factor (VIF) is less than 10 for all variables, which indicates that multicollinearity is not a concern in the estimation of the models. Thus, the regression model does not suffer from multicollinearity.

Table 2-4. Descriptive statistics

Panel A: LPEs

(Scale: 1,000Yen)

		Mean	Standard deviation	Minimum	Lower quartile	Median	Upper quartile	Maximum	Sample Size
Total	Cost*	1,946,197	7,320,193	382	148,701	441,239	1,512,568	295,467,927	115,929
	Revenue**	2,083,008	9,354,756	75	170,870	477,245	1,547,037	355,330,535	
	Ln cost $_t$ / cost $_{t-1}$	0.04101	0.09656	-0.48719	-0.00904	0.02957	0.08073	0.57912	
	Ln revenue $_t$ / revenue $_{t-1}$	0.04341	0.10744	-0.56932	-0.00933	0.02114	0.07433	0.66314	
Residential Water Supply	Cost*	1,065,668	6,774,393	2,160	107,613	221,621	603,446	295,467,927	64,675
	Revenue**	1,300,173	8,365,265	294	130,266	272,108	735,249	355,330,535	
	Ln cost $_t$ / cost $_{t-1}$	0.04577	0.10358	-0.48290	-0.01010	0.03116	0.08902	0.57874	
	Ln revenue $_t$ / revenue $_{t-1}$	0.04900	0.11070	-0.56601	-0.00895	0.02035	0.07403	0.66286	
Industrial Water Supply	Cost*	476,548	889,671	1,677	62,770	214,673	463,819	8,042,787	7,296
	Revenue**	611,846	1,125,119	708	67,160	265,268	615,598	11,326,896	
	Ln cost $_t$ / cost $_{t-1}$	0.01980	0.11230	-0.48719	-0.03042	0.01117	0.06390	0.56784	
	Ln revenue $_t$ / revenue $_{t-1}$	0.02361	0.10851	-0.56583	-0.00629	0.00177	0.03059	0.64851	
Sewerage	Cost*	5,322,071	18,203,066	1,086	201,342	682,454	2,744,434	225,035,329	4,525
	Revenue**	7,300,351	28,571,454	75	101,462	555,047	3,217,774	344,008,013	
	Ln cost $_t$ / cost $_{t-1}$	0.03273	0.08959	-0.47635	-0.00871	0.01830	0.05856	0.57912	
	Ln revenue $_t$ / revenue $_{t-1}$	0.04654	0.10907	-0.55551	-0.00635	0.02001	0.07392	0.66314	
Transportation	Cost*	8,925,017	19,250,696	382	348,485	1,779,477	6,132,778	149,541,551	2,677
	Revenue**	8,705,197	21,195,366	1,741	306,571	1,570,819	5,174,318	163,824,708	
	Ln cost $_t$ / cost $_{t-1}$	0.01174	0.08491	-0.48158	-0.02899	0.01153	0.04929	0.57121	
	Ln revenue $_t$ / revenue $_{t-1}$	0.01463	0.09550	-0.53314	-0.02770	0.00457	0.04682	0.65543	
Electric Power	Cost*	1,685,005	1,401,034	7,198	715,088	1,359,032	2,324,393	7,926,889	1,261
	Revenue**	2,265,455	1,792,677	13,700	948,625	1,911,831	3,179,656	9,605,919	
	Ln cost $_t$ / cost $_{t-1}$	0.03174	0.07822	-0.40621	-0.01232	0.02570	0.06965	0.45241	
	Ln revenue $_t$ / revenue $_{t-1}$	0.02399	0.07932	-0.37420	-0.01410	0.00869	0.04683	0.62548	
Gas Power	Cost*	1,263,644	3,293,313	27,840	198,447	447,234	954,152	40,287,262	2,274
	Revenue**	1,377,663	3,505,486	27,253	215,862	487,177	1,064,206	40,270,247	
	Ln cost $_t$ / cost $_{t-1}$	0.04504	0.09517	-0.36607	-0.01443	0.02992	0.09005	0.56286	
	Ln revenue $_t$ / revenue $_{t-1}$	0.04829	0.09993	-0.28446	-0.01263	0.02464	0.08038	0.58733	
Hospital	Cost*	3,090,634	3,621,221	28,828	726,049	1,687,856	4,030,324	31,602,391	32,066
	Revenue**	2,790,521	3,360,561	700	621,644	1,463,985	3,637,399	32,298,365	
	Ln cost $_t$ / cost $_{t-1}$	0.04084	0.07661	-0.47925	-0.00031	0.03384	0.07567	0.57704	
	Ln revenue $_t$ / revenue $_{t-1}$	0.04011	0.10112	-0.56932	-0.00902	0.03386	0.08350	0.65367	
Wholesale Market	Cost*	1,900,347	3,679,698	42,733	235,815	496,231	1,091,269	16,949,597	516
	Revenue**	1,718,437	3,206,354	58,783	188,243	477,556	1,372,835	14,497,486	
	Ln cost $_t$ / cost $_{t-1}$	0.01971	0.07123	-0.41089	-0.01870	0.01412	0.05088	0.43474	
	Ln revenue $_t$ / revenue $_{t-1}$	0.01658	0.06003	-0.42070	-0.01496	0.00482	0.03430	0.51378	
Toll Road	Cost*	497,635	481,220	22,252	195,702	290,347	642,219	2,372,781	270
	Revenue**	692,079	884,575	22,778	186,634	342,516	826,008	4,569,640	
	Ln cost $_t$ / cost $_{t-1}$	0.02885	0.13502	-0.39079	-0.03376	0.02208	0.08266	0.53742	
	Ln revenue $_t$ / revenue $_{t-1}$	0.02526	0.15362	-0.56601	-0.03861	0.02085	0.07889	0.62754	
Car Parking	Cost*	82,441	68,813	2,222	38,621	74,155	108,933	372,239	369
	Revenue**	127,903	112,924	4,366	51,008	98,883	174,920	563,130	
	Ln cost $_t$ / cost $_{t-1}$	0.00743	0.13908	-0.44680	-0.05085	0.00225	0.05782	0.57128	
	Ln revenue $_t$ / revenue $_{t-1}$	0.00069	0.12528	-0.53474	-0.04949	0.00000	0.05577	0.66278	

* Operating costs, **Operating revenues

Panel B: CEs

(Scale: 1,000,000Yen)

		Mean	Standard deviation	Minimum	Lower quartile	Median	Upper quartile	Maximum	Sample Size
Total	Cost*	125,774	648,568	2	9,127	23,643	68,737	21,359,227	84,343
	Revenue**	131,521	659,166	3	9,817	24,978	72,599	21,403,613	
	Ln cost $_t$ / cost $_{t-1}$	0.03958	0.14110	-0.73556	-0.02781	0.03373	-0.03163	0.81494	
	Ln revenue $_t$/ revenue $_{t-1}$	0.03871	0.15540	-0.77351	0.10157	0.03435	0.10635	0.85349	
Agriculture and Fishery	Cost*	94,881	152,120	2	4,295	17,998	138,252	602,390	426
	Revenue**	96,747	153,914	3	4,419	20,480	140,481	612,888	
	Ln cost $_t$ / cost $_{t-1}$	0.03889	0.16101	-0.58739	-0.03284	0.02816	0.08908	0.73166	
	Ln revenue $_t$/ revenue $_{t-1}$	0.03931	0.18943	-0.70995	-0.03497	0.02480	0.09267	0.81866	
Mining	Cost*	60,597	22,065	261	52,866	67,054	74,242	101,943	82
	Revenue**	62,770	22,779	180	55,544	68,566	76,659	104,996	
	Ln cost $_t$ / cost $_{t-1}$	0.03611	0.17392	-0.64688	-0.05549	0.02399	0.10066	0.58887	
	Ln revenue $_t$/ revenue $_{t-1}$	0.03559	0.19552	-0.64940	-0.06487	0.02476	0.09957	0.65909	
Petroleum	Cost*	57,586	53,898	2,769	10,215	55,354	72,511	218,544	65
	Revenue**	76,792	94,113	4,638	15,943	60,555	84,634	452,228	
	Ln cost $_t$ / cost $_{t-1}$	0.04612	0.20656	-0.35237	-0.05296	0.02296	0.13136	0.80511	
	Ln revenue $_t$/ revenue $_{t-1}$	0.03331	0.23462	-0.66545	-0.08351	0.03760	0.14985	0.75472	
Construction	Cost*	132,019	237,300	174	21,094	47,333	132,397	2,015,551	5,272
	Revenue**	136,941	246,680	212	21,748	49,045	135,420	2,168,285	
	Ln cost $_t$ / cost $_{t-1}$	0.02690	0.13266	-0.67110	-0.04520	0.02896	0.10185	0.68698	
	Ln revenue $_t$/ revenue $_{t-1}$	0.02572	0.13736	-0.74256	-0.04859	0.02892	0.10341	0.75482	
Foods	Cost*	72,220	212,318	27	5,542	16,471	56,063	3,464,264	6,679
	Revenue**	75,446	220,709	22	6,162	17,553	59,375	3,480,490	
	Ln cost $_t$ / cost $_{t-1}$	0.06045	0.15442	-0.72516	-0.01157	0.03919	0.11229	0.81494	
	Ln revenue $_t$/ revenue $_{t-1}$	0.06093	0.16605	-0.76474	-0.01254	0.03795	0.11462	0.85105	
Tectiles, Pulp and Paper	Cost*	43,365	100,497	16	3,610	10,185	31,938	1,045,802	6,287
	Revenue**	45,521	105,242	7	3,923	10,908	33,395	1,100,228	
	Ln cost $_t$ / cost $_{t-1}$	0.05120	0.17111	-0.71247	-0.03426	0.03310	0.11877	0.79249	
	Ln revenue $_t$/ revenue $_{t-1}$	0.05190	0.18957	-0.77349	-0.03882	0.03393	0.12721	0.84832	
Chemicals	Cost*	60,838	122,718	41	7,817	19,003	54,036	1,563,564	10,279
	Revenue**	66,040	131,944	10	8,578	20,478	58,024	1,602,062	
	Ln cost $_t$ / cost $_{t-1}$	0.04384	0.12206	-0.70580	-0.01651	0.03451	0.09264	0.80315	
	Ln revenue $_t$/ revenue $_{t-1}$	0.04249	0.13302	-0.73760	-0.01987	0.03496	0.09632	0.85053	
Resources and Materials	Cost*	100,727	294,103	158	9,626	22,143	70,419	3,678,713	8,040
	Revenue**	105,601	306,000	236	10,254	23,420	73,837	3,753,397	
	Ln cost $_t$ / cost $_{t-1}$	0.02205	0.13031	-0.72685	-0.04353	0.02438	0.08901	0.78846	
	Ln revenue $_t$/ revenue $_{t-1}$	0.02044	0.14584	-0.77351	-0.05065	0.02428	0.09562	0.82038	
Machinery and Electric Machinery	Cost*	97,397	374,006	10	8,861	19,449	49,936	4,862,221	14,947
	Revenue**	101,324	382,156	21	9,415	20,626	52,640	4,994,719	
	Ln cost $_t$ / cost $_{t-1}$	0.03525	0.15359	-0.73094	-0.04333	0.03814	0.11601	0.80750	
	Ln revenue $_t$/ revenue $_{t-1}$	0.03442	0.18155	-0.77308	-0.05260	0.04087	0.12769	0.85349	
Automobiles and Transportation Equipment	Cost*	136,215	531,671	23	11,284	26,030	63,670	10,970,663	11,402
	Revenue**	141,568	554,663	6	12,113	27,180	66,138	12,079,264	
	Ln cost $_t$ / cost $_{t-1}$	0.03515	0.13022	-0.73524	-0.02943	0.03336	0.09610	0.81312	
	Ln revenue $_t$/ revenue $_{t-1}$	0.03423	0.14288	-0.76523	-0.03243	0.03415	0.09974	0.84630	
Financial	Cost*	363,828	1,715,798	75	18,530	59,053	147,589	21,359,227	8,920
	Revenue**	369,269	1,720,356	51	20,414	61,312	152,949	21,403,613	
	Ln cost $_t$ / cost $_{t-1}$	0.04457	0.15367	-0.73556	-0.02835	0.03425	0.11203	0.81210	
	Ln revenue $_t$/ revenue $_{t-1}$	0.04371	0.16007	-0.75328	-0.03005	0.03524	0.11322	0.83715	
Broadcasting, Software, Commercial etc.	Cost*	118,766	383,299	101	9,540	24,001	63,343	6,034,976	11,944
	Revenue**	132,210	435,412	94	10,141	25,172	67,917	6,371,287	
	Ln cost $_t$ / cost $_{t-1}$	0.04143	0.12023	-0.71695	-0.01427	0.03405	0.09108	0.80006	
	Ln revenue $_t$/ revenue $_{t-1}$	0.04007	0.12611	-0.73672	-0.01583	0.03397	0.09146	0.83182	

* Operating costs, **Operating revenues

Table 2-5. Multicollinearity test

Panel A: LPEs

Variance inflation factors	
Explanatory Variable	VIF
$ln\ (revenue_{i,t}/revenue_{i,t-1})$	2.15166
$Decrease\_Dummy*ln\ (revenue_{i,t}/revenue_{i,t-1})$	2.140197
$Pop_{i,t}$	1.028519

VIF= centered variance inflation factor.

Panel B: CEs

Variance inflation factors	
Explanatory Variable	VIF
$ln\ (revenue_{i,t}/revenue_{i,t-1})$	2.31132
$Decrease\_Dummy*ln\ (revenue_{i,t}/revenue_{i,t-1})$	2.339443
$Pop_{i,t}$	2.256402

VIF= centered variance inflation factor.

4 Results

In panel data analysis, there is a process for choosing the optimal result from the model of pooled estimates, fixed effects, and random effects. the author describes all the analysis results and explain the optimal results. First, in all panel data analyses, the author used an F-test to determine whether a pooled model and a fixed effects model is more suitable[10]. The result confirms that the fixed/random effects model is more suitable than the pooled model. In addition, the author also conducted the Hausman test to confirm which model, the fixed effects or random effects model, is suitable. In addition, the author confirmed the influence of serial correlation through the Durbin-Watson ratio. The influence of serial correlation is low in all the analyses.

To test *Hypothesis 2-1* using model 2-1, the author analyzed panel data for 40 years. The results showed that LPEs' cost actions demonstrate asymmetric cost behavior (Panel

[10] In this research, Breusch-Pagan test which can compare between pooled model and random effects model are omitted

A of Table 2-6). Namely, β_2 was 0.0791 (fixed effects), and the positive value indicates anti-sticky costs. Conversely, the CE analysis resulted in a β_2 value of -0.0978 (fixed effects), and the negative value indicates sticky costs (Panel B of Table 2-6). Thus, *Hypothesis 2-1* was not supported.

Table 2-6. Cost behavior based on the panel data analysis using model 2-1

Variable	Pred. sign	Panel A: LPEs			Panel B: CEs		
		Coefficient	t-stat		Coefficient	t-stat	
β_0		0.0207	68.24	***	0.0026		***
β_1	+	0.4952	183.96	***	0.8647		***
β_2	−	***0.0791***	***10.69***	***	***-0.0978***	***-24.92***	***
$Adj.R^2$		0.3355			0.8467		
N		115,929			84,343		
Panel data		Fixed effects			Fixed effects		
DW		2.1819			1.8114		

Note: For β_0, β_1, and β_2, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test. *, **, and *** denote significance at levels of 0.1, 0.05, and 0.01. Adj.R^2, *DW*, and N mean Adjusted R^2, Durbin-Watson ratio, and Number of observations, respectively.

Under institutional constraints, it was predicted that sticky costs would increase because LPEs are subject to stronger institutional pressures than CEs. However, the analysis resulted in the opposite conclusion, which was not expected. In previous studies, no research showed that public organizations' cost behavior was anti-sticky (Yasukata et al. 2011; Bradbury and Scott 2018; Cohen et al. 2017; Holzhacker et al. 2015). Additionally, Banker and Byzalov (2014) argued that CEs' cost behavior generally indicated sticky costs on average. Clearly, this result is a new discovery that contrasts with previous studies.

This result signifies that LPE administrators actively manage their resource-adjustable costs when their operating revenue decreases and the pressure for low-cost economic efficiency increases. the author believes that the lack of support for this hypothesis might be driven by the accounting (regulations on dividends and retained

earnings) and management system (redundancies, i.e., preparation for disasters such as a standby isolated power unit and food stockpiled for emergencies) differences between CEs and LPEs. Namely, the anti-sticky costs are induced by resource-adjustable costs, which imply that there are redundant resources caused by LPEs' accounting and management systems.

Regarding the accounting system, the author focuses on the appropriation of retained earnings and the net income of LPEs. The retained earnings of CEs are often allocated to stakeholders, such as shareholders, managers, or workers. Unlike CEs, LPEs are subject to legal restrictions regarding how they can appropriate retained earnings. Namely, it is unnecessary for LPEs to distribute their final profits to stakeholders, such as shareholders, managers, and workers. Additionally, because they can receive preferential treatment regarding corporate tax and property tax, their retained earnings may often be generated. However, LPEs are required to operate with moderate profits and not to maximize their net income. Therefore, the author conjectures that LPE administrators intend to ensure their management resource slack so that they can adjust quickly when operating revenue declines. Because the slack resources in LPEs are oriented toward preventing disasters, they are not necessary for normal operations. Therefore, there is a great deal of room for discretion; thus, it is easy to reduce these resources. In other words, LPE administrators may increase their management resources, thus increasing their operating expenses, in order to avoid significantly increasing their operating profits. In fact, as shown in Panel B of Figure 2-2, operating expenses and operating revenues show very similar, consistent movements over the long term. LPEs thus may accumulate excessive management resources rather than repaying their bonds. Because LPEs have little risk of bankruptcy, they may not make the effort to repay their debt; on the contrary, it is possible

that they intend to bear the cost of procuring excessive management resources accordingly. Therefore, they can use their profit for management resources instead of bond repayment.

Next regarding the management system, the author focuses on public sector management, especially the redundancy of management resources. Cyert and March (1963) argued that organizations use internal rules for different purposes to compensate for environmental changes. In public sector management, retaining slack management resources is explained as a necessary cost "redundancy" to prepare for disaster (Koike et al. 2015), such as retaining emergency equipment or facilities that can provide public services in a disaster such as an earthquake, typhoon, eruption, or flood. Therefore, LPEs are allowed to retain slack management resources as redundant management resources because LPE administrators can explain that it is necessary to secure slack resources for the public interest. That is, they earn legitimacy for their spending by retaining slack resources as redundant resources. LPE administrators can therefore adjust their costs for redundancy; in other words, they can increase the slack resources that are designated redundant resources when operating revenue is likely to exceed operating expenses; conversely, they can easily decrease the slack resources designated as redundant resources when their net income is in deficit and the disaster does not occur. the author believes that when operating revenue is declining, it might actively reduce the holding costs of these slack resources, and therefore, the author conjectures that anti-sticky costs appear in LPEs. Thus, the author believes that LPE administrators may avoid sticky costs and obtain legitimacy for their spending by retaining redundant management resources and adhering to regulations for the disposal of net profits.

To verify *Hypothesis 2-2*, the author analyzed the cross-section of cost behavior using the data for each year separately and verified that the change was dynamic over time (Table 2-7). It is possible to confirm the tendency of the change in cost behavior through

time (Figure 2-4) [11]. Two characteristics—sticky costs and anti-sticky costs—were confirmed by the dynamic analysis. Panel A of Table 2-7 and Panel A of Figure 2-4 may show that β_2 changed from a positive to a negative value for LPEs' cost behavior, that the deviations of the β_2 values were large and that the year-to-year change in β_2 had a negative slope. Thus, the results show that anti-sticky costs gradually weakened. Especially from 1975 to 2002, β_2 had primarily positive values, indicating anti-sticky costs. However, the degree of anti-sticky costs gradually decreased, especially after 2004, when β_2 was primarily negative, indicating sticky costs. In contrast, in the analysis of CEs, β_2 was primarily negative in Panel B of Table 2-7 and Panel B of Figure 2-4. The average cost stickiness changed slightly with time but, in contrast to the results for the LPEs, there was no significant change in the value of β_2 for CEs over time. Thus, institutional pressures were associated with the change in LPEs' cost behavior over time, in contrast to that of CEs; *Hypothesis 2-2* was partly supported for LPEs after around the year 2000.

[11] This result was equivalent and consistent with the results using panel data analysis with the time trend dummy variable: $\ln\left(\frac{Cost_{i,t}}{Cost_{i,t-1}}\right) = \beta_0 + \beta_1 * \ln\left(\frac{Revenue_{i,t}}{Revenue_{i,t-1}}\right) + \beta_2 * Decrease\_Dummy_{i,t} * \ln\left(\frac{Revenue_{i,t}}{Revenue_{i,t-1}}\right) + \beta_3 * Timetrend + \beta_4 * Decrease\_Dummy_{i,t} * \ln\left(\frac{Revenue_{i,t}}{Revenue_{i,t-1}}\right) * Timetrend + \varepsilon_{i,t}$

Table 2-7. The results for individual years based on OLS analysis using model 2-1

Panel A: LPEs

Year	β_0	β_1	β_2	$Adj.R^2$	N	*F-statistic*	*Prob(F-statistic)*
1975	0.0834 ***	0.2884 ***	0.4668 ***	0.2751	2,656	504.75	0.00
1976	0.0864 ***	0.2572 ***	0.6934 ***	0.2730	2,723	512.00	0.00
1977	0.0860 ***	0.3476 ***	0.4302 ***	0.2701	2,802	519.33	0.00
1978	0.0528 ***	0.3991 ***	0.2634 ***	0.2763	2,858	546.30	0.00
1979	0.0667 ***	0.4025 ***	0.2336 ***	0.2648	2,886	520.66	0.00
1980	0.0916 ***	0.3922 ***	0.3728 ***	0.3513	2,890	783.28	0.00
1981	0.0476 ***	0.3327 ***	0.2413 ***	0.2548	2,934	502.45	0.00
1982	0.0255 ***	0.3887 ***	0.1806 ***	0.2594	2,962	519.64	0.00
1983	0.0246 ***	0.4699 ***	0.1482 ***	0.2988	2,991	637.99	0.00
1984	0.0297 ***	0.4181 ***	0.0902 *	0.2515	3,028	509.42	0.00
1985	0.0317 ***	0.4139 ***	0.2455 ***	0.2602	3,050	537.21	0.00
1986	0.0197 ***	0.4338 ***	0.2608 ***	0.2680	3,075	563.78	0.00
1987	0.0143 ***	0.5593 ***	0.1810 ***	0.3488	3,080	825.59	0.00
1988	0.0242 ***	0.5104 ***	0.1485 ***	0.2868	3,110	626.03	0.00
1989	0.0243 ***	0.5686 ***	0.0430	0.3046	3,119	683.80	0.00
1990	0.0384 ***	0.5471 ***	-0.0170	0.2625	3,130	557.86	0.00
1991	0.0400 ***	0.5447 ***	0.0765	0.2582	3,137	546.72	0.00
1992	0.0306 ***	0.5313 ***	-0.1058 **	0.2550	3,163	542.28	0.00
1993	0.0280 ***	0.5212 ***	0.1578 ***	0.2928	3,179	658.97	0.00
1994	0.0231 ***	0.4643 ***	-0.1466 ***	0.1953	3,180	386.74	0.00
1995	0.0132 ***	0.5559 ***	0.0230	0.2637	3,200	573.78	0.00
1996	0.0130 ***	0.4663 ***	0.2584 ***	0.2767	3,204	613.60	0.00
1997	0.0156 ***	0.4735 ***	0.2397 ***	0.2874	3,218	649.59	0.00
1998	0.0105 ***	0.4898 ***	0.2175 ***	0.2764	3,219	615.49	0.00
1999	0.0091 ***	0.5487 ***	0.1725 ***	0.2742	3,230	610.90	0.00
2000	0.0049 ***	0.5338 ***	0.1411 ***	0.2718	3,218	601.34	0.00
2001	0.0114 ***	0.4594 ***	0.2003 ***	0.2171	3,224	447.96	0.00
2002	-0.0038 **	0.4173 ***	0.1568 ***	0.2193	3,232	454.84	0.00
2003	-0.0032 **	0.5785 ***	-0.0134	0.2736	3,198	602.98	0.00
2004	-0.0028 *	0.6758 ***	-0.2361 ***	0.3058	2,821	622.12	0.00
2005	-0.0025	0.8186 ***	-0.3796 ***	0.4385	2,454	958.94	0.00
2006	0.0017	0.5754 ***	-0.2197 ***	0.1988	2,725	338.93	0.00
2007	0.0032 **	0.4978 ***	0.0439	0.2448	2,708	439.79	0.00
2008	0.0033 **	0.4470 ***	-0.0240	0.2427	2,710	435.20	0.00
2009	-0.0040 ***	0.5068 ***	-0.1284 ***	0.2081	2,698	355.35	0.00
2010	-0.0040 ***	0.4387 ***	-0.1333 ***	0.1414	2,723	225.06	0.00
2011	0.0052 ***	0.5021 ***	-0.2221 ***	0.1472	2,687	232.87	0.00
2012	0.0061 ***	0.3067 ***	0.0309	0.1048	2,740	161.25	0.00
2013	0.0085 ***	0.3630 ***	-0.0593	0.0799	2,767	121.07	0.00

*significant at the 10% level, **significant at the 5% level, ***significant at the 1% level, $Adj.R^2$=Adjusted R^2, N=Number of Observations

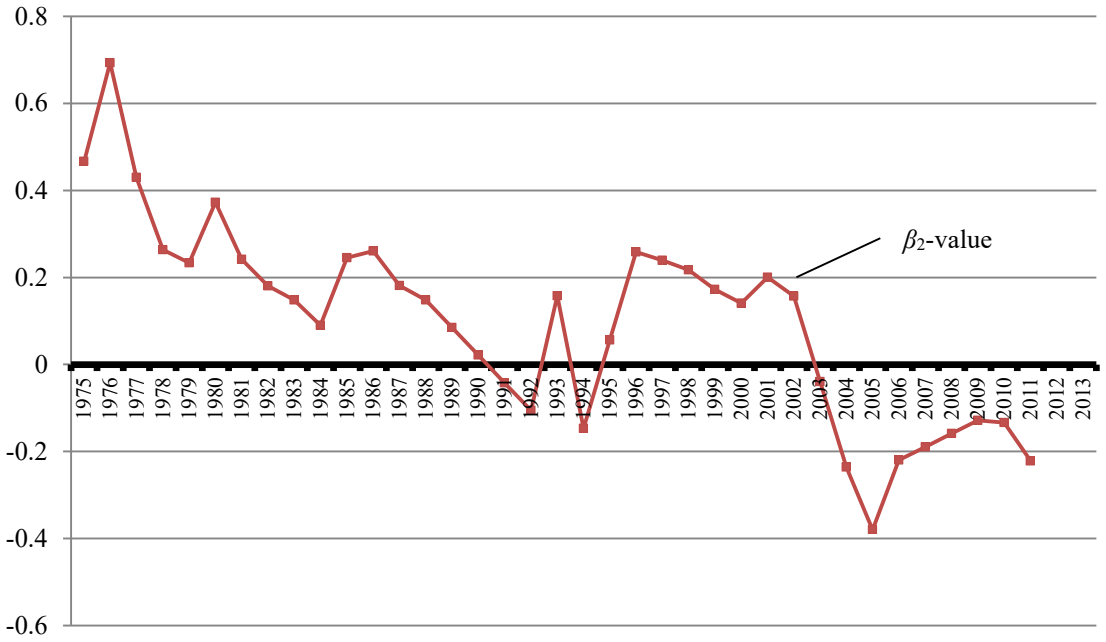
Panel B: CEs

Year	β_0	β_1	β_2	$Adj.R^2$	N	*F-statistic*	*Prob(F-statistic)*
1975	0.0298 ***	0.8926 ***	-0.1076 ***	0.9298	1,053	6,966.39	0.00
1976	0.0168 ***	0.8543 ***	-0.0567 **	0.9092	1,065	5,330.40	0.00
1977	0.0123 ***	0.8500 ***	-0.0206	0.9236	1,090	6,579.05	0.00
1978	0.0119 ***	0.9113 ***	0.0097	0.9332	1,149	8,025.62	0.00
1979	-0.0017	0.9397 ***	-0.1150 ***	0.9321	1,367	9,374.25	0.00
1980	0.0069 ***	0.9050 ***	0.1452 ***	0.9241	1,385	8,428.48	0.00
1981	0.0137 ***	0.8879 ***	0.1137 ***	0.9383	1,406	10,678.92	0.00
1982	0.0096 ***	0.9295 ***	-0.0363 *	0.9400	1,436	11,249.80	0.00
1983	0.0059 ***	0.9583 ***	-0.1630 ***	0.9342	1,479	10,497.84	0.00
1984	0.0033 ***	0.9371 ***	-0.0730 ***	0.9509	1,525	14,756.17	0.00
1985	0.0024 **	0.9439 ***	-0.0812 ***	0.9506	1,575	15,138.00	0.00
1986	0.0065 ***	0.9357 ***	-0.0535 ***	0.9432	1,621	13,444.14	0.00
1987	0.0014	0.9704 ***	-0.0997 ***	0.9364	1,673	12,319.27	0.00
1988	-0.0027 **	0.9274 ***	-0.0356 *	0.9156	1,720	9,322.80	0.00
1989	0.0035 ***	0.8948 ***	0.0722 ***	0.9404	1,759	13,874.49	0.00
1990	0.0040 ***	0.9445 ***	-0.1287 ***	0.9125	1,837	9,573.52	0.00
1991	0.0073 ***	0.9377 ***	-0.0722 ***	0.9292	1,916	12,558.01	0.00
1992	0.0062 ***	0.9458 ***	-0.0883 ***	0.9367	1,981	14,654.93	0.00
1993	0.0007	0.9829 ***	-0.2312 ***	0.9381	2,053	15,552.19	0.00
1994	-0.0014	0.9539 ***	-0.1195 ***	0.9304	2,107	14,068.74	0.00
1995	-0.0025 ***	0.9156 ***	-0.0387 ***	0.9294	2,150	14,142.35	0.00
1996	0.0009	0.9173 ***	-0.0425 **	0.9256	2,214	13,765.34	0.00
1997	-0.0018 *	0.9506 ***	-0.1833 ***	0.9018	2,320	10,654.80	0.00
1998	0.0023 ***	0.9527 ***	-0.1180 ***	0.9396	2,398	18,638.26	0.00
1999	-0.0095 ***	0.9371 ***	-0.1462 ***	0.9215	2,487	14,597.35	0.00
2000	-0.0055 ***	0.9057 ***	-0.0351 **	0.8997	2,554	11,446.83	0.00
2001	-0.0052 ***	0.9058 ***	-0.3004 ***	0.8385	2,637	6,845.25	0.00
2002	0.0021	0.8670 ***	-0.1067 ***	0.8690	2,730	9,054.03	0.00
2003	-0.0057	0.8663 ***	-0.0434 **	0.8287	2,869	6,938.02	0.00
2004	-0.0005	0.8287 ***	0.0063	0.8195	2,929	6,647.12	0.00
2005	0.0023	0.8583 ***	-0.1164 ***	0.8104	2,963	6,331.68	0.00
2006	0.0044 ***	0.8663 ***	-0.1177 ***	0.8128	2,974	6,456.73	0.00
2007	0.0056 ***	0.8797 ***	-0.2054 ***	0.7544	3,007	4,617.78	0.00
2008	0.0120 ***	0.7870 ***	-0.0728 ***	0.6937	3,054	3,457.98	0.00
2009	0.0061 ***	0.8248 ***	-0.1069 ***	0.7444	3,098	4,511.85	0.00
2010	-0.0211 ***	0.7556 ***	-0.0237	0.7156	3,112	3,914.58	0.00
2011	-0.0009	0.7059 ***	-0.0111	0.6902	3,183	3,545.08	0.00
2012	0.0064 ***	0.6528 ***	0.0077	0.6426	3,206	2,881.67	0.00
2013	0.0012	0.7256 ***	-0.0174	0.6940	3,261	3,698.40	0.00

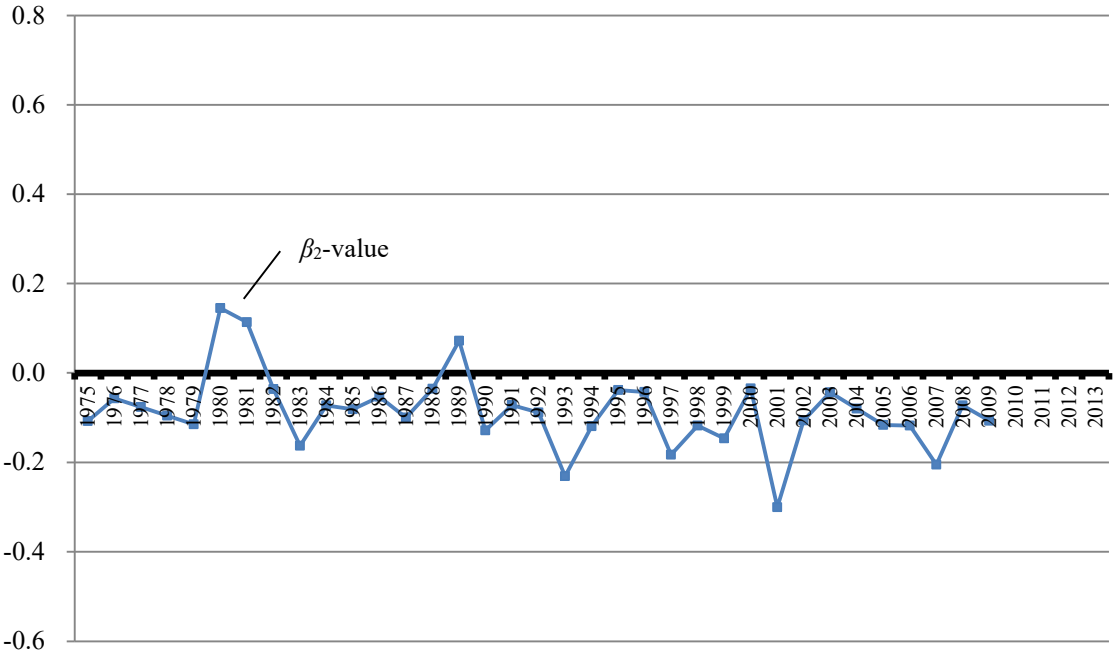
*significant at the 10% level, **significant at the 5% level, ***significant at the 1% level, $Adj.R^2$=Adjusted R^2, N=Number of Observations

Figure 2-4. β_2 value (sticky cost value) changes in each year

Panel A: LPEs



Panel B: CEs



Considering the change in LPEs' long-term cost behavior, one can assume that the asymmetric cost behavior changed substantially after around the year 2000. LPEs gradually lost redundancy due to surplus profits and, simultaneously, the potential loss of cost adjustment flexibility. Additionally, LPEs and CEs had significantly different cost behavior characteristics. the author hypothesized that these different cost behavior characteristics were caused by institutional constraints, especially those serving the "public interest". LPEs provide services in a constant and stable manner, and the quality of the public services must be maintained over the long term. For this purpose, LPEs must always maintain their facilities and equipment. For example, if the LPE is operating a water supply project, it will be necessary to constantly update the water pipeline and maintain the dam facility. However, in a long-term business, obsolete equipment must be repaired or replaced, even if revenues decrease. Moreover, it is difficult to increase utility fees. Since repair or replacement costs, as substantial fixed costs, increase with the passage of time[12], the author suggests that increases in repair or replacement costs for large-scale facilities gradually lead LPEs to lose redundant management resources and cost adjustment flexibility. As a result, the author assumes that LPE administrators cannot gain gradual control over the efficiency of their services. In other words, LPE management is strongly affected by institutional pressure to protect the public interest. Therefore, the author conjectures that this inefficiency risk is affected by an increase in reinvestment (replacement) costs for large-scale facilities or equipment.

Next, to verify *Hypothesis 2-3*, the author analyzed each industry type (Table 2-8) using model 2-1. the author found significant results for all industries except for the toll road business. The results show that the presence of not only sticky costs but also anti-sticky costs was confirmed. Various cost behaviors appeared in LPEs for each industry.

---

[12] Repair costs (including replacement costs) increased by a factor of 7.6 times from 1974 to 2013.

Based on these results, *Hypothesis 2-3* was partially supported. the author found that similar to CEs, LPEs demonstrated diverse cost behaviors in each industry. In particular, considering the industry types with a high ratio of human resources[13], transportation businesses' cost behavior reflected anti-sticky costs (β_2 was 0.0693 (fixed effects)), while hospital businesses' cost behavior reflected sticky costs (β_2 was -0.1640 (fixed effects)). For the industry types with a high ratio of material resources[14], residential water supply, industrial water supply, and gas power businesses' cost behavior reflected anti-sticky costs (β_2 was 0.2908 (fixed effects), 0.0565 (random effects), and 0.3996 (fixed effects)), while electricity and sewage businesses' cost behavior reflected sticky costs (β_2 was -0.1473 (random effects) and -0.2656 (fixed effects)).

[13] According to the LPEs' yearbook in 2013, labor cost ratios are as follows: residential water supply is 12.5%, industrial water supply is 11.9%, sewerage is 6.4%, transportation is 33.3%, electric power is 25.1%, gas power is 8.5%, and hospitals are 46.5%.

[14] According to the LPEs' yearbook in 2013, depreciation cost ratios are as follows: residential water supply is 32.7%, industrial water supply is 39.6%, sewerage is 44.0%, transportation is 25.7%, electric power is 26.2%, gas power is 13.0%, and hospitals are 6.5%.

Table 2-8. Cost behavior of each industry based on the panel data analysis using model 2-1

Panel A: LPEs

Variable	Residential Water Supply			Industrial Water Supply			Sewage			Transportation			Electric Power		
	Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat	
β_0	0.0261	59.80	***	0.0135	9.36	***	0.0100	6.05	***	0.0073	3.94	***	0.0165	6.70	***
β_1	0.4719	131.64	***	0.3111	22.23	***	0.4179	33.18	***	0.4159	19.27	***	0.5541	19.06	***
β_2	***0.2908***	***24.29***	***	***0.0565***	***1.83***	*	***-0.2713***	***-7.58***	***	***0.0693***	***1.66***	*	***-0.1473***	***-1.81***	*
$Adj.R^2$	0.3115			0.1004			0.2120			0.2545			0.2829		
N	64,675			7,296			4,525			2,677			1,261		
DW	2.2369			2.1257			1.8679			2.0660			2.4386		
Panel date	Fixed			Random			Random			Fixed			Random		

Variable	Gas Power			Hospital			Wholesale Market			Toll Road			Car Parking		
	Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat	
β_0	0.0174	9.61	***	0.0128	33.33	***	0.0134	3.85	***	0.0131	1.31		-0.0197	-2.26	**
β_1	0.6705	43.62	***	0.6279	166.43	***	0.5407	9.45	***	0.4400	6.12	***	0.7101	8.25	***
β_2	***0.3996***	***6.56***	***	***-0.1640***	***-20.38***	***	***0.2506***	***1.85***	*	***-0.1208***	***-0.91***		***-0.6605***	***-4.74***	***
$Adj.R^2$	0.5892			0.5954			0.2622			0.1951			0.1690		
N	2,274			32,066			516			270			369		
DW	2.3448			1.9436			2.0174			1.7790			2.2295		
Panel date	Fixed			Fixed			Random			Random			Random		

Note: For β_0, β_1, and β_2, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test. *, **, and *** denote significance at levels of 0.1, 0.05, and 0.01. $Adj.R^2$, DW, and N mean Adjusted R^2, Durbin-Watson ratio, and Number of observations, respectively.

Panel B: CE

Variable	Agriculture and Fishery			Mining			Petroleum			Construction			Foods			Tectiles, Pulp and Paper		
	Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat	
β_0	0.0084	1.37		0.0059	0.52		0.0049	0.21		0.0011	1.85	*	0.0041	3.23	***	0.0075	4.84	***
β_1	0.7539	27.05	***	0.8134	12.64	***	0.7625	6.51	***	0.9576	205.95	***	0.8520	102.46	***	0.7865	83.75	***
β_2	***-0.0202***	***-0.37***		***-0.0254***	***-0.21***		***-0.2344***	***-1.11***		***-0.0308***	***-3.67***	***	***-0.1697***	***-9.37***	***	***-0.0721***	***-3.92***	***
$Adj.R^2$	0.7751			0.8112			0.6237			0.9556			0.7851			0.7796		
N	426			82			65			5,272			6,679			6,287		
DW	2.0054			1.6398			2.3279			2.0396			1.7382			1.7361		
Panel date	Random			Random			Fixed			Random			Fixed			Fixed		

Variable	Chemicals			Resources and Materials			Machinery and Electric Machinery			Automobiles and Transportation Equipment			Financial			Broadcasting, Software, Commercial etc.		
	Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat	
β_0	0.0030	3.54	***	0.0021	2.65	***	0.0034	5.41	***	0.0025	3.22	***	-0.0008	-0.75		0.0010	1.75	*
β_1	0.8503	121.25	***	0.8592	136.03	***	0.8267	200.41	***	0.8835	193.04	***	0.9207	140.29	***	0.9331	198.05	***
β_2	***-0.1780***	***-12.44***	***	***-0.0574***	***-5.22***	***	***-0.0676***	***-9.31***	***	***-0.0739***	***-8.78***	***	***-0.1547***	***-12.37***	***	***-0.1265***	***-13.64***	***
$Adj.R^2$	0.7667			0.8728			0.8961			0.8806			0.8080			0.8792		
N	10,279			8,040			14,947			11,402			8,920			11,944		
DW	1.6892			1.8629			1.8500			1.7211			1.7943			2.0349		
Panel date	Fixed			Fixed			Fixed			Random			Random			Fixed		

Note: For β_0, β_1, and β_2, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test. *, **, and *** denote significance at levels of 0.1, 0.05, and 0.01. $Adj.R^2$, *DW*, and N mean Adjusted R^2, Durbin-Watson ratio, and Number of observations, respectively.

The various cost behaviors suggest that there are factors other than the influence of the adjustment cost for human resources and material resources. It is possible that the non-exclusion of public services and the influence of monopolies also exert an influence on cost behaviors. Public services provide essential, lifesaving activities that cannot be managed based on CEs' economic principles. For example, it is impossible to cut off the electric power supply of people who do not pay their bills or to fail to provide medical services to those who cannot pay for them. Thus, these businesses would not be profitable for CEs. In LPE businesses with sticky costs, the author conjectures that these non-exclusionary public services (welfare services for free) make LPEs' cost management less flexible from the perspective of institutional constraints, especially in terms of protecting the public interest. On the other hand, these LPEs' businesses are projects that require substantial investment and that cannot be procured by the private sector; therefore, the market share ratio of LPEs is generally high[15]. In these high market share business environments, it may be possible to manage their costs by accurately forecasting the necessary resources for the future without idle capacity costs. Therefore, the author believes that the evidence of anti-sticky costs in the residential water supply business and the industrial water supply business originates from managing the supply based on the accurate prediction of demand.

Next, to verify *Hypothesis 2-4*, the author analyzed whether population changes impact LPEs' cost behavior. Table 2-9 shows the results of model 2-2. In Panel A of Table 2-9, β_3 indicates the influence of the total population and is -0.3080 (fixed effects); β_4 shows the influence of the youth population (0-14 years old) and is 0.5216 (fixed effects); β_5 shows the influence of the productive age population and is not

[15] According to the LPEs' yearbook in 2013, the market share ratios are as follows: residential water supply is 99.5%, industrial water supply is 99.9%, sewerage is 91.3%, transportation (railway) is 13.4%, electric power is 1.0%, gas power is 2.3%, and hospitals are 12.3%.

significant; and β_6 indicates the effect of the elderly population and is -0.0901 (fixed effects). In particular, it should be noted that the changes in the total population (β_3) and the elderly population (β_6) may have had negative impacts on LPEs' cost behavior after 1995. Conversely, the youth population acted to strengthen the anti-sticky costs. Thus, *Hypothesis 2-4* was almost supported.

Table 2-9. Population changes and cost behavior based on the panel data analysis by model 2-2

Panel A: LPEs

Variable	The Effect of Total Population Change			The Effect of Youth (0-14 years) Population Change			The Effect of Middle-aged (15-64 years) Population Change			The Effect of Elderly (65+ years) Population Change		
	Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat	
β_0	0.0041	10.66	***	0.0041	10.80	***	0.0041	10.60	***	0.0041	10.72	***
β_1	0.5227	84.53	***	0.5212	84.34	***	0.5227	84.53	***	0.5224	84.47	***
β_2	-0.0401	-3.60	***	0.9987	9.89	***	-0.0861	-1.67	*	-0.1721	-3.70	***
$\boldsymbol{\beta_3}$	***-0.3080***	***-2.17***	**									
$\boldsymbol{\beta_4}$				***0.5216***	***10.36***	***						
$\boldsymbol{\beta_5}$							***-0.0954***	***-0.90***				
$\boldsymbol{\beta_6}$										***-0.0901***	***-2.91***	***
$Adj.R^2$	0.2346			0.2361			0.2345			0.2346		
N	55,976			55,976			55,976			55,976		
DW	2.3250			2.3227			2.3245			2.3246		
Panel date	Fixed effets			Fixed effets			Fixed effets			Fixed effets		

Note: From β_0 to β_6, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test. β_3 means Pop_total, β_4 means Pop_youth, β_5 means Pop_middle and β_6 means Pop_elder, respectively. *, **, and *** denote significance at levels of 0.1, 0.05, and 0.01. $Adj.R^2$, DW, and N mean Adjusted R^2, Durbin-Watson ratio, and Number of observations, respectively.

Panel B: CEs

Variable	The Effect of Total Population Change			The Effect of Youth (0-14 years) Population Change			The Effect of Middle-aged (15-64 years) Population Change			The Effect of Elderly (65+ years) Population Change		
	Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat	
β_0	0.0021	5.01	***	0.0023	5.58	***	0.0023	5.49	***	0.0023	5.59	***
β_1	0.8049	253.81	***	0.8047	254.01	***	0.8048	254.03	***	0.8047	254.02	***
β_2	-0.0567	-10.10	***	-0.3699	-10.66	***	0.3057	7.28	***	1.1022	9.02	***
β_3	***2.4228***	***2.71***	***									
β_4				***-0.2005***	***-9.21***	***						
β_5							***0.8441***	***8.65***	***			
β_6										***0.5842***	***8.65***	***
$Adj.R^2$	0.8075			0.8078			0.8077			0.8077		
N	53,146			53,146			53,146			53,146		
DW	1.8569			1.8523			1.8525			1.8525		
Panel date	Fixed effets			Fixed effets			Fixed effets			Fixed effets		

Note: From β_0 to β_6, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test. β_3 means Pop_total, β_4 means Pop_youth, β_5 means Pop_middle and β_6 means Pop_elder, respectively. *, **, and *** denote significance at levels of 0.1, 0.05, and 0.01. $Adj.R^2$, DW, and N mean Adjusted R^2, Durbin-Watson ratio, and Number of observations, respectively.

In contrast, population changes also impact CEs' cost behavior, as shown in Panel B of Table 2-9. The influence of the total population β_3 is 2.4228 (fixed effects), the influence of the youth population β_4 is -0.2005 (fixed effects), the influence of the productive age population β_5 is 0.8441 (fixed effects), and the influence of the elderly population is 0.5842 (fixed effects). Thus, the results confirm that population changes affect cost management for not only LPEs but also CEs. Furthermore, population changes, except in the youth population, positively influence CEs' cost management. the author argues that cost management corresponding to population changes is important for both CEs and LPEs. In particular, since 1995, LPEs have had to consider that changes in the total population and the elderly population affect cost management.

Next, using model 2-3, the author verified that LPEs' long-term cost management was performed over 4-year periods, verifying *Hypothesis 2-5*. Thus, LPE administrators decide to control costs under normative institutional constraints from the local parliament and mayor. The results of the analysis are shown in Table 2-10, and the changes in the asymmetry of LPEs' and CEs' cost behaviors over 4 years are shown in Figure 2-5. In the analysis of model 2-3, the β_2 value is the magnitude of change from t-1 to t, which indicates whether the asymmetric cost behavior involved sticky costs or anti-sticky costs. Additionally, the β_4, β_6, and β_8 values represented the annual change in asymmetric cost behavior for t-1/t-2, t-2/t-3, and t-3/t-4, respectively. The result of the analysis of LPEs in Panel A of Table 2-10 shows that β_2 was 0.1157 (fixed effects), and the positive value indicates that anti-sticky costs were observed over the short term. However, the asymmetric cost behavior values (β_4, β_6, and β_8) gradually approached zero through each period and were 0.0226, -0.0179, and -0.0158 (fixed effects), respectively, and the change from a positive value to a negative value occurred over 4 years. It can be theorized that the anti-sticky value gradually shifted in the direction of

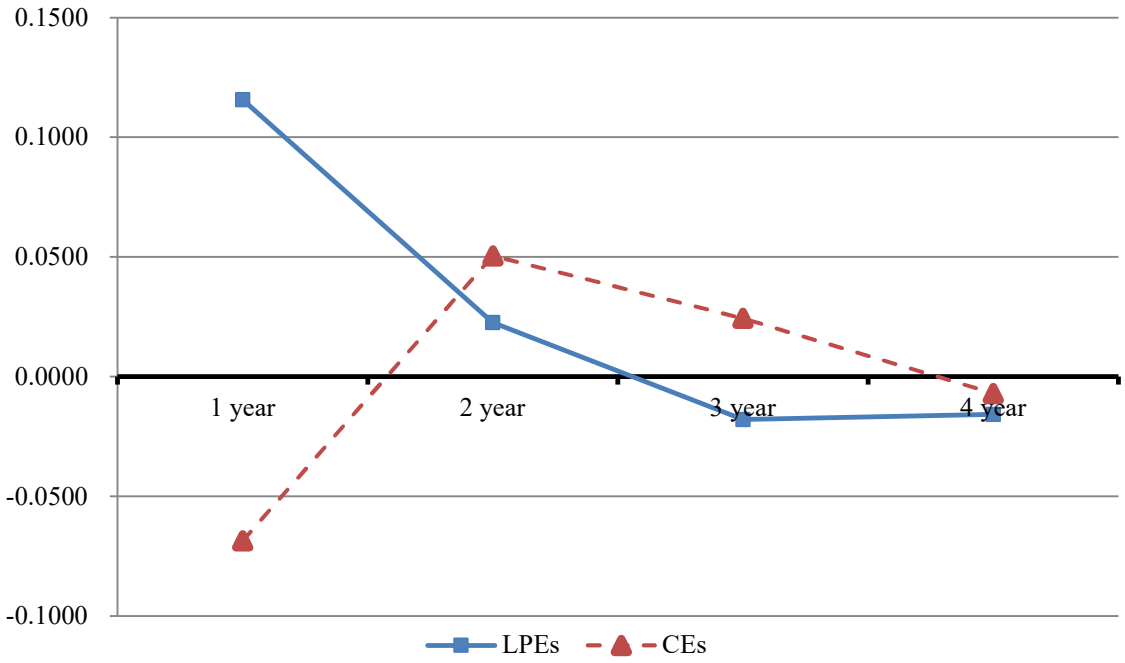
the value of sticky costs within 4 years. Thus, the administrators of LPEs managed their costs to approximate a proportional relationship throughout the four years, with the goal of stable operations. Therefore, *Hypothesis 2-5* was supported.

Table 2-10. Cost behavior over 4 years based on the panel data analysis using model 2-3

Variable		Panel A: LPEs			Panel B: CEs		
		Coefficient	t-stat		Coefficient	t-stat	
β_0		0.0122	30.76	***	0.0015	4.45	***
β_1		0.4693	135.29	***	0.8760	428.33	***
β_2	***(t/t-1)***	***0.1157***	***13.89***	***	***-0.0685***	***-19.31***	***
β_3		0.0550	17.18	***	0.0346	17.41	***
β_4	***(t-1/t-2)***	***0.0226***	***2.76***	***	***0.0505***	***14.23***	***
β_5		0.0690	23.75	***	0.0213	11.15	***
β_6	***(t-2/t-3)***	***-0.0179***	***-2.23***	**	***0.0244***	***7.02***	***
β_7		0.0456	17.58	***	0.0217	12.45	***
β_8	***(t-3/t-4)***	***-0.0158***	***-2.09***	**	***-0.0070***	***-2.12***	**
$Adj.R^2$		0.3104			0.8956		
N		100,923			72,814		
DW		2.2610			2.1173		
Panel date		Fixed effets			Fixed effets		

Note: From β_0 to β_8, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test. *, **, and *** denote significance at levels of 0.1, 0.05, and 0.01. $Adj.R^2$, DW, and N mean Adjusted R^2, Durbin-Watson ratio, and Number of observations, respectively.

Figure 2-5. β_2, β_4, β_6, and β_8 value (sticky cost value) change in each 4-year period



The analysis of CEs in Panel B of Table 2-10 contrasts with the analysis of LPEs. β_2 was -0.0685 (fixed effects), and the negative value indicates sticky costs. Additionally, the value changed in the subsequent period. The three asymmetric cost behavior values (β_4, β_6, and β_8) were 0.0505, 0.0244, and -0.0070 (fixed effects), respectively, and the change from a negative value to a positive value occurred over 4 years. Therefore, CE managers returned costs to a proportional relationship to secure profits as quickly as possible.

LPEs balance the public interest and efficiency, and this process requires sustainable management. Therefore, with a focus on the four-year change in cost behavior, it was theorized that administrators decide to maintain their costs after anti-sticky costs are observed. Additionally, they decide to improve services in the public interest instead of pursuing excessive efficiency, which may be due to institutional pressure stemming from the election of a local parliament and mayor.

5 Conclusions

This study verified the long-term cost behavior of Japanese LPEs by comparing these firms with CEs. the author found five primary results. First, it was generally believed that LPEs are less efficient than private enterprises (CEs), but when examining the cost behavior change, the results revealed that LPEs are not necessarily inefficient with regard to cost stickiness. A panel data analysis covering 40 years showed contrasting results. The results indicated that sticky costs were confirmed for CEs, whereas anti-sticky costs were present among LPEs. the author believes that the lack of support for this expectation might be driven by differences between CEs' and LPEs' accounting and management systems. In terms of the difference in accounting systems, the regulations on dividends and retained earnings mark a difference in accounting systems. LPEs are also subject to legal restrictions regarding how they can appropriate retained earnings, though they may often be generated since they can receive preferential treatment regarding corporate tax and property tax. Furthermore, LPE administrators are not allowed to receive dividends from the organization's profits. Therefore, it is possible that LPE administrators intend to ensure that they have slack management resources because LPEs are required to operate with moderate profits and not to maximize their net income. In terms of the difference in management systems, securing slack resources is different in CEs and LPEs. LPEs earn legitimacy for their spending by retaining slack resources as facilities for disasters (i.e., redundancies) because they must serve the public interest. For this reason, the author believes that it is possible that profits may be allocated to the expenses of redundancies if the LPE administrator predicts an increase in profits. the author also suggests that compared to CEs, LPEs have more redundancies that allow them to adjust their management resources. Based on the results of the analysis, the author argues that choosing LPEs as public service providers over outsourcing and privatization was a successful decision in terms of cost

management, and it was not a mistake since LPEs can manage their costs by maintaining the flexibility of cost adjustment.

Second, the cross-sectional analysis for each year shows that the timeline transition of cost behavior is different between LPEs and CEs. Namely, LPEs' anti-sticky costs have shifted to sticky costs even though CEs' cost behavior remained unchanged. Therefore, the fluctuation of LPEs' cost behavior suggests that LPE administrators gradually lost the flexibility to adjust costs around the year 2000. In other words, LPEs are gradually losing redundancy due to surplus profits. the author supposes that this trend has occurred because LPEs have experienced strong institutional pressure to protect the public interest from the viewpoint of maintaining public service quality. Namely the author conjectures that this inefficiency risk is affected by increases in repair and replacement costs. Obsolete equipment must be repaired or replaced in order to maintain public service quality, even when revenues decrease. Since repair and replacement costs, as fixed costs, increase with the passage of time, the author suggests that increases in these costs gradually lead LPEs to lose cost adjustment flexibility. Therefore, LPEs' business must be continually managed to reduce their costs by maintaining their ability to adjust management resources. In other words, LPE administrators must carry out cost management that is always conscious of taking measures to maintain the ability to adjust management resources. For this reason, LPE administrators should always be careful to maintain a balance between efficiency and the public interest. These findings are confirmed by clarifying the change in long-term cost behavior over 40 years. Regarding the cost behavior of public sector organizations, the author argues that it is necessary to verify their cost management based on long-term empirical analysis because of the premise that public organizations must operate stably over the long term.

Third, in the analysis by industry, LPEs' cost behavior showed not only anti-sticky costs but also sticky costs. LPEs' anti-sticky costs differ from findings in previous studies to date. Therefore, it is possible that the panel data analysis results of the 40 years are influenced and distorted by the type of industry. In addition, the results of this analysis indicate a conclusion that differs from previous studies: anti-sticky costs are stronger in projects with high resource adjustment costs, such as high-intensity assets. In other words, for projects with substantial physical assets, such as the residential water supply, industrial water supply and gas businesses, the presence of anti-sticky costs was confirmed. Especially in industries with high fixed assets, market monopoly rates are also high[16]. These industries' administrators may be able to adjust their management resources according to accurate future demand forecasts. Therefore, anti-sticky costs appear in these industries despite high fixed assets. Conversely, in LPE businesses with sticky costs, the author conjectures that these non-exclusionary public services (welfare services for free) make LPEs' cost management less flexible from the perspective of institutional constraints, especially in terms of protecting the public interest. the author suggests that the influence of monopolies and the non-exclusionary nature of public services also influence cost behaviors. For those industries in which anti-sticky costs appeared, further detailed research that focuses on the characteristics of each of these industries is needed. Furthermore, it is also important to clarify how administrators can maintain cost adjustment abilities over the long term.

Fourth, the author clarified the relationship between population changes and LPEs' cost behavior. Population changes drive changes in the demand for public services. In Japan, the increasing number of elderly people and the decreasing population are major demographic issues. In order for LPEs to maintain stable cost

[16] Refer to footnote 15.

management in the future, LPE administrators must engage in cost management in response to population changes. This analysis confirmed that the population changes, the increasing elderly population, and the decreasing total population have had a negative influence on LPEs' cost behavior, suggesting that the impact of population changes must be taken into account when considering management needs. Forecasting future population changes will provide accurate demand forecasts for management. A declining population and an increasing number of elderly people are a problem not only in Japan but also across developed countries. the author believes that determining how to reduce surplus capacity costs based on population changes has become an important issue for LPEs throughout the world.

Fifth, the author verified that asymmetric cost behaviors were resolved over subsequent periods in the 4-year time frame because of institutional pressure from politicians. Clearly, both LPE administrators and CE managers acted to resolve asymmetric cost behaviors. However, there were differences in the speed of change and the direction of movement. In CEs, business managers promptly adjusted their costs to acquire cost management flexibility when sticky costs were present. In contrast, when anti-sticky costs were present in LPEs, administrators managed their costs subtly and slowly, and cost behaviors gradually shifted toward a proportional relationship over four years. Because LPEs must supply their services stably and sustainably, one might assume that LPE administrators should avoid responding promptly and suddenly controlling their costs and instead attempt to balance the public interest and cost efficiency. Regarding the direction of movement of cost behaviors over four years, LPE administrators chose to improve services in the public interest instead of pursuing efficiency. The examination of the four-year change in cost behaviors shows that the LPE administrators decided to maintain their costs after anti-sticky costs were observed.

One might assume that LPE administrators are subject to institutional pressure from the politicians who insist on responding to public opinion and social demands that require the enrichment of public services rather than excessive cost efficiency. Conversely, CE managers may aim to adjust their costs promptly to be able to manage them flexibly. Thus, from a decision-making perspective, the author believes LPE administrators must aim for a long-term balance between protecting the public interest and achieving efficiency due to institutional pressure from politicians. In contrast, CEs' business managers may decide to control and adjust their costs with a focus on securing profits as quickly as possible.

Management accounting research can provide information about cost behavior and propose effective cost management strategies not only in theory but also in practice. In public organizations, including LPEs, it is important to understand how cost behavior will change in the future. Currently, Japan's national and local governments are promoting two plans to resolve the two main issues of population changes and a deteriorating financial situation. The first plan is called the Compact City Plan. It intends to concentrate urban functions, such as public service systems, in central urban areas, thus improving the efficiency of cost management in depopulated areas. Examples include district development plans to increase the public transportation network of central urban areas and a renewed maintenance plan to construct a single building that houses many types of public services together. The second plan is the Intermunicipal Cooperation Plan, in which public services will be combined through amalgamation or joint ventures to improve efficiency with economies of scale. By reaching agreements with different public organizations, separately managed entities can be consolidated into one organization. For example, in the water supply business,

several LPEs can jointly develop large dams and provide water services for a wide area that spans multiple municipalities.

Although the expectations for the Compact City Plan and the Intermunicipal Cooperation Plan are high, the effects and benefits of these policies, such as improved public services and reduced costs, have not been adequately explained. In addition, because the Compact City Plan and the Intermunicipal Cooperation Plan have not been studied sufficiently in either an academic or a real-world context, we do not know whether they will improve efficiency. Therefore, it is extremely important to understand the future cost behavior of public organizations to determine whether the Compact City or Intermunicipal Cooperation Plans will provide the effective management of public organizations in the context of a declining population and depopulated areas. Having reached these five conclusions, my research explored how public organization administrators have made long-term cost management decisions.

In the future, research should examine the factors influencing LPEs' asymmetric cost behavior, as noted by Günther et al. (2014), including both internal and external factors. Especially for industries in which sticky costs have been confirmed, we need to determine how to maintain cost flexibility over the long term. In contrast, in industries with anti-sticky costs, we must learn how to maintain cost adjustment flexibility. It is conceivable that LPEs may be subject not only to institutional constraints, such as achieving efficiency and protecting the public interest, but also to the non-exclusionary nature of public services and the influence of monopolies. There is a continuing need for detailed investigations of and research on public organizations' asymmetric cost behavior, especially that of LPEs.

Appendix

Variable	Definition
Cost	Operating expenses
Revenue	Operating revenues
Pop _Total	The natural logarithm of total population deflated by the previous year's total population
Pop_Youth	The natural logarithm of the youth population (aged 0-14) deflated by the total population
Pop_Middle	The natural logarithm of the middle-aged population (aged 15-64) deflated by the total population
Pop_Elder	The natural logarithm of the elderly population (aged 65 and over) deflated by the total population

III Empirical Study on Asymmetric Cost Behavior of the Public Sector Organizations: Analysis of the Sticky Costs of Local Public Enterprises

1 Introduction

In order to perform the management smoothly, it is very important to understand the cost behavior. Cost behavior is a theme that has been attracting attention from both academic and business practice, and it may be said that the grasp of the cost behavior is an important research theme in the management accounting even today.

In traditional cost behavior research, the author tried to grasp cost behavior using the production and working hours from a relation with the business volume which is the activity amount of the enterprise to break down into a cost element such as fixed costs and variable costs. In the process, the cost has been linear and proportional to changes in the relevant range, and in direct costing; it has been assumed that the change in cost was proportional.

In many later studies, including Noreen and Soderstrom (1997) and Anderson et al. (2003), cost behavior attracts attention in some other time. In these studies, unlike the research of cost behavior such as traditional fixed costs and variable costs; by paying attention to the capacity, they have given a new suggestion. In other words, regarding about the relationship between the cost magnitude of change and the sales amount magnitude of change, they have made it clear that in sticky costs, the cost does not decrease at the time of the sales amount decrease symmetrically; whereas the cost was empirically observed to increase at the time of the sales amount increase symmetrically. After that, Anderson et al. (2003) has verified the sticky costs using the models that were used to describe the sales of the magnitude of change that was a proxy for activity variables, the explanatory variables, and selling, general and administrative

expenses of the magnitude of change that was a proxy for cost variables, dependent variable, by published financial data.

After Anderson et al. (2003), such research have attempted to make additional verifications on the basis of cost data in the organization. Subramaniam and Weidenmier (2016) verified the sticky costs from scales of the properties of the business environment and the tangible fixed assets, and the aspects that the capacity utilization of those properties is furthermore different between industries.

Hirai and Shiiba (2006) verified whether the sticky costs were observed in Japanese firms based on the hypothesis that the cost behavior varied in the country depending on the analytic model of Anderson et al. (2003). As a result of the analysis, they clarified that the sticky costs were observed in Japanese firms as well as the research of Anderson et al. (2003).

Yasukata et al. (2011) paid, non-profit, attention to the nonprofit organizations like the National Hospital Organization. As a result of the analysis, they clarified that the secured profit was attempted by a positive reduction in the material cost in the decrease phase of medical revenue while the sticky costs were seen in the salary expense.

Holzhacker et al. (2015) was divided from the viewpoint of the institution theory into the profit corporation, the nonprofit organization, and the public organization. They clarified that the reaction of the private hospital to the cancellation of the sticky costs was smaller, and larger in the decrease phase of earnings, in the phase of deterioration of earnings by the consultation fee control policy.

However, most of these prior studies have studied on commercial companies, because of the structure of the financial statements are different from public sector organizations, they have been excluded as research subjects.

In addition to the origin of the sticky costs, two opinions of the deliberate managerial decision view and the high adjustment costs view are being thought about now. In the deliberate managerial decision view, management results determine the economical possibility that the cost becomes sticky. In other words, if the management has determined that the future economic recovery closes, it maintains the excess capacity.

In the high adjustment costs view, the possibility that an action to reduce activity cost and manage the capacity cost of the manager, in comparison with decrease in sales amount speed, do not match up with what is being pointed out. In addition, it is thought that the sticky costs may be present because the committed capacity cost, caused by past decision making, continues occurring even at the time of decrease of the sales amount.

In this study, the author pays attention to the local public enterprises which make financial statements based on business accounting and are available for the comparison with the commercial companies based on indications according to, Kama and Weiss (2013). Then, whether the sticky costs in public sector organizations are confirmed, the author will analyze the characteristic as compared with the prior studies.

2 Characteristics of the Public Sector Organizations

2.1 Current Situations and Issues Surrounding the Public Sector Organizations

Today, problems such as aging, development of low birth rate, decline of workforce and population, and regional economic decline and fiscal inflexibility[17], etc. are pointed out. To supply administrative services stably and continuously, the author has to pursue the efficiency and the cost performance, and be conscious of fiscal soundness above up to

[17] According to the material of the government, the government bond ratio doubles with 24.3% in fiscal year 2015 though in fiscal year 1980 was 12.7%. Moreover, the social security-related expenditure increases to 32.7% in fiscal year 2015 though it was 18.8% in fiscal year 1980.

now. On the other hand, it is difficult to indicate the appropriate level of the quality and quantity of administrative services and the cost of its service objectively. From the viewpoint of cost management, effective administrative services and cost control has been required in the public sector organizations in future.

Currently, in the public sector organizations, it is promoted by the efforts of the compact city wishing to make a further reduction of administrative costs by the consolidation of the city functions through the integration such as public facilities, etc., and further promoting the efficiency of administrative services. To promote the cost management in order to understand the cost behavior of the public sector organizations, it has been required to advance the efforts for the future of the compact city.

2.2 Institutional Theory Features of Public Sector Organizations

2.2.1 Local public enterprises in public sector organizations

Local public enterprises are carrying the businesses which are composed of water supply, industrial water supply, orbit, car transportation, railroad, electricity, gas and hospital business, etc. in the local public enterprise law and are covering public service in the wide range. Local public enterprises are leading figures of the public service (public nature) and demanded the exertion of economic rationality by the technique of business accounting in its operations (economic efficiency) at the same time. In this way, the local public enterprises have the mission to acquire the sustainable management and the cost optimization by improving economic efficiency and the pursuit of reasonable profits that focused on profitability. In this regard, this is different in characteristics from pure public service to cover the tax.

2.2.2 Local public enterprises in comparison with commercial enterprises

In commercial enterprises, they are strongly required to earn from the perspective of maximization of profit, however in the local public enterprises, not only in the economy, but also from the viewpoint of improving the welfare of the residents, is a feature that the continuity of stable business activity is required. For this reason, local public enterprises would be subjected to institutional constraints from a variety of stakeholders. In the following, the author has easily organized the characteristic point of it.

The first of the features is that low-profit level is allowed while maintaining the balance between the various stakeholders. To assume stable administration having top priority, it is more important for managers to decide evading a loss from management failure than to earn much profit. Furthermore, from the point of view to ensure the public nature, the managers of local public enterprises have to acquire permission from councilors in their low-profit decisions.

The second feature, unlike the commercial companies, local public enterprises have to submit the balance sheet and budget to the chiefs who are mayor or governor and congress, and there is a need to obtain the approval of them. It means that local public enterprises do not assume limited liability for the maintenance of the business, while also acknowledging the management of independence. So local governments are responsible for maintain the business in the end. Therefore, the author can confirm that some businesses have continued even if they are deficit operations.

3 Research Hypotheses

In this study, the author focuses on the public sector organizations that have not been analyzed enough up to now especially the local public enterprises, and the author sets the following research hypotheses. Most of the empirical studies concerning cost behavior targeted the commercial companies, and the existence of the sticky costs is

verified from the difference among the organizational property, capacity, and the utilization. First of all, according to the prior studies, the author should verify whether the sticky costs are also confirmed in the local public enterprises.

Hypotheses 3-1: The sticky costs exist in the local public enterprises.

In the public sector organizations including the local public enterprises, the financial inflexibility such as the mandatory spending like the national debt service expenditure, the public bond and the labor cost, and the ratios of the existing expenditure increase compared with general finances, have been pointed out. Also, it is thought that the declining degree of freedom of budget make the sticky costs become stronger compared with the commercial companies according to Anderson et al. (2003). Moreover, the local public enterprises have the organizational behavioral trait on both sides of economy and publicity; and the feature different from the commercial companies that attempt the maximization of the profit. When basing on feature, the author thinks that there is a difference in decision making concerning the business manager's cost adjustment. Especially, Holzhacker et al. (2015) clarified that the cost behavior of the public sector organizations was verified from the aspect in the institution theory and economics, and the sticky costs appeared strongly compared with the commercial companies[18].

In addition, the public sector organizations put a lot of regulatory cost by the adjustment of the budget because they are under the government guarantee for the funding on financial affairs and the risk on the management. There is little necessity of consideration for the distribution of the residual income, and the pursuit of profit is not

[18] In the viewpoint by the institution theory, the organization is pointed out that a system restriction is received by the stakeholder. Additionally, because they are vulnerable to the influence of the normative system from the fact that there is a need to achieve total optimization in terms of public nature of the request, the public sector organizations are explained that the regulatory cost increases compared with the commercial companies.

the first objective of the public sector organizations. Then, the author sets the research hypothesis below.

Hypotheses 3-2: The sticky costs in the local public enterprises appear stronger than the commercial companies.

In Anderson et al. (2003) etc., how the sticky costs change in two or more years were analyzed. When the sticky costs is confirmed in the public sector organizations, it should be confirmed how it changes after two or more years. Especially, because the organization purpose of the local public enterprises is not only the publicity but also the economy, it is thought that the local public enterprises have a feature different compared with the commercial companies which give priority only to the maximization of the profit. In a word, because it is necessary to carry on an operation from a public interest viewpoint even if it is the time when they cannot take the profit, it is thought that the sticky costs are not cancelled or decreased easily even in a mid/long term compared with the commercial companies. Then, the author sets the research hypothesis below.

Hypotheses 3-3: The sticky costs are not cancelled or decreased easily from the commercial companies when seeing in two, three and four years.

The type of business of the local public enterprises takes up various topics such as; the water supply, waterworks for industrial use, the orbit, the public car transportation, the railway, the electricity, the gas, the hospital, the drainage, the market, the tollway, and the parking lot maintenance, etc. which decided in Local Public Enterprise Law and Municipality Ordinance. As Subramaniam and Weidenmier (2016) pointed it out, since the business environment was different according to the type of business and each industry, and the sizes of the capacity of the tangible fixed asset and the inventory, etc.

were different, it was thought that the cost behavior was also different. Then, the author sets the research hypothesis below.

Hypotheses 3-4: As for the local public enterprises, since the business environment is different in each type of business, the level of the sticky costs is different depending on the type of business.

4 Analysis Methods

4.1 Analysis Model

In the research on the sticky costs that have been chiefly done for the commercial companies, the analytic model of Anderson et al. (2003) is used by a lot of prior studies. In the local public enterprises accounting, selling general and administrative costs are not the legal description matter while sales correspond to the revenue from operations. Therefore, in this study, the author uses operating expense in which cost of goods sold and selling general and administrative costs are added up instead of only using selling general and administrative costs.

In Subramaniam and Weidenmier (2016), they were empirically verifying the cost behavior by using not only the selling general and administrative costs but also the cost of goods sold. The sticky costs were verified by many of researches' afterwards using the operating expense (Günther et al. 2014).

Then the author verified whether the sticky costs exist in the public sector organizations in *Hypothesis 3-1* using the following analytic models which were used by Anderson et al. (2003).

Model 3-1

$$\ln\left(\frac{Cost_{i,t}}{Cost_{i,t-1}}\right) = \beta_0 + \beta_1 * \ln\left(\frac{Revenue_{i,t}}{Revenue_{i,t-1}}\right) + \beta_2 * Decrease\_Dummy_{i,t} * \ln\left(\frac{Revenue_{i,t}}{Revenue_{i,t-1}}\right) + \varepsilon_{i,t} \quad (3.1)$$

Here, *Cost*: the operating expense, *Revenue*: the operating revenue, *Decrease_Dummy*: the dummy variable that if the operating revenue decreases from *t-1* at *t* period, 1 is taken in other cases, 0 is taken, *ln*: Naturalized logarithm.

In *Hypothesis 3-2*, the author verifies whether the sticky costs appear more strongly in the public sector organizations than the commercial companies from the point of the sticky costs. In *Hypothesis 3-3*, to verify the cost behavior for two or more years, the author performs the analysis tabulated for each section using model 3-1 of Anderson et al. (2003), and the author also performs the analysis using model 3-2 of Anderson et al. (2003).

Model 3-2

$$\ln\left(\frac{Cost_{i,t}}{Cost_{i,t-1}}\right) = \beta_0 + \beta_1 * \ln\left(\frac{Revenue_{i,t}}{Revenue_{i,t-1}}\right) + \beta_2 * Decrease\_Dummy_{i,t} * \ln\left(\frac{Revenue_{i,t}}{Revenue_{i,t-1}}\right)$$
$$+\beta_3 * \ln\left(\frac{Revenue_{i,t-1}}{Revenue_{i,t-2}}\right) + \beta_4 * Decrease\_Dummy_{i,t-1} * \ln\left(\frac{Revenue_{i,t-1}}{Revenue_{i,t-2}}\right) \quad (3.2)$$

Here, *Cost*: the operating expense, *Revenue*: the operating revenue, *Decrease_Dummy*: the dummy variable that if the operating revenue decreases from *t-1(t-2)* at *t (t-1)* period, 1 is taken in other cases, 0 is taken, *ln*: Naturalized logarithm.

If the sticky costs continue for a long term, the operating expense is asymmetric for the change of the revenue from operations before one term, and it is sure to become a value whose not only β_2 but also β_4 is smaller than 0. In *Hypothesis 3-4*, the author analyzes the local public enterprises by industries using model 3-1.

4.2 Data and Sample Selection

4.2.1 Analysis Period Covered

In this study, the author tries to analyze using the financial data of the local public enterprises. Furthermore, for comparison with the Anderson et al. (2003) and Hirai and Shiiba (2006) the author also uses the same period; from 1979 to 1998. There is no bias

by the difference of the method of the accounting treatment because the review concerning the financial accounting processing, according to the Local Public Enterprise Law revision, did not amended until 2012 after it was amended in 1966.

4.2.2 Sample Data

In this study, the author is performing an analysis centered on business subject to the application of the Local Public Enterprise Law, and the author uses the data in the income statement for each business of "Local Public Enterprises Yearbook". The number of businesses in which the implementation of Local Public Enterprise Law was 2,854 businesses (57,080 samples) by ten types of business. It was received continuously for 20 years from the fiscal year 1979 to 1998. The 66 businesses (1,320 samples) that were not actually begun at the establishment run up and the revenue from operations have not been generated were excluded from the analysis. In addition, the municipal mergers are carried out during the period of analysis in the 19 business (380 samples). Then they were excluded from the analysis since there is the doubt in the consistency of business, so the author can avoid the bias.

Though the deficit businesses were uniformly excluded and were done in the analysis of Anderson et al.(2003) etc., many settlement of accounts of local public enterprises were deficit; expenditures were greater than revenue, which is responsible for the necessity of public utilities to engage in the social life, such as lifelines and infrastructure in many cases. Therefore, in this study, the author excluded only about 373 businesses (7,460 samples) that lack the balance in all surveyed period for 20 years. Finally, the analysis object became 47,920 samples in 10 types of business and 2,396 businesses of the data of 20 years from 1979 to 1998 (Table 3-1).

Table 3-1. Number of samples and exclusion number passage table

	Observations (Firm-Years) Deleted (and the number of firms)	Observations (Firm-Years) Remaining (and the number of firms)
Beginning raw sample data (1979-1998)	— —	57,080(2,854)
1 Delete observations that are operating revenues = 0 yen because of business preparations	1,320(66)	55,760(2,788)
2 Delete observations that aren't securing business continuity because of municipal merger	380(19)	55,380(2,769)
3 Delete observations with operating costs > operating revenues through all 20 years	7,460(373)	47,920(2,396)
Final observations (Firm-Years) remaining	— —	47,920(2,396)

In addition, the author excluded them from the sample when there was an outlier in the top and bottom 1 % respectively of *Cost i, t/Cost i, t-1*, and *Revenue i, t/Revenue i, t-1* because there was a possibility that the unexpected value (outlier) is included 1% in the top and 1% bottom. As a result, the excluded number of data became 1,036 samples, and the number of data finally analyzed became 44,488 samples (Table 3-2).

Table 3-2. Sample data of industrial types after excluded outliers

	Sample data				Number of the outliers			Number of the samples after excluded outliers	
	Number of firms (a)	Sample size (1979-1998) (a*20)	Composition ratio	Number of samples "Cost i,t/Cost i,t-1"and "Revenue i,t/Revenue i,t-1"(excluded only 1979 year)	Revenue i,t/Revenue i,t-1	Cost i,t/Cost i,t-1	List-wise case deletion	Number of samples "Cost i,t/Cost i,t-1"and "Revenue i,t/Revenue i,t-1"	Composition ratio
Water supply	1,625	32,500	67.82%	30,875	431	523	761	30,114	67.69%
Industrial water supply	128	2,560	5.34%	2,432	78	83	118	2,314	5.20%
Transportation	36	720	1.50%	684	4	8	10	674	1.52%
Electric power	32	640	1.34%	608	4	1	4	604	1.36%
Gas power	66	1,320	2.75%	1,254	9	6	13	1,241	2.79%
Hospital	467	9,340	19.49%	8,873	75	53	90	8,783	19.74%
Sewerage	24	480	1.00%	456	16	5	19	437	0.98%
Wholesale Market	8	160	0.33%	152	0	0	0	152	0.34%
Toll Road	4	80	0.17%	76	4	7	7	69	0.16%
car parking	6	120	0.25%	114	6	13	14	100	0.22%
Total	2,396	47,920	100.00%	45,524	627	699	1,036	44,488	100.00%

5 Analysis Methods Analysis Result

5.1 Descriptive Statistics

First of all, the water supply business occupied a lot of 32,500 by 1,625 business samples (about 67%) as a breakdown according to the business. Then, 9,340 samples (approximately 19%) hospital business in the 548 business, industrial water supply is 128 business 2,560 samples (approximately 5%), gas business has continued with 66 business 1,320 samples (about 2%).

Next, in the sample, especially in the value of the standard deviation, it was characterized that both operating expenses and the operating revenue were larger than the average value. And there were the features that show the difference between the maximum value and the minimum value was large, and there was a big difference between the median and the mean value. In addition, the operating revenue exceeded the operating expense by the mean value and the median, when the operating revenue

was compared with the operating expense. It meant that structural money-losing enterprises (loss firms) didn't exist in the sample data, because the sample data which the operating expense was more than the operating revenue for all analysis period was excluded, based on the prior studies (Table 3-3). Further analysis in Table 3-4 tests the variables for the significant factors that could influence the regression, multicollinearity and auto-correlation, then the results show the regression model does not suffer from multicollinearity.

Table 3-3. Descriptive statistics of sample data (after excluding outliers)

(Scale: 1,000 yen)

	Mean	Standard deviation	Minimum	Lower quartile
Revenue（Operating revenues）	1,825,251	10,019,753	2,809	171,564
Cost（Operating costs）	1,559,054	7,326,139	2,222	136,560
ln Revenue t / Revenue t-1	0.0470	0.0812	-0.2877	0.0007
ln Cost t / Cost t-1	0.0478	0.0801	-0.2840	0.0044

	Median	Upper quartile	Maximum	Number of firm-years
Revenue（Operating revenues）	407,769	1,249,357	355,330,535	44,488
Cost（Operating costs）	338,988	1,116,223	295,467,927	44,488
ln Revenue t / Revenue t-1	0.0323	0.0773	0.3930	44,488
ln Cost t / Cost t-1	0.0421	0.0858	0.3876	44,488

(Scale: 1,000 yen)

Type of industries	Mean		
	Revenue (Operating revenues)	Cost (Operating costs)	Revenue－Cost
Water supply	1,227,682	981,119	246,563
Industrial water supply	758,354	583,579	174,775
Transportation	10,572,346	10,306,967	265,379
Electric power	2,374,254	1,655,826	718,429
Gas power	915,302	820,444	94,858
Hospital	2,447,471	2,545,926	-98,455
Sewerage	25,279,611	15,864,157	9,415,454
Wholesale Market	1,117,203	1,019,061	98,142
Toll Road	760,845	594,971	165,873
Car parking	151,833	87,190	64,643

Type of industries	Standard deviation		Median	
	Revenue (Operating revenues)	Cost (Operating costs)	Revenue (Operating revenues)	Cost (Operating costs)
Water supply	8,508,912	6,712,921	264,890	205,639
Industrial water supply	1,235,284	989,192	345,957	275,226
Transportation	25,369,008	23,115,846	1,720,389	1,867,155
Electric power	1,725,437	1,245,771	2,039,012	1,405,505
Gas power	1,182,181	1,060,343	481,267	435,910
Hospital	2,499,614	2,592,117	1,494,156	1,571,137
Sewerage	58,266,300	31,924,323	3,829,400	3,232,100
Wholesale Market	1,591,534	1,474,367	520,297	500,996
Toll Road	494,389	295,988	605,286	530,918
Car parking	151,932	78,899	115,492	65,799

(Continued)

Type of industries	Maximum		Minimum	
	Revenue (Operating revenues)	Cost (Operating costs)	Revenue (Operating revenues)	Cost (Operating costs)
Water supply	355,330,535	295,467,927	14,850	15,419
Industrial water supply	11,326,896	8,042,787	2,809	2,956
Transportation	163,824,708	149,541,551	83,961	73,872
Electric power	9,529,287	7,869,884	158,784	106,467
Gas power	7,777,095	6,805,552	64,114	55,944
Hospital	21,032,304	20,502,866	79,612	109,442
Sewerage	340,350,591	194,333,891	82,233	121,626
Wholesale Market	6,430,996	6,885,937	101,377	70,401
Toll Road	2,127,252	1,482,174	46,833	89,087
Car parking	563,130	298,094	4,366	2,222

Table 3-4. Multicollinearity test

Variance inflation factors	
Explanatory Variable	VIF
$Revenues_{i,t}$	1.442342
$Decrease\_Dummy * Revenues_{i,t}$	1.442342

VIF= centered variance inflation factor.

Then, as the characteristic of the entire data, each scale differs greatly for each type of business. In operating expense and operating revenue respectively, it was feature of the data that there was the difference between each type of business. Incidentally, it was thought that this respect originates in two reasons, first by the difference of the scale of government finance of the municipality, and second by the difference of the management scale of the business unit the management subject.

In addition, when the author checked the details of industry specification of the operating revenue and the operating expense, most businesses were the surplus and especially the drainage business was the significant surplus. On the other hand, the hospital business was only deficit on average.

In addition, the author confirmed the composition of the operating expense handled by this study. And the author has summarized the major industries and the cost composition ratio (Table 3-5). As for the operating expense, the cost of goods sold and

the selling general and administrative costs were included. However, the author couldn't check the detail of them because each industry adopts different bookkeeping method. Then, the author decided to analyze using the operating expense data instead of the cost of goods sold or the selling general and administrative costs.

Table 3-5. Comparison of cost composition ratio by industrial classification

(%)

	Labor cost		Depreciation		Material cost		Power cost		Repair cost		Interest expense		Others	
	1979	1998	1979	1998	1979	1998	1979	1998	1979	1998	1979	1998	1979	1998
Water supply	24.2	18.7	14.0	22.0	0.0	0.0	5.6	3.5	4.7	7.2	25.5	19.2	26.0	29.4
Industrial water supply	19.1	16.9	18.5	28.1	0.0	0.0	9.8	5.9	4.6	5.3	26.8	23.1	21.3	20.7
Transportation	55.2	42.9	9.5	19.0	0.0	0.0	4.3	2.7	2.8	4.4	21.4	20.6	6.8	10.4
Electric power	36.3	31.6	19.9	21.0	0.0	0.0	0.0	0.0	5.6	10.2	25.2	15.4	13.0	21.8
Gas power	17.5	16.5	11.6	21.3	46.4	31.4	0.0	0.0	4.6	5.7	9.3	8.0	10.6	17.1
Hospital	51.7	47.6	4.0	5.5	25.7	26.6	0.0	0.0	0.9	0.8	3.9	3.3	13.8	16.2
Sewerage	13.5	9.9	16.9	28.4	0.0	0.0	5.1	2.9	2.3	3.9	47.1	40.1	15.2	14.8
Total industries average	36.0	31.6	9.6	15.3	0.0	0.0	3.0	1.8	2.7	3.7	17.9	15.4	30.8	32.2

In Electric power, Gas power and Hospital industries, Power cost is categorized as Others.

5.2 Verification Results of the Sticky Costs in the Public Sector Organizations

The author would like sequentially to confirm the verification results of the research hypothesis set by paragraph 4. The analysis results were significant at the 1% level in both F-test, the effectiveness of the model has been confirmed. Further, in this study the author used panel data analysis, and performed Hausman test, it was revealed that the fixed effects model was suitable (Table 3-6).

In *Hypothesis 3-1*, to verify whether the sticky costs exist in the public sector organizations, the author tried to analyze referring to the analytic model of Anderson et al. (2003). In the analytic model, the author has converted each the relative change from last year of the operating expense (explained variable) and the operating revenue (explanatory variable) into the naturalized logarithm. β_1 is equal to the increasing ratio

of the operating expense when the ratio of operating revenue from the previous year increased by 1%. And, when the ratio of the operating revenue is decreased by 1%, the estimate becomes the value in which β_1 and β_2 are added together. In this case, if the sticky costs are confirmed, it becomes $\beta_2<0$ and $\beta_1>\beta_1+\beta_2$, and it means the magnitude change of the operating expense becomes asymmetrical at the increase and the decrease of the operating revenue ratio.

Table 3-6. Verification results of model 3-1

Variable	Predicted sign	Coefficient	t-stat
β_0		0.0317	66.18***
β_1	+	0.4081	79.52***
β_2	−	0.3440	21.06***
$Adj.R^2$		0.2350	
N		44,488	
DW		2.2374	
Panel data		Fixed effects	

Note: For β_0, β_1, and β_2, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test.
*, **, and *** denote significance at levels of 0.1, 0.05, and 0.01.
$Adj.R^2$, DW, and N mean Adjusted R^2, Durbin-Watson ratio, and Number of observations, respectively.

As a result, β_2 showed the plus value that indicates the sticky costs. So, anti-sticky costs that Anderson and Lanen (2007), Weiss (2010), and Banker et al. (2014b) had reported were confirmed. Anti-sticky means a decrease in the ratio of the operating expense when the decrease of the operating revenue is higher than the increase of the ratio of the operating expense when the operating revenue is increased. Therefore, the sticky costs were not confirmed in this analysis intended for the entire local public enterprises, and *Hypothesis 3-1* was not supported. And the fixed effect presumption was not greatly different from the estimated result of the cross section, and neither anti-

sticky that β_2 became the plus value was confirmed. Thus the author didn't need to verify research *Hypothesis 3-2* and *Hypothesis3-3*.

To verify *Hypothesis 3-4*, the author conducted an analysis of the cost behavior by industry from the point of view of the differences of business environment, cost structure, and capacity. And, the author verified the presence and the level of the sticky costs (Table 3-7).

The sticky costs which β_2 took a negative value were hospital business and electricity utilities industry. In the contrary, anti-sticky costs which β_2 indicated the positive value were water supply business, industrial water supply business, and gas business.

Here, the author would like to add consideration in paying attention the contrasting results between the water supply business and the hospital business which are especially occupied with a lot of numbers of samples. When the author confirmed the cost structure of the local public enterprises[19], in the cost composition ratio of hospital business, it was observed to have lower depreciation and amortization and conversely higher labor cost and higher material cost. On the other hand, in the cost composition ratio of water supply business, it was observed depreciation and amortization, repair cost and interest expense were higher than an all average industries. Similarly, the author could confirm that hospital business was deficit and water supply business was conversely surplus[20]. In this way, in addition to the difference in the business environment, a large difference can be seen in the capacity and cost structure in the water supply business and the hospital business. In the following, the author will carry out further studies in this regard.

---

[19] Refer to Table 3-5.
[20] Refer to Table 3-3.

Among the local public enterprises, in the water supply business, the sticky costs pointed out by the prior studies were contrasted result. The author argues this factor as follows.

First, because the water supply business should supply service high and stably by public interest, and does the management almost exclusively, it has the flexibility of cost adjustment. The author thinks that this factor has unfolded the presence of anti-sticky costs in water supply business[21].

Second, because the price imputation of the cost adequately reflects the management situation by adopting the summary cost method[22] in a water rate system,

---

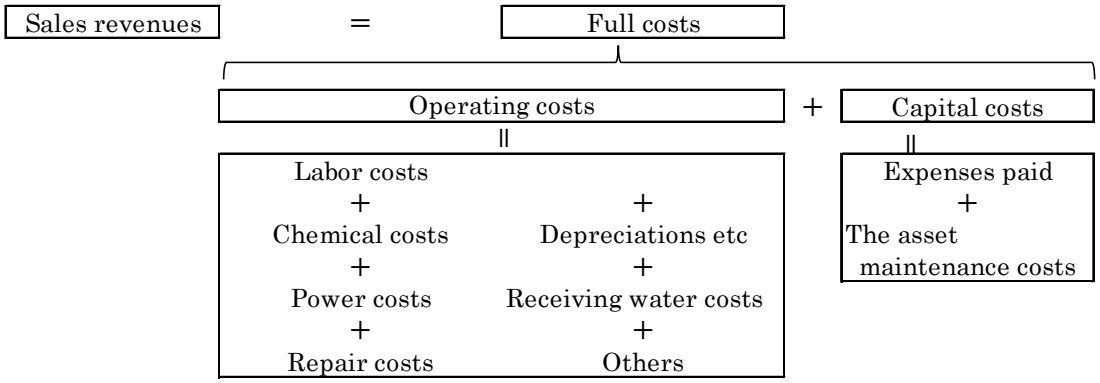
[21] About the market monopoly situation of the local public enterprises, there is a description in 'The local public enterprises yearbook' as follows.

Table note 3-1

Type of industries	Items	Gland total in Japan (A)	Breakdown of Local public enterprises (B)	(B)/(A) (%)
Water supply	Present water supply population (people)	121,289,000	120,523,000	99.4
Industrial water supply	Quantity of annual total water supply (m^3)	493,000,000	4,897,000,000	99.9
Transportation (Subway)	The annual transportation passengers (people)	4,723,000,000	2,638,000,000	55.9
Transportation (motor transport)	The annual transportation passengers (people)	5,419,000,000	1,453,000,000	26.8
Electric power	annual power generation (kWh)	146,288,000,000	9,618,000,000	0.9
Gas power	Annual gas sales volume (m^3)	22,678,000,000	761,000,000	3.4
Hospital	the number of hospital beds (beds)	1,661,000	236,000	14.2

[22] When arranging it based on Nakamura (2012), fare receipts become equal to the summary cost including both operating expenses and the capital charges.

Chart note 3-1



Arranged with reference to Nakamura (2012)

the author thinks that it is in the financial structure that the sticky costs don't appear easily.

In the hospital business, the sticky costs were confirmed as well as in the prior studies such as Holzhacker et al. (2015). The author would like to point out the factors as follows. First, the author thinks that the factors which have caused the existence of the sticky costs were by the fixed price of the medical treatment fee, and the diagnosis and treatment obligation based on the law. In the hospital business, the charge of each medical service is provided by the fixed price regulation. Also, according to the diagnosis and treatment obligation on the law, it is necessary to secure for the system to treat patient at any time even if patient is absent. Second, the possibility of management measures cause and labor legal cause are also conceivable.

Table 3-7. Results of model 3-1 by industrial classification

Variable	Water Supply			Industrial Water Supply			Sewage			Transportation			Electric Power		
	Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat	
β_0	0.0353	56.38	***	0.0235	11.10	***	0.0403	9.15	***	0.0146	4.60	***	0.0198	6.41	***
β_1	0.3632	56.83	***	0.2613	8.52	***	0.3251	8.86	***	0.3532	6.42	***	0.5750	13.75	***
β_2	0.5136	23.91	***	0.2372	3.15	***	-0.1475	-0.78		0.1549	1.24		-0.3352	-1.94	*
$Adj.R^2$	0.2035			0.0657			0.1616			0.1350			0.2721		
N	30,114			2,314			437			674			604		
DW	2.2762			2.2407			1.8618			2.0808			2.5942		
Panel date	Fixed			Random			Random			Random			Random		

Variable	Gas Power			Hospital			Wholesale Market			Toll Road			Car Parking		
	Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat	
β_0	0.0142	7.28	***	0.0210	32.06	***	0.0224	3.63	***	0.0211	1.15		0.0247	1.42	
β_1	0.7118	33.28	***	0.6233	84.13	***	0.6106	5.30	***	0.0205	0.07		0.1862	0.90	
$\boldsymbol{\beta_2}$	0.3864	5.46	***	-0.2279	-11.05	***	-0.4122	-1.13		0.5603	1.26		-0.0274	-0.06	
$Adj.R^2$	0.6473			0.5583			0.1776			0.0732			-0.0043		
N	1,241			8,783			152			69			100		
DW	2.1402			1.8242			2.1380			1.5570			2.0782		
Panel date	Fixed			Fixed			Random			Random			Random		

Note: For β_0, β_1, and β_2, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test. *, **, and *** denote significance at levels of 0.1, 0.05, and 0.01. $Adj.R^2$, DW, and N mean Adjusted R^2, Durbin-Watson ratio, and Number of observations, respectively.

Speaking about the medical treatment profession such as the specialized physicians and nurses, even when the operating revenue decreases, it tends to evade the salary cutting and the layoff from the difficulty of the adoption. In addition, because a severe standard has been installed from the statutory regulation to the execution of the layoff based on the worker protection, the author thinks that it is difficult to lay them off.

6 Additional Analysis

The author thought that the main cause of the presence of anti-sticky costs is the possibility of receiving the influence of the water supply business which accounts for about 67% of all sample data. Because of such, the author excluded the sample of the water supply business, and the author conducted the additional analysis to verify the hypotheses (*Hypothesis 3-4* is excluded).

6.1 Additional Analysis of Research Hypothesis 3-1

As a result of analyzing *Hypothesis 3-1* using model 3-1 based on data (with the exception of using the water supply business sample data), β_2 took a negative value not only in the cross-section analysis but also the panel data analysis. Therefore, the sticky costs were confirmed in the entire local public enterprises, except in the water supply business (Table 3-8). As a result, the author confirmed the result which supports *Hypothesis 3-1* that the sticky costs existed in all samples, except in the water supply business.

Table 3-8. Results of model 3-1 excluding water supply industry

Variable	Predicted sign	Coefficient	t-stat	
β_0		0.0223	33.08	***
β_1	+	0.5461	67.08	***
β_2	−	-0.0639	-2.80	***
$Adj.R^2$		0.3615		
N		14,374		
DW		2.0925		
Panel data		Fixed effects		

Note: For β_0, β_1, and β_2, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test.
*, **, and *** denote significance at levels of 0.1, 0.05, and 0.01.
$Adj.R^2$, DW, and N mean Adjusted R^2, Durbin-Watson ratio, and Number of observations, respectively., respectively.

6.2 Additional Analysis of Research Hypothesis 3-2

Hypothesis 3-2 has been verified once again from the confirmation of the sticky costs in samples except in the water supply business (Table 3-9). As a result of the analysis in Anderson et al. (2003) and Hirai and Shiiba (2006), β_2 shows that the sticky costs had the value of -0.14 in the commercial companies of Japan and -0.19 in the commercial companies of United States. On the other hand, in the study, β_2 acquired the value of -0.06. Upon retrieving the results, the author has observed that the value which was acquired in the study was smaller in comparison with both of the analyses of the prior studies. Therefore, *Hypothesis 3-2* which assumed for the sticky costs to be stronger in local public enterprises than in commercial companies was not supported. In this point, the author has pointed out the two following points from the viewpoint of the publicity. In the local public enterprises, especially in high public interest business like the water supply business and the gas business, etc., summary cost method is adopted. Because the ratio of the market monopoly is high, the businesses with high public interest are

thought to be setting up the market trend and the demand forecast compared with the commercial companies easily. The local public enterprises which occupied high market share can predict and plan more accurately the future good and service according to setting up the market trend and the demand forecast.

Table 3-9. Estimated result of model 3-1 and comparison with prior studies

Public enterprises	Commercial enterprises		
	Local public enterprises	Japanese enterprises	American enterprises
β_0	0.0223 ***	0.0189 ***	0.0481 ***
	33.08	23.64	39.88
β_1	0.5461 ***	0.6352 ***	0.5459 ***
	67.08	84.57	164.11
β_2	-0.0639 ***	-0.1398 ***	-0.1914 ***
	-2.80	-8.95	-26.14
$Adj.R^2$	0.3615	0.3927	0.3663
N	14,374	20,539	63,958

upper data indicates coefficient estimates, under data indicates t-statistics
*significant at 10% level,**significant at 5% level,***significant at 1% level
$Adj.R^2$=Adjusted R^2, N=Number of observations

6.3 Additional Analysis of Research Hypothesis 3-3

From the analysis totaled by using model 3-1 according to each section and the analysis of two or more years that uses model 3-2, the author verified a long-term cost behavior (Table 3-10). When seeing in the result of the cross-section analysis of model 3-1 results by the pooled data, a negative value was confirmed to β_2 in a total of four years for the long term. From these results, it can be said that the sticky costs would be seen continuously for a long term in the local public enterprises. On the other hand, when seeing in the result of the cross-section analysis of model 3-2 results by the fixed-effect data, positive values were confirmed to β_2 and β_4. So the author could not verified consistent results from long term cost behavior.

Table 3-10. Estimated results by total according to each period with model 3-1 and model 3-2 excluding water supply industry

Model 3-1

Variable	2 years			3 years			4 years		
	Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat	
β_0	0.0377	31.11	***	0.0517	27.60	***	0.0627	20.92	***
β_1	0.5807	62.41	***	0.6409	63.50	***	0.6435	44.52	***
β_2	-0.0086	-0.65		-0.0086	-0.56		-0.0108	-0.57	
$Adj.R^2$	0.4602			0.5582			0.5444		
N	6,769			5,033			2,996		
DW	2.1778			2.3685			2.6643		
Panel data	Fixed effects			Fixed effects			Fixed effects		

Note: For β_0, β_1, and β_2, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test.

*, **, and *** denote significance at levels of 0.1, 0.05, and 0.01.

$Adj.R^2$, DW, and N mean Adjusted R^2, Durbin-Watson ratio, and Number of observations, respectively.

Model 3-2

Variable		Coefficient	t-stat	
β_0		0.0199	25.14	***
β_1		0.5217	60.02	***
β_2	$t/t\text{-}1$	0.0436	5.48	***
β_3		-0.0215	-0.93	
β_4	$t\text{-}1/t\text{-}2$	0.0654	2.90	***
$Adj.R^2$		0.3617		
N		13,466		
DW		2.1840		
Panel data		Fixed effects		

Note: From β_0 to β_4, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test.

*, **, and *** denote significance at levels of 0.1, 0.05, and 0.01.

$Adj.R^2$, DW, and N mean Adjusted R^2, Durbin-Watson ratio, and Number of observations, respectively.

7 Conclusion

In this study, the author focused on the local public enterprises which make financial statements based on business accounting. And the author paid attention to the comparison with the commercial companies. Then, the author analyzed the characteristics as compared with the prior studies, whether the sticky costs in public sector organizations are confirmed.

As a result, the sticky costs were not confirmed in the entire the local public enterprises to represent the public sector organizations and were confirmed anti-sticky by Anderson and Lanen (2007), Weiss (2010), and Banker et al. (2014b).

On the other hand, in the analysis of the cost behavior of industry specification, both the sticky costs and anti-sticky were confirmed. And the author found the diversity of the cost behavior in each industry type. The author confirmed the two opposing results; both the sticky costs and the anti-sticky costs from each industry. Especially, the author thought that the impact of water supply business that accounts for about 67% of the sample was high. Then, the author additionally analyzed the sample data excluding the water supply business.

As a result of the additional analysis, the sticky costs were confirmed in the entire local public enterprises in the analyses, except the water supply business, and *Hypothesis 3-1* was supported from that result[23]. However, in the comparison with the commercial companies, the sticky costs of the local public enterprises were weaker, and *Hypothesis 3-2* was not supported. Also, in a long-term cost behavior, the sticky costs were not consistently confirmed, so *Hypothesis 3-3* was not supported.

---

[23] The author also excluded the hospital business sample data after excluding the water supply business sample data. After doing so, the author analyzed the data once again and the accumulated result was anti-sticky. There is a possibility that the amount of samples can influence the result of cost behavior of the entire local public enterprises. It can be said that it is preferable to analyze cost behavior of each business in the future.

In the study, though the author derived the research hypotheses after basing both the deliberate managerial decision view and the high adjustment costs view pointed out by the prior studies, there is a possibility that factors other than these also influence. Especially, the author thought that the local public enterprises were not only influenced by business environment but also market monopoly level, capacity selection, worker protection laws and regulation, and charge / pricing methods etc. from the viewpoint of stable service supply for daily necessities. The author argued that these points influenced the cost behavior, especially the sticky costs. In addition, the author suggested that the business managers in charge of the local public enterprises were affected from the budgetary discussion systems and a lot of stakeholders who were head of municipalities and local assemblies. Thus, the author argued that the peculiar cost behavior was confirmed in the public sector organizations, because the public sector organizations receive the restriction in a system different from the commercial companies.

Moreover, from the analysis results, about the cost behavior of the local public enterprises, the author confirmed for the first time that the striking feature was seemed in each business of the local public enterprises like anti-sticky of the water supply business and the sticky costs of the hospital business.

Finally, the author pointed out the limitation of this chapter. The author tried the analysis using the data taken up for 20 years from the fiscal year 1979 to the fiscal year 1998 to avoid the influence of business by the economic fluctuation and to compare them with the prior studies. But the author will need to collect the most recent data and it will be better to analyze and verify them, too.

In addition, because the operating revenue and the operating expense used for the analysis are data on financial statements, it is indicated that these financial data

aren’t appropriate for proxy indicators of activity and cost (Anderson and Lanen 2007; Günther et al. 2014).Therefore, in the future research, for instance, it is possible to use ‘revenue earning water’ in case of water supply business and ‘bed occupancy rate’ in case of hospital business.

IV Study on Downside Risk of Demand and Cost Behavior of Local Public Enterprises: Verification of Local Public Enterprise Manager's Decision Making Based on Population Estimate Scenario in the Future

1 Introduction

In the last few decades, empirical research on cost behavior has developed mainly in the private sector. Anderson et al. (2003) empirically clarified that the decrease rate of the cost when the activity amount decreases is small compared to the increase rate of the cost when the activity amount increases, and named this phenomenon the sticky costs. Afterwards, it has clarified empirically that the cost doesn't change proportionally (e.g., Subramaniam and Weidenmier 2016; Calleja et al. 2006; Weiss 2010; Banker and Byzalov 2014).

On the other hand, there are very few research on cost behavior in the public sector (Bradbury and Scott 2018; Cohen et al. 2017; Holzhacker et al. 2015). Some prior studies explain that the reason is caused by the fact that accounts methods are different (Kama and Weiss 2013; Shust and Weiss 2014). However, in public sector organizations such as national and local governments and public enterprises, cost management is essential as well as for-profit enterprises. This is because it is indispensable for public sector organizations to conduct efficient management and cost reduction efforts in carrying out sustainable public services. Therefore, the author thinks that the cost management is also important in public institutions.

In this chapter, the author focused on local public enterprises among public sector organizations. The local public enterprises adopt the same accounting standards and accounting treatment as for-profit enterprises though they are one of the public sector organizations. For this reason, it clears the issue of differences in accounting methods pointed out by Kama and Weiss (2013) and Shust and Weiss (2014).

In this context, in Hosomi and Nagasawa (2018) that analyzes the cost behavior of the Japanese local public enterprises, the author clarified that there are a sticky costs and an anti-sticky costs from 1979 to 1998 as an analysis term. It seems that the background of this phenomenon appears to have an impact on the business environment, cost structure, market monopoly level, and pricing procedure. However, the cost behavior after 1999 cannot be verified in Hosomi and Nagasawa (2018).

Then, first of all, the author decided to clarify the cost behavior of local public enterprises after 1999.And the author focused on "market monopoly" and "business environment" pointed out by Hosomi and Nagasawa (2018) as a factor influencing cost and behavior. Especially, the author focused on "Change in demand" in the business environment. It is pointed out that the change in the public service demand is influenced from the demographic change by the public economics and the public finance. Therefore, the author decided to catch the demographic change as a representation index of demand, and to verify the relation between demand and the cost behavior.

Banker et al. (2014b) argues that the demand uncertainty affects cost behavior. And, when the demand uncertainty is large, they point out that the sticky costs become strong. However, when the demand uncertainty is small, it has not been verified how cost behavior will change. When the market share is high, demand forecasting can be done accurately, so the demand uncertainty will be small. Local public enterprises have businesses with high market share. Therefore, in the case of a business with a high market share, managers can accurately predict demand and unnecessary adjustment of management resources will not be done, so the author thinks the sticky costs should weaken. Thus, in this chapter the author examined the relationship between market share and cost behavior. Finally, the author examined the relationship between the downside risk of demand and the cost behavior.

Banker et al. (2014b) explains that the downside risk of demand influences as one of the factors of the sticky costs. In this chapter, the author focused on the population decline which represents the downside risk of demand. In Japan, the country reports that the population decline began in 2006 from the census. For this reason, the author examined how behavior changes cost when the downside risk of demand increases due to the population decline.

First, in section 2, the author will describe the characteristics of the local public enterprises in recent years and the changes in the population and future predictions in Japan. In section 3, the author reviews both the researches of cost behavior for public sector organizations and the researches of demand forecasts and cost behavior. Then, based on the prior studies, the author derives research hypotheses. Section 4 confirms the analysis technique, and section 5 explains the analysis result. Finally, in section 6, the author summarizes and discuss the contents of this study.

2 Characteristics of Local Public Enterprises and Population Forecast

2.1 Characteristics of Local Public Enterprises

Local public enterprises in Japan are one of the public sector organizations owned by each local public entity. However, they do not depend on local governments but are operated independently. For this reason, the local public enterprise manager exists as the highest decision-maker in local public enterprises, making management decisions. Managers of local public enterprises have two major missions. One is to demonstrate economic efficiency and the other is to increase public interest. Therefore, they should secure the profit of a level necessary to sustain public service (e.g., Eldenburg et al. 2004; Ballantine et al. 2008). In other words, they must make appropriate cost management based on accurate prediction of demand.

Demand greatly depends on the population in the public sector[24]. Therefore, it is very important for the managers of local public enterprises to understand the population transition. It has also been reported in Banker et al. (2014b) that demand changes affect cost behavior. Therefore, the cost behavior of local public enterprises is estimated to be affected by changes in the population.

And the author would like to explain supplementarily about another mission, publicity. Businesses of local public enterprises include social infrastructure business such as water supply, industrial water supply, electricity, gas, transportation, service business such as hospital, nursing care etc. Every businesses are indispensable services for residents' lives. Such public services are subject to government entry restrictions and fee restrictions[25]. In other words, the businesses that local public enterprises are responsible for are businesses that require the introduction of large-scale human and material capital such as social infrastructure, or the high risk businesses where service supply is not sufficiently done only by the market principle. For this reason, "Market Failure" in Economics exists, and there are many projects for which a commercial business entity is difficult to enter. As a result, there are many industries with high market share in local public enterprises (Table 4-1).

[24] For example, in the field of public economics, the effects of the population are taken into account in the cost function of public organizations (e.g., Shoup1976; Hayashi and Osoguchi 2004; Nakano 2016).

[25] The new entry company cannot do business without obtaining permission. In addition, official price system such as summary cost method and medical fee are introduced for the fee.

Table 4-1. Market share of local public enterprises

(%)

Type of Businesses	Market Share
Water Supply	99.5
Industrial Water Supply	99.9
Sewerage	91.3
Transportation *1	13.4
Electric Power	1.1
Gas Power	2.3
Hospital	12.3
Wholesale Market *2	13.1
Car Parking *3	-

Source(excluded Wholesale Market)：“The Local Public Enterprises Yearbook No.60(2013)”

*1 Average of Railway, Car Transport, Monorail and Shipping, *2 Source: Endo (2013), *3 No data

2.2 Trend of Population in Japan and Future Population Estimates

Changes in the population of Japan have two characteristics. One is the population structure that the percentage of elderly people in the population is higher than other generations. And the other is that the trend has changed dramatically so that the population may decrease after 2006.

In connection with the first feature, though elderly people are over 65 years old, in Japan, in 2005 the proportion of elderly people in the population exceeded 20%, becoming called super aging society. For this reason, Japan is said to be one of the world's oldest elderly people, but elderly people with health risks have pension as their main source of income, so their reliance on public services is high[26]. It is pointed out in the field of public economics and public finance that the changing population composition by age in this way leads to a change in the demand for public services due to the change in the medium and long term (e.g., Hayashi and Osoguchi 2004; Nakano

[26] Medical expenses for the elderly has exceeded 35% of the national medical expenses since 2000 and continues to increase. The nursing care expenditure was 0.7% of GDP in 2000, but it doubled to 1.9% in 2013. In addition, the ratio of elderly person 60 years or older is higher than 50% among welfare recipients.

2016). Therefore, in order to carry out cost management, it is required to accurately grasp the demand forecast and respond to the change. And managers must also pay attention to the change in the proportion of population by age in order to cope with the change in demand. Thus, in order to verify the cost behavior of local public enterprises, it is required to verify it while paying attention to the trend of population composition by age.

As the second feature, in Japan, the total population has declined since 2006. In Japan, the population has consistently increased since 1945 after the World WarII, but its trend has changed significantly. And the National Institute of Population and Social Security estimates population in the future and predicts that population decline will continue in the future[27]. Local public enterprises must rebuild their capacity to the capacity corresponding to the demand drop of population decline and to downsize management resources so as not to generate unnecessary slack. Therefore, management based on future population estimation is indispensable not only for local public enterprises but also for all public organizations[28]. There are three estimates for this future population decline prediction: optimistic scenario (high estimate), neutral scenario (middle estimate), pessimistic scenario (low order estimation), but in all scenarios the future population will be in decreasing trend (Figure 4-1). And, it is reported by the census that it is after 2006 that the population decline actually started[29].

---

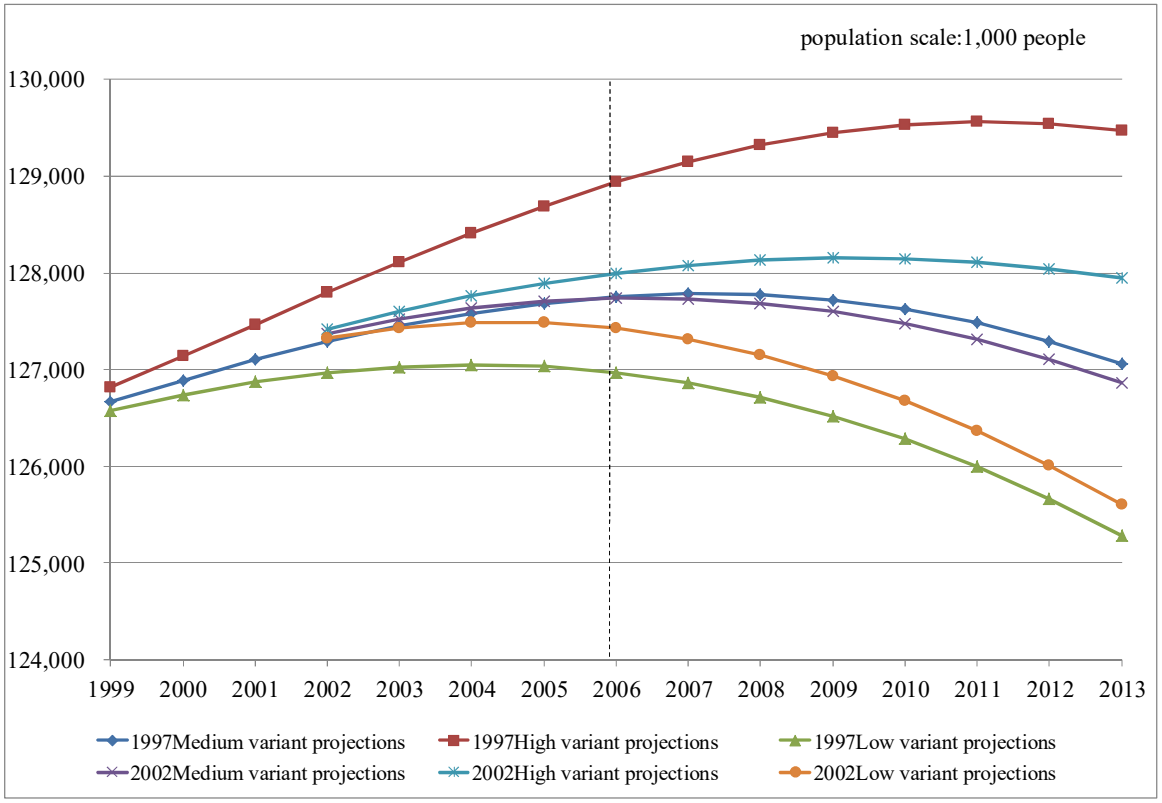
[27] Most recently, estimates are conducted in 1997, 2002, 2006, 2012 and 2017.

[28] In public works projects carried out by the government, it is explained that proper operation of population projection in the future is important for demand forecasting(Ministry of Internal Affairs and Communications “Advice based on the findings about demand for public works project predictions” (August, 2008)). This material is used as a reference material in formulating future management plans in many public organizations including local public enterprises (Nishioka et al. 2007a; Nishioka et al. 2007b).

[29] The word "population decline" was used for the first time in "2005 preliminary population report of the 2005 census population" published by the Ministry of Internal Affairs and Communications in December 2005. http://www.stat.go.jp/info/today/009.html

Therefore, from 2006 onwards, the population decrease scenario based on future population estimation will show the downside risk of demand. Banker et al. (2014b) explains that the downside risk of demand is a cause of the sticky costs. If the managers misread the demand forecast, it will hold a large amount of unnecessary slacks. Conversely, if the capacity is excessively reduced, it will lead to a crisis that the service will be insufficient for demand. In other words, it can be said that managers are in an environment where accurate demand forecasting and cost management must be performed based on population projections in the future.

Figure 4-1. Population projections for Japan (high, medium and low variant projections)



3 Asymmetric Cost Behavior and Hypothesis Deriving

3.1 Asymmetric Cost Behavior

Empirical studies of cost behavior have been actively studied over ten years. It has become clear that the cost changes asymmetrically with respect to the change in activity

amount (sticky costs and anti-sticky costs). However, there are few studies on cost behaviors for public organizations, and the research contents are limited.

In this section, the author confirmed prior studies from two points of research on cost behavior of public organization and relationship between demand forecast and cost behavior.

Bradbury and Scott (2018) and Cohen et al. (2017) investigate the local public entity. And they clarified that there is an asymmetric diversity in the cost behavior of the local public entity. They explain that factors that cause sticky costs are mainly service expenses for residents. The resident service expense relates to the core competence of the local public entity, and it becomes incentive to try to improve resident's satisfaction rating to the local public enterprise managers. For this reason, it has been pointed out that managers are less likely to have the incentive to reduce the cost even if the tax revenue decreases (Bradbury and Scott 2018). In addition, it is explained that the sticky costs appear from the reason that the cost reduction is difficult because providing with public service is core competence for the public sector organizations (Cohen et al. 2017). On the other hand, Cohen et al. (2017) clarifies that the anti-sticky costs appear in the internal expenses such as administrative expenses not related to core competence.

However, the tax is used for the proxy index of the activity amount in their analyses. The tax is not consideration of service but the one obligatorily collected. For this reason, it is pointed out that tax is not suitable as the proxy index representing the change in the activity amount of the organization (Banker et al. 2018). The local public enterprises that the author analyzes are getting usage fee as service consideration as well as for-profit enterprises, so their points are clear.

Kama and Weiss (2013) and Shust and Weiss (2014) excluded the public enterprises from the analysis object for the reasons that the accounting methods were different. However, the local public enterprises in Japan are managed by the same accounting standards and accounting methods as for commercial enterprises. Therefore, their points are cleared and the same research technique as the prior studies can be used. Holzhacker et al. (2015) analyzed the cost behavior of hospitals into three categories, private, public, and non-profit by the each ownership, clearly shows that the sticky costs appear strongly in local public enterprises. However, since they have examined only the hospital business of public services, they do not grasp the cost behavior of public services in other business fields. In this respect, this research covers nine businesses including hospital business, so the author can generalize and verify the cost behavior of public organizations.

Next, the author confirms prior studies on the demand forecast and the relationship between cost behaviors of local public enterprises. Banker et al. (2014b) explains that in situations where demand uncertainty arises, management maintains management resources to respond to changes in demand to maintain idle capacity. For this reason, they say that if the uncertainty of demand is large, the sticky costs will increase to maintain capacity.

On the other hand, when the possibility of demand falling below forecast increases, that is, when the downside risk of demand is high, it is distinguished from uncertainty of demand. And, they explain that the sticky costs appear in this case (Banker et al. 2014b). According to Banker et al. (2014b), if the downside risk of demand is high, it will lower the average of demand. Therefore, they are explaining that the sticky costs appear because it becomes with a lot of needless resources on business

to the demand forecast, and the idle capacity increases as a result in high fixed cost structure industries.

Thus, when the sticky costs appear, it is divided into the case where demand is uncertain and the case where downside risk of demand arises and they insist that the sticky costs appear as a result of each different cost management.

Banker et al. (2014a) clarifies that there are differences in decision-making stance between when management is optimistic and when it is pessimistic. That is, if management is optimistic, it is expected that future expectations will be high, so management resources will be kept intact, if it is pessimistic, management resources will be adjusted.

Characteristics of this research not only clarify whether the sticky costs are confirmed in the cost behavior of public organization, but also the relationship between market share and uncertainty of demand forecast, and future demand forecast and the downside risk of demand.

3.2 Hypotheses Setting

In previous studies on cost behavior of public organizations, both the sticky costs and the anti-sticky costs appear, and asymmetric cost behavior has been confirmed (e.g., Bradbury and Scott 2018; Cohen et al. 2017; Holzhacker et al. 2015). In addition, Hosomi and Nagasawa (2018) analyzed cost behavior of local public enterprises in Japan during the period from 1979 to 1998, and confirmed that asymmetry appears in cost behavior. And, they are suggesting the possibility that the business environment, the cost structure, the market share, and the pricing procedure influence as a factor of the asymmetric cost behavior.

Focusing on the business environment pointed out by them, in Japan, since 1999, the population which substitutes for demand changed significantly. Concretely, the percentage of elderly people in Japan's population composition by age until 1998 was

low compared to the present. However, as confirmed in the previous section, in 2005, Japan began to enter a super aging society and changed to an era where the proportion of elderly people is remarkably increasing. Therefore, it can be said that it shifted to a business environment clearly different from the analysis period of Hosomi and Nagasawa (2018) when demand changes are examined from the population structure.

Elderly people are highly dependent on public services, but pension is the center of income, so it is difficult to increase fee income. Bradbury and Scott (2018) and Cohen et al. (2017) pointed out that even though tax revenue declines, residents' services are the core competence of public organizations and incentives to reduce their expenses do not work, the sticky costs will occur. As the business environment surrounding local public enterprises since 1999, the demand for public services has increased due to the increase in elderly people, and managers are thought to reduce the flexibility of cost adjustment. In other words, it can be said that the business environment has undergone a major change due to changes in population composition by age. Therefore, unlike the analysis result of Hosomi and Nagasawa (2018), it is thought that the sticky costs appear to the cost behavior of local public enterprises.

Hypothesis 4-1 ： The sticky costs appear in the cost behavior of local public enterprises.

Next, Hosomi and Nagasawa (2018) pointed out the market share as one factor that affects cost behavior of local public enterprises. Banker et al. (2014b) pointed out that the sticky costs appear when the demand uncertainty rises. Conversely, when the uncertainty of demand is low, theoretical and empirical validation has not been done on how cost behavior changes. Theoretically, the uncertainty of demand decreases in a business environment where the market share is high and the future demand forecast is high accuracy. Therefore, it is not necessary for managers to hold slacks, and the cost adjustment should be done so as to be an optimal management resource. In this case, the

idle capacity cost decreases, and the sticky costs become weak or it seems that the anti-sticky costs appear. Three businesses of water supply business, industrial water supply business, and sewerage business maintain the market share of 90% or more as shown in Table 4-1. In these three businesses, the market share is high, so it can be said that it is in a business environment in which more accurate demand forecasting can be performed than other businesses. Hosomi and Nagasawa (2018) also revealed that the anti-sticky costs appear in the water supply business and the industrial water supply business in the analysis of cost behavior by industry.

Hypothesis 4-2：In businesses with high market share, the sticky costs are weaker than that of businesses with low monopolization, or the anti-sticky costs appear.

Finally, the author would like to examine the change in cost behavior from the relationship between the three future population estimation scenarios and the downside risk of demand. Banker et al. (2014b) asserts that the sticky costs appear when there is a downside risk of demand, apart from the uncertainty of demand. Three population estimation prospects that represent the demand forecast of local public enterprises are optimistic scenario, neutral scenario, and pessimistic scenario. However, all of these predicted the future population will decline. In other words, it can be said that the business environment of the Japanese public organizations has a situation in which the downside risk of demand is high. In particular, since 2006, population declines have also been reported in the census. Banker et al. (2014b) analyzed commercial companies, but the author thinks that local public enterprises are different from commercial companies. In other words, the author thinks that local public enterprises can make demand forecasts based on population, and because the demand forecast accuracy is high, managers can respond to the downside risk of demand. Therefore, the author

thinks that the sticky costs show weak value or the anti-sticky costs show even when the downside risk of demand increases due to the declining population since 2006. Managers of local public enterprises are considered to be capable of cost management based on long-term management plan without holding large amounts of unnecessary slacks.

Hypothesis 4-3：Because the downside risk of demand rises after 2006, the sticky costs become weak more than before that.

4 Research Method

4.1 Sample Selection and Descriptive Statistics

In this study, the author analyzed local public enterprises in Japan since 1999 which Hosomi and Nagasawa (2018) did not analyze. The analysis period is 15 years from 1999 to 2013. The reason for this is to avoid the bias due to the change in accounting method because the accounting method of local public enterprises was changed with the revision of the law in 2014.

Sample data were targeted at 9 industries(water supply business, industrial water supply business, transportation business, electric power business, gas power business, hospital business, sewerage business, wholesale market business, and car parking business) published based on "Local Public Enterprise Yearbook" by the Autonomy Local Finance Bureau of the Ministry of Public Management, Home Affairs, Posts and Telecommunications.

In the analysis model, since the year-on-year ratio is used, except for 1999 data, the number of samples was 41,194 fiscal year data. From this data, further outliers of 1% above and below are excluded listwise, eventually the number of samples was 4,342 businesses, 39,803 data. Descriptive statistics are shown in Table 4-2. The largest

number of samples is 20,363 water supply business, accounting for 51.16%. The second largest number sample is hospital business 10,989 data, accounting for 27.61%. And the third largest number sample is 3,253 sewerage business data, accounting for 8.17%, the fourth largest is 3,080 industrial water business, accounting for 7.74%. In other projects, the number of samples is less than 5% of the total. The point where the present study is different from Hosomi and Nagasawa (2018) is a point that the toll road business is not included in the analysis object. Since the toll road business was entrusted or transferred to private enterprises, it was no longer a local public enterprise.

As a feature of data, the operating expenses, the average value of operating revenues, and the standard deviation are all the highest in the transportation business. And the minimum value includes 0 yen for operating expenses and operating revenues. This means including preparations for start-up and preparation for disposal. Although some studies exclude these samples, survival bias is generated by excluding these samples, so the author decided to include them in this study. And the water supply business is the largest for the maximum value. And, in this study, these samples were converted in a natural logarithm and used for analysis. Further analysis in Panel B of Table 4-2 tests the variables for the significant factors that could influence the regression, multicollinearity and auto-correlation. The variance inflation factor (VIF) is less than 10 for all variables, which indicates that multicollinearity is not a concern in the estimation of the models. Thus, the regression model does not suffer from multicollinearity.

Table 4-2. Descriptive statistics and Multicollinearity test

Panel A: Descriptive statistics

*Scale: 1,000 yen

		Mean	Standard deviation	Minimum	Lower quartile	Median	Upper quartile	Maximum	Sample size
Total	Cost (Operating costs) *	2,612,574	8,799,640	0	221,487	662,522	2,151,206	287,019,811	39,803
	Revenue (Operating revenues) *	2,755,903	10,869,173	0	239,630	671,813	2,144,273	343,940,347	
	ln cost $_t$/cost $_{t-1}$	0.0024	0.0757	-0.4990	-0.0284	0.0009	0.0303	0.5087	
	ln revenue $_t$/revenue $_{t-1}$	-0.0006	0.0737	-0.6526	-0.0242	-0.0023	0.0216	0.6419	
Water Supply	Cost (Operating costs) *	1,548,498	8,312,254	0	185,332	395,952	1,055,683	287,019,811	20,363
	Revenue (Operating revenues) *	1,829,384	9,941,144	0	217,217	463,236	1,217,356	343,940,347	
	ln cost $_t$/cost $_{t-1}$	0.0053	0.0739	-0.4990	-0.0274	0.0011	0.0320	0.5087	
	ln revenue $_t$/revenue $_{t-1}$	0.0005	0.0570	-0.5997	-0.0214	-0.0045	0.0141	0.6239	
Industrial Water Supply	Cost (Operating costs) *	439,601	903,945	0	24,339	161,663	427,028	7,998,631	3,080
	Revenue (Operating revenues) *	562,334	1,149,919	0	23,598	172,163	566,361	10,943,486	
	ln cost $_t$/cost $_{t-1}$	-0.0041	0.1045	-0.4982	-0.0457	-0.0043	0.0375	0.4999	
	ln revenue $_t$/revenue $_{t-1}$	-0.0016	0.0863	-0.5840	-0.0159	0.0000	0.0109	0.5922	
Sewerage	Cost (Operating costs) *	4,097,754	16,494,054	0	128,629	477,270	1,894,689	225,035,329	3,253
	Revenue (Operating revenues) *	5,195,664	23,407,597	0	57,751	343,483	57,751	341,558,184	
	ln cost $_t$/cost $_{t-1}$	0.0146	0.0788	-0.4764	-0.0154	0.0081	-0.0154	0.4929	
	ln revenue $_t$/revenue $_{t-1}$	0.0234	0.0904	-0.6526	-0.0121	0.0084	-0.0121	0.6419	
Transportation	Cost (Operating costs) *	11,283,879	23,086,602	0	616,783	2,099,192	10,968,929	138,555,307	819
	Revenue (Operating revenues) *	11,737,793	26,872,233	0	509,212	1,672,011	10,845,291	155,059,483	
	ln cost $_t$/cost $_{t-1}$	-0.0265	0.0812	-0.4816	-0.0575	-0.0202	0.0102	0.4580	
	ln revenue $_t$/revenue $_{t-1}$	-0.0262	0.0928	-0.6122	-0.0464	-0.0155	0.0074	0.5557	
Electric Power	Cost (Operating costs) *	2,222,829	5,213,301	0	300,991	637,249	1,479,712	40,287,262	542
	Revenue (Operating revenues) *	2,382,385	5,523,493	0	330,796	691,594	1,531,321	40,270,247	
	ln cost $_t$/cost $_{t-1}$	0.0107	0.0756	-0.2547	-0.0309	0.0043	-0.0309	0.4891	
	ln revenue $_t$/revenue $_{t-1}$	0.0099	0.0688	-0.6239	-0.0247	0.0051	-0.0247	0.4456	
Gas Power	Cost (Operating costs) *	2,177,425	1,585,314	30,139	1,083,237	1,853,304	2,891,793	7,926,889	422
	Revenue (Operating revenues) *	2,648,441	1,914,715	45,709	1,291,597	2,225,493	3,540,690	9,506,942	
	ln cost $_t$/cost $_{t-1}$	-0.0044	0.0711	-0.3572	-0.0422	-0.0102	0.0302	0.3839	
	ln revenue $_t$/revenue $_{t-1}$	-0.0118	0.0631	-0.3742	-0.0406	-0.0104	0.0107	0.4312	
Hospital	Cost (Operating costs) *	4,175,345	4,512,187	0	974,274	2,319,061	5,954,692	31,602,391	10,989
	Revenue (Operating revenues) *	3,772,942	4,265,283	0	812,593	2,022,084	812,593	32,298,365	
	ln cost $_t$/cost $_{t-1}$	-0.0022	0.0657	-0.4888	-0.0274	0.0012	-0.0274	0.5049	
	ln revenue $_t$/revenue $_{t-1}$	-0.0068	0.0873	-0.6494	-0.0397	0.0010	-0.0397	0.6249	
Wholesale Market	Cost (Operating costs) *	2,267,100	4,212,595	66,223	267,661	602,699	1,839,599	16,928,397	193
	Revenue (Operating revenues) *	1,963,711	3,743,950	0	178,288	571,458	1,418,043	14,497,486	
	ln cost $_t$/cost $_{t-1}$	-0.0148	0.0738	-0.4109	-0.0412	-0.0167	0.0087	0.4347	
	ln revenue $_t$/revenue $_{t-1}$	-0.0148	0.0394	-0.4207	-0.0266	-0.0111	0.0022	0.0510	
Car Parking	Cost (Operating costs) *	95,731	73,103	2,791	50,318	83,077	120,878	372,239	142
	Revenue (Operating revenues) *	135,424	98,231	4,533	73,697	103,079	192,007	499,078	
	ln cost $_t$/cost $_{t-1}$	-0.0211	0.1155	-0.4468	-0.0703	-0.0219	0.0219	0.4063	
	ln revenue $_t$/revenue $_{t-1}$	-0.0406	0.1103	-0.5347	-0.0896	-0.0281	0.0141	0.2633	

Panel B: Multicollinearity test

Variance inflation factors

Explanatory Variable	VIF
Revenues $_{i,t}$	2.475775
*Decrease_Dummy *Revenues* $_{i,t}$	2.475775

VIF= centered variance inflation factor.

4.2 Analytical Model

A model of Anderson et al. (2003) has been adopted in many studies as an empirical research method of cost behavior (e.g., Banker and Byzalov 2014). This model was also used for research targeting public organizations, and the asymmetry of cost has been clarified (e.g., Bradbury and Scott 2018). And since Hosomi and Nagasawa (2018) also uses this model, it is effective in comparison with their analysis results. Therefore, the author decided to use Anderson et al. (2003) model to verify *Hypotheses 4-1* and *4-2*.

Model 4-1

$$ln\left[\frac{Cost_{i,t}}{Cost_{i,t-1}}\right] = \beta_0 + \beta_1 * ln\left[\frac{Re\,v\,enue_{i,t}}{Re\,v\,enue_{i,t-1}}\right] + \beta_2 * Decrease\_Dummy_{i,t} * ln\left[\frac{Re\,v\,enue_{i,t}}{Re\,v\,enue_{i,t-1}}\right] + \varepsilon_{i,t} \quad (4.1)$$

In this formula, *Cost* represents operating expenses and *Revenue* represents operating revenue. *Decrease_Dummy* is a dummy variable that takes 1 if the operating revenue declines compared with the previous year and 0 in other cases. If β_2 is 0, the operating revenue and the operating expenses are in a proportional relationship, but if β_2 is a negative value it indicates the sticky costs, and in the contrary when it becomes a plus, it indicates the anti-sticky costs. In addition, in the verification of *Hypothesis 4-3*, in order to take into account the influence of the trend of population decline that began in 2006, verification is carried out by model 4-2 which adds the after dummy variable to model 4-1.

Model 4-2

$$ln\left[\frac{Cost_{i,t}}{Cost_{i.t-1}}\right] = \beta_0 + \beta_1 ln\left[\frac{Re\ v\ enue_{i,t}}{Re\ v\ enue_{i,t-1}}\right] + \beta_2 * Decrease\_Dummy_{i,t} * ln\left[\frac{Re\ v\ enue_{i,t}}{Re\ v\ enue_{i,t-1}}\right]$$
$$+\beta_3 * Decrease\_Dummy_{i,t} * ln\left[\frac{Re\ v\ enue_{i,t}}{Re\ v\ enue_{i,t-1}}\right] * After + \varepsilon_{i,t} \quad (4.2)$$

In this formula, *Cost* represents operating expenses, *Revenue* represents operating revenue. *Decrease_Dummy* is a dummy variable that takes 1 if the operating revenue declines compared with the previous year and 0 in other cases. *After* dummy is a dummy variable in which it assumes after fiscal year 2006 to be 1.

5 Result

Using model 4-1, the author verified the cost behavior of local public enterprises through panel data analysis (Table 4-3). As a result of analysis, a significant result was obtained in all of the pooled model, the fixed effect model, and the random effect model. And, as a result of the Hausman test, the fixed effect model represented the most suitable result. β_2 showed a negative value of -0.830. From this result, it was confirmed that the sticky appeared in cost behavior of the local public enterprises from 1999 to 2013. Hosomi and Nagasawa (2018) analyzes the cost behavior between 1979 and 1998 and confirms the anti-sticky costs. The result of this analysis contrasted with the analysis result of Hosomi and Nagasawa (2018). The author focused on demand in the business environment and thought that the change in composition ratio of population by age due to the increase in elderly people influences cost behavior, but this *Hypothesis 4-1* was supported.

Table 4-3. Cost behavior of local public enterprises

Variable	Predicted sign	Coefficient	t-stat
β_0		0.0009	2.01 **
β_1	+	0.4811	57.73 ***
β_2	−	-0.0830	-6.24 ***
$Adj.R^2$		0.1930	
N		39,803	
DW		2.3961	
Panel data		Fixed effects	

Note: For β_0, β_1, and β_2, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test.
*, **, and *** denote significance at levels of 0.1, 0.05, and 0.01.
$Adj.R^2$, N, and DW mean Adjusted R^2, Number of observations, and Durbin-Watson ratio, respectively.

Next, the author confirms the cost behavior from the correlation between market share and demand forecast for *Hypothesis 4-2*. the author compared the cost behavior between the three businesses, water supply, industrial water supply, sewerage, which has a market share of more than 90%, and other projects (Table 4-4). As a result of analysis, significant results were obtained in all of the pooled model, the fixed effect model, and the random effect model. And, as a result of Hausman test, the fixed effect model showed the best result. In three businesses with high market share, β_2, which indicates the sticky costs, was -0.1287, but in other businesses where the market share was low, β_2 was -0.0395. As a result, the author assumed that the sticky costs weakened or the anti-sticky costs occurred due to low uncertainty of demand when market share was high, but *Hypothesis 4-2* was not supported. For reference, the cost behavior for each industry is shown in Table 4-5, but a variety of cost behavior was confirmed for each type of industry. This result was partially different from Hosomi and Nagasawa (2018).

Table 4-4. Relationship between market share and cost behavior

Variable	Predicted sign	High Market Share Businesses[†1]		Low Market Share Businesses[†2]	
		Coefficient	t-stat	Coefficient	t-stat
β_0		0.0017	3.01***	-0.0011	-1.67**
β_1	+	0.4883	44.47***	0.4698	40.07***
β_2	−	-0.1287	-6.58***	-0.0395	-2.36***
$Adj.R^2$		0.1218		0.3769	
N		26,696		13,107	
DW		2.4533		2.1973	
Panel data		Fixed effects		Fixed effects	

Note: For β_0, β_1, and β_2, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test. *, **, and *** denote significance at levels of 0.1, 0.05, and 0.01. $Adj.R^2$, N, and DW mean Adjusted R^2, Number of observations, and Durbin-Watson ratio, respectively.
[†1] Water Supply Business, Industrial Water Supply Business, Sewerage Business, [†2] Other businesses

Table 4-5. Cost behavior by industrial classification (Additional Analysis)

Variable	Water Supply			Industrial Water Supply			Sewage			Transportation			Electric Power		
	Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat	
β_0	0.0033	5.60	***	-0.0018	-0.84		0.0018	1.14		-0.0127	-4.24	***	-0.0005	-0.12	
β_1	0.6074	50.45	***	0.2286	6.94	***	0.3600	17.15	***	0.3698	6.70	***	0.3594	4.41	***
β_2	-0.1013	-4.47	***	0.0772	1.56		-0.2897	-7.47	***	0.1012	1.40		-0.0162	-0.12	
$Adj.R^2$	0.1795			0.0489			0.1383			0.3007			0.0934		
N	20,363			3,080			3,253			819			422		
DW	2.4155			2.1852			2.2927			2.2031			2.4645		
Panel date	Fixed			Random			Fixed			Fixed			Random		

Variable	Gas Power			Hospital			Wholesale Market			Car Parking		
	Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat		Coefficient	t-stat	
β_0	-0.0051	-1.63		-0.0001	-0.21		-0.0043	-0.68		-0.0210	-1.61	
β_1	0.9068	17.62	***	0.4860	42.36	***	0.6816	1.29		0.4572	2.02	**
$\boldsymbol{\beta_2}$	-0.3932	-4.27	***	-0.0416	-2.56	**	0.0423	0.07		-0.3095	-1.10	
$Adj.R^2$	0.4756			0.4068			0.1383			0.0412		
N	542			10,989			193			142		
DW	2.0660			2.1847			2.2141			2.0900		
Panel date	Random			Fixed			Random			Random		

Note: For β_0, β_1, and β_2, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test. *, **, and *** denote significance at levels of 0.1, 0.05, and 0.01. $Adj.R^2$, N, and DW mean Adjusted R^2, Number of observations, and Durbin-Watson ratio, respectively.

Finally, in order to verify *Hypothesis 4-3*, the author performed panel data analysis using model 4-2 (Table 4-6). As a result of analysis, significant results were obtained in all three analysis models. And, as a result of Hausman test, the author found that the fixed effect model is most suitable. β_3 representing cost behavior since 2006 has a negative value of -0.2094. In other words, it is confirmed that the sticky costs tend to strengthen after 2006, when the downside risk of demand increases. As a result, *Hypothesis 4-3* was not supported.

Table 4-6. Relationship between downside risk of demand and cost behavior

Including After year 2006 Dummy Variables				
Variable		Coefficient	t-stat	
β_0		0.0013	2.87	***
β_1		0.4775	57.42	***
β_2		0.0525	3.20	***
β_3	*after*	-0.2094	-13.97	***
$Adj.R^2$		0.1974		
N		39,803		
DW		2.3961		
Panel data		Fixed effects		

Note: For β_0, β_1, and β_2, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test.
*, **, and *** denote significance at levels of 0.1, 0.05, and 0.01.
$Adj.R^2$, N, and DW mean Adjusted R^2, Number of observations, and Durbin-Watson ratio, respectively.

6 Conclusion

In this chapter, in order to clarify the cost behavior of public organization, the author confirmed the cost behavior for the local public enterprises owned by local public entities. Together with the work of Hosomi and Nagasawa (2018) covering 1979 to 1998, the analysis period lasts 35 years. Over the long term, the author has verified the cost behavior of local public enterprises. Based on this point, the author will describe the features of this research, the limits of this research and the future subjects below.

As the first feature, it can be pointed out that the sticky costs are confirmed in the cost behavior of the local public enterprise as a whole. This result contrasted with Hosomi and Nagasawa (2018) which confirmed the anti-sticky costs. As an external environmental factor affecting asymmetric cost behavior, the impact of the increase in elderly people can be considered. In other words, changes in population composition by age may have influenced the cost behavior of local public enterprises. Japan has entered a super aging society in 2005 and pressure is increasing to expand public services for public organizations. Therefore, as for the local public enterprise managers, the situation that it was difficult to reduce cost to income decrease continued to cope with the stagnation of the rate income. The author thought that changes in the business environment due to the proportion of these population by age group contributed to the asymmetry of cost behavior. However, in this research the author cannot fully control these external environmental factors. In future research, it can be said that it is necessary to verify these factors more strictly. In addition, not only external environmental factors, but also analysis factors within the organization management are required.

The second feature is that the influence on cost behavior is confirmed from the interaction of market share and demand forecast. When the market share is high, precise demand forecasting is possible and the uncertainty of demand decreases. For this reason, the author thought the local public enterprise managers did not need to keep slack of management resources in preparation for uncertainty of demand, and the sticky costs would decline. However, as a result of the analysis, the conclusion showed the opposite fact. In other words, the sticky costs appeared stronger in all of the three businesses of water supply, industrial water supply, and sewerage, which have a high market share, compared to other businesses. This means that even if the reliability of demand due to

market share increases, the cost behavior of local public enterprises are affected by other factors. In future research, explanation from another factor other than market share rate is required. Hosomi and Nagasawa (2018) suggests that pricing and a cost structure may influence it as other factors to affect the cost behavior. Even these factors need to be verified in future research. Furthermore, as additional analysis, the author confirmed the cost behavior by industry, but the result was different from Hosomi and Nagasawa (2018). Therefore, it can be said that more detailed analysis is necessary for each industry. The author would like to identify the factors that change the cost behavior for each industry type in future research.

Finally, as the third feature, this study focuses on the downside risk of demand. Public services are mainly conducted by local public enterprises, so the author used the population as a proxy variable for demand. Then, the author confirmed how local public enterprises are performing cost management for three scenarios of future population forecast (optimism, neutral, pessimism). As a result of the analysis, after 2006 when the downside risk of demand by the population decline rose, it became clear that the sticky costs are strengthening. This suggests that local public enterprises may be affected more than anticipated by the cost structure specific to the public organization, i.e. high fixed costs, low variable costs. And this indicates that the mechanism of sticky costs found in private enterprises was confirmed by public organizations in the event of downside risks argued by Banker et al. (2014b). In other words, it means that the administrators of local public enterprises could not adjust their management resources in preparation for the downside risk of demand like private enterprises managers caused by their high fixed cost structure.

The costs behaviors of public organizations are expected to be elucidated not only from academic but also practical, and further exploration is required in the future.

V Sticky Costs in the Case of Municipal Mergers: An Evaluation of Adjustment Costs versus Economies of Scale

1 Introduction

This study examines how public organization administrators manage their costs through municipal mergers with a focus on the change in cost behavior as a method for verifying cost management. From a resource-based view (RBV), for-profit enterprises in the private sector gain a competitive advantage through mergers by acquiring the capabilities of the external organization and converting them to internal resources (Anand and Singh 1997; Capron et al. 1998; Vermeulen and Barkema 2001). In other words, there may be an expectation of synergy effects and the acquisition of the management resources and capacity of the other company following a merger (e.g., Graebner et al. 2010). However, few cases of mergers have the expected effect (King et al. 2004; Lubatkin 1983). After a merger, the improvement of financial indicators is confirmed in the short term, but a negative effect on innovation is reported because the new organization cannot achieve the competitiveness of long-term companies (Hitt et al. 1991). This outcome is because a merger is a process of integrating heterogeneous organization structures, organization routines, operations, corporate cultures, etc. across multiple companies, which requires a process of rearranging management resources.

These prior studies only focus on the mergers and acquisitions (M&A) of for-profit enterprises, and few empirical studies focus on mergers of municipalities in the public sector. In Japan, municipality mergers peaked until 2004. These mergers took place throughout the country, and the number of municipalities decreased to about half. Few such cases of large-scale municipal mergers exist worldwide. In this study, the author focuses on the time period when these mergers took place. In general, municipal

mergers are also expected to provide the benefits of scale and synergy effects. Furthermore, it is thought that municipal mergers 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 merger effects, those that do not find merger effects, and those that explain that the effect is limited. In other words, these studies have not reached a conclusion on whether the mergers of municipalities are effective or not. It is necessary to clarify whether the effectiveness of a public organization's cost management improves through municipal mergers and to verify whether a bigger organization is really better. In the research on empirical cost behavior, it has been pointed out that as the organization size and scale of management resources increase, resource adjustment costs also increase, and sticky costs are therefore increased (Boshch and Blandon 2011; Sepasi and Hassani 2015).

As for public sector cost behavior, due to the expansion of management resources, such as human resources and material resources, caused by the merger, resource adjustment costs may increase. With an increase in resource adjustment costs, public organizations' sticky costs may intensify after mergers of municipalities. In other words, the administrators of the merged municipalities may not be able to fully adjust their human resources and material resources costs to correspond to the change in their activities. From an RBV, the capabilities of the external organization cannot be smoothly transformed into the management resources of the internal organizations. Because public organizations are required to conduct efficient and effective management through mergers, it is necessary to understand the cost behavior after

mergers of municipalities to determine whether mergers have positive or negative effects for public organizations. To do so, the author will also clarify whether or not sticky costs increase for public organizations following a merger.

In this study, the author focuses on municipal enterprises (MEs) in Japan as representative public organizations. Under ME law, MEs are considered a part of municipal organizations. However, from the viewpoint of business management, the chiefs generally give management authority to the MEs' administrators so that they can manage their MEs independently from municipalities. MEs generally provide services, such as water services, and receive service charges. Therefore the administrators of MEs have to manage based on only their service charges without depending on taxes. Since MEs 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 MEs is also integrated as part of municipal mergers. Therefore, by analyzing MEs, it is possible to understand not only public organizations' cost behavior but also the changes in cost management due to municipal mergers.

In this study, the author first clarifies the cost behavior of MEs, which are public sector organizations, using an empirical model, and, then, the author verifies the changes in cost behavior due to municipal mergers using the differences-in-differences method (DID). Using the DID method, it is possible to capture only the effect of municipal mergers.

This chapter proceeds as follows. Section 2 discusses the characteristics of MEs and the effect of municipal mergers, and Section 3 describes the DID method. In Section 4, the author reviews the literature on public organization cost behavior and

develop my research hypotheses. Section 5 describes the research methodology, including the sample data, the variable measures, and the models. Section 6 presents and discusses the results. Finally, Section 7 concludes with a discussion of the limitations of this study and suggestion for future research.

2 Characteristics of MEs and Effects of Municipal Mergers

2.1 Characteristics of MEs

MEs in Japan deal with the functions such as the water supply, the industrial water supply, sewer, automobile transportation, railways, electricity, gas, and hospitals, and each municipality independently deals with its own businesses. These services can be provided not only by MEs but also by commercial enterprises. However, before starting such businesses, government approval and authorization are required in Japan, since these services are critical necessities. In other words, MEs 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 (Ooshima 1971).

The organizational forms of MEs have some unique characteristics. A ME is an internal bureau of a municipal organization, so a ME is not completely independent from a municipality under the law. However, MEs have their own business administrators apart from the chiefs who are the heads of the municipalities. Therefore, administrators manage ME businesses independently from municipalities. This business system is intended to allow ME administrators to make cost management decisions quickly and flexibly since their services should be provided efficiently and effectively. Additionally, MEs' settlements and budgets are also separate from those of municipalities. Thus, MEs have to continue to provide their services to residents stably based only on the service charges without depending on taxes from municipalities. On

the other hand, MEs are not fully independent from municipalities because the management of the ME administrator must be monitored by the congress and the chief to ensure that the public services are provided safely and continuously. For this reason, ME administrators cannot make important management decisions on their own but rather must get approval from the chiefs and congress. In other words, the chief and councilors who are elected as the representatives of residents oversee the state of ME management. ME administrators have their own stakeholders, and their main purpose is to stably maintain their businesses efficiently and effectively; they are different from commercial enterprises, whose main objective is the maximization of profit (Eldenburg et al. 2004; Holzhacker et al. 2015).

Next, since this study focus on resource adjustment costs, it is important to understand the features of ME management resources. Among MEs' 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 an ME might mainly consist of high committed capacity costs. Furthermore, an ME 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 ME management is a low fixed asset turnover rate[30]. Therefore, ME administrators should manage in the direction of reducing the idle capacity in material resources in order to manage their MEs 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 MEs. ME employees are guaranteed the same status as that of public officers.

[30] The fixed asset component ratio is 91.6%, the fixed ratio is 146.7%, and the fixed asset turnover rate is 0.11% (Local Public Enterprise Yearbook No.61).

By law, ME administrators must continue to employ their workers. For this reason, even if the business situation deteriorates, the dismissal of ME employees is difficult for ME administrators. Even after municipal mergers, ME administrators are obliged to continue the employment of both their own employees and the employees of the merged ME. Thus, ME human resources have a high committed capacity cost and a low managed capacity cost.

2.2 Effects of Municipal Mergers

In Japan, since 1999 and with a peak in 2004, many mergers have been conducted among municipalities. As the result, the number of municipalities decreased from 3,232 organizations in 1999 to 1,719 organizations in 2013. Since MEs are one of the internal divisions of municipalities, they also integrated as part of municipal mergers. The number of MEs decreased from 11,712 businesses in 1999 to 8,703 businesses in 2013[31]. The nationwide increase in municipal mergers occurred for three reasons: the pressure for efficiency improvements caused by the long-term downturn of the Japanese economy, the influence of the decline in population and the expansion of the depopulation area, and the requirement of effective and high-quality public service. First, the long-term downturn of the Japanese economy caused the deterioration of the financial statuses of municipalities. For this reason, small- and medium-sized municipalities had to strengthen their financial basis through mergers. Specifically, municipal mergers aimed to achieve economies of scale. Second, due to the expansion of the depopulation area, demand for public services changed significantly. In other words, in order to secure profitability, municipalities had to provide services to wider

[31] There are several reasons why the rate of decrease in the number of municipalities due to the merger differs from the rate of decrease in the number of municipal enterprises. One of the major reasons is that some municipal enterprises started their operations after the merger of municipalities.

areas. Thus, mergers also aimed to achieve economics of scope. Finally, municipalities expected to share knowledge through mergers and enhance synergy effects. Moreover, when municipal mergers were carried out, subsidies from the Japanese government increased, which created incentives for stakeholders in municipalities.

The Japanese government reported the effectiveness of municipal mergers in 2008 and 2010. These reports stated that the effects of municipal mergers 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 mergers. There are three main arguments. The first is that there is good evidence of municipal mergers effects, the second is that there is no evidence of municipal mergers effects, and the third is that there is only limited evidence of municipal mergers effects (Drew et al. 2015; Edwards and Xiao 2009; Gonzales and Mehay 1987; Liner 1992; Mehay 1981). These studies mainly focus on the correlation between municipal mergers and municipal expenditures, and, so far, no previous studies have focused on changes in cost management due to municipal mergers. In other words, this study is the first to verify the effects of municipal mergers from the viewpoint of the management accounting field.

3 Differences-in-Differences Method

DID is one of the analysis methods used primarily in the field of public economics for policy evaluation. This method can verify differences between the treatment group and the control group by comparing two time periods.

According to Kitamura (2009), DID can be explained as follows. Policy implementation is denoted by "*y1*," and "*y0*" indicates otherwise; "*b*" indicates the period before policy implementation, and "*a*" is the period after policy implementation;

and "*d1*" is the treatment group, and "*d0*" is the control group. Then, the throughput effect (*TE*) can be expressed as follows.

$$TEi = Ei\ (y1a \mid d1) - Ei\ (y1b \mid d1) = BAi$$

Similarly, the difference in the control group before and after policy implementation is as follows.

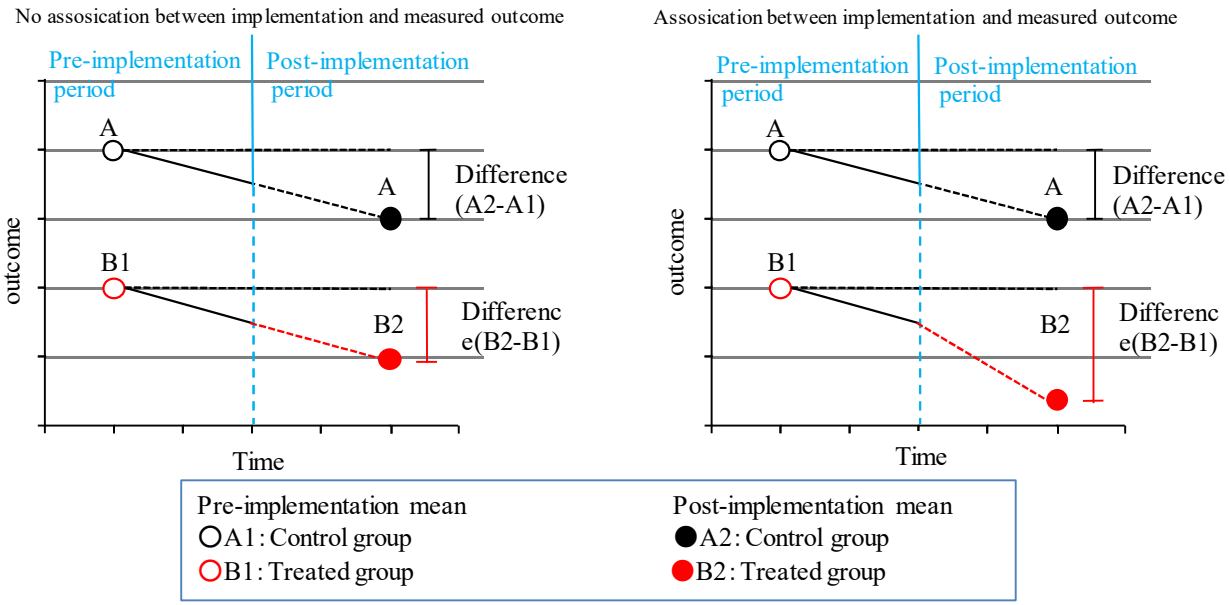
$$TEj = Ej\ (y0a \mid d0) - E\,j\ (y0b \mid d0) = BAj$$

Here, since the change over time in the control group includes the change over time when no treatment occurs, the treatment effect of the treatment group will be overestimated. Therefore, the following difference obtained by the above two equations is the result of estimation by DID.

$$DID = TEi - TEj = BAi - BAj = Ei\ (y1a - y1b \mid d1) - E\,j\ (y0a - y0b \mid d0)$$

A concrete image of the analysis method is shown in Figure 5-1. Based on this method, the author will clarify only the effect on merger cost behavior.

Figure 5-1. Analysis image of the DID method – Source: Dimick and Ryan (2014)



4 Adjustment Costs 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, in the case of human resources, the costs of human resource development, such as training costs or the costs for dismissal compensation, need to adjust depending on the activity level. Similarly, in the case of material resources, maintenance costs or repair costs for facilities or equipment need to adjust 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 author argues 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 (Bradbury and Scott 2018; Cohen et al. 2017; Holzhacker et al. 2015). Bradbury and Scott (2018) analyze the cost behavior of New Zealand municipalities, Cohen et al. (2017) focus on Greek municipalities, and Holzhacker 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 (Holzhacker et al. 2015). Since MEs in Japan are also public organizations, my prediction is that sticky costs will appear strongly for MEs.

Furthermore, Sepasi and Hassani (2015) and Pamplona et al. (2016) clarify that sticky costs are stronger for large organizations than for smaller organization, 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 mergers, since resource adjustment costs are increased by mergers (Jang et al. 2016).

Thus, first of all, the author focuses on the change in organization size. When the organization scale is expanded due to a merger, administrators of MEs should have more difficulty adjusting their management resources. In the case of merging MEs, because the scale of the organization becomes larger after the merger, the sticky costs should be stronger after a merger than they are before a merger.

Hypothesis 5-1-1: In the case of merging MEs, sticky costs appear stronger after a merger than they are before a merger.

In order to confirm whether the changes in MEs' cost behavior are due to the effect of a merger, it is necessary to clarify whether similar changes occur for non-merging MEs. If mergers influence cost behavior, the cost behavior of non-merging MEs should not change significantly throughout the analysis periods.

Hypothesis 5-1-2: In the case of non-merging MEs, sticky costs do not change significantly during the analysis periods, so sticky costs are not as strong as they are for after merged sample of merging MEs.

From an RBV, the merging ME should see an improvement in its management resources with the passage of time after the merger. However, mergers have the expected effect in few cases (Lubatkin 1983; King et al. 2004). Thus, after a merger, the improvement of financial indicators is confirmed in the short term, but mergers may negatively influence innovation, and companies cannot acquire competitive advantage in the long term (Hitt et al. 1991). There is concern that a merger makes it difficult to make long-term adjustments to cost management.

Hypothesis 5-2-1: After a merger of MEs, sticky costs increase over time as compared with those of non-merging MEs.

On the other hand, for non-merging MEs, sticky costs should not change as time passes after 2004.

Hypothesis 5-2-2: In the case of non-merging MEs, sticky costs do not change after 2004.

Next, as management resources are consolidated and eliminated by the mergers, it is necessary to consider the impact of resource adjustment costs on cost behavior. Boshch and Blandon (2011), Dalla Via and Perego (2014), Sepasi and Hassani (2015), and Pamplona et al. (2016) 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 material resource costs and human resource costs. Therefore, when management resources are greater, the committed capacity cost increases, and managers have more difficulty adjusting material resources or human resources costs flexibly. In addition, Jang et al. (2016) focus on the M&A of enterprises and clarify that the sticky costs will also increase for

companies with a large scale of material resources. MEs should integrate their facilities and equipment through mergers, so the scale of material resources should expand. Therefore, as material resources increase, resource adjustment costs increase, and sticky costs are strengthened.

Hypothesis 5-3-1: For merging MEs, the influence of the scale of material resources may affect cost behavior by strengthening sticky costs as compared with those before the merger.

In order to confirm whether changes in MEs' cost behavior are due to mergers, it is necessary to clarify whether similar changes occur for non-merging MEs.

Hypothesis 5-3-2: The impact of material resources adjustment costs is stronger for merging MEs than it is for non-merging MEs.

Next, the author examines 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 and Chen 2006; Banker et al. 2013; Calleja et al. 2006). 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; Calleja et al. 2006). Thus, sticky costs strengthen as the scale of an organization expands, since adjusting human resources costs becomes more difficult for managers (Pamplona et al. 2016; Sepasi and Hassani 2015).

In case of MEs, worker protection laws also make it difficult for management to dismiss employees easily. If the administrators of MEs dismiss employees, then there are still huge resource adjustment costs, such as an increase in compensation costs or

the prolongation of the adjustment by litigation. For this reason, mergers of MEs may increase the committed capacity cost of human resources, so ME administrators will likely lose the flexibility of cost adjustment.

Hypothesis 5-4-1: In the case of merging MEs, the influence of the scale of human resources may strengthen sticky costs relative to the sticky costs before the merger.

In order to confirm whether changes in the cost behavior of MEs are due to mergers, it is necessary to clarify whether similar changes occur for non-merging MEs.

Hypothesis 5-4-2: The impact of human resources adjustment costs is stronger for merging MEs than it is for non-merging MEs.

5 Results

5.1 Sample Selection and Descriptive Statistics

To verify these hypotheses, the current study addresses a panel data analysis. The beginning of the analysis period is fiscal year 1999, when municipal mergers started, and the end of the analysis period is fiscal year 2013, giving a time period of fifteen years.

Analytical samples were collected from the "Local Public Enterprise Yearbook" edited by the Japanese government. This yearbook lists the financial data for nine industries (i.e., the water supply, industrial water supply, transportation, electricity, gas, hospital, sewerage, marketing, and parking lot businesses) for each municipality. In order to observe cost behavior, this study adopts operating revenue as proxy for activity, operating cost as a proxy for costs, total assets as a proxy for material resources, and labor costs as a proxy for human resources, like many other prior studies do (Anderson et al. 2003).

The collected data represent 34,052 firm-years. To control for the effect of outliers, this study deletes the top and bottom 1% of observations. The final sample data includes data for 33,343 firm-years. Therefore, the panel data is unbalanced. Looking at breakdown of the sample data, the sample of merging MEs includes 17,049 firm-years, and the sample of non-merging MEs includes 16,294 firm-years. The sample of merging MEs is composed of 7,888 data points before mergers and 9,161 data points after mergers. Similarly, the sample of non-merging MEs is composed of 4,570 data points before the year 2004 (excluding 2004) and 11,724 data points after the year 2004 (including 2004). 2004 represents the year when mergers were most frequently conducted in Japan.

To use the DID method, the sample was divided into merging MEs as the treatment group (*T*: Treated group) and non-merging MEs as the control group (*C*: control group). In addition, the treatment group was divided into the sample before merging (*b*: before) and the sample after merging (*a*: after). Similarly, the control group was divided into the sample before 2004 (*04 b*: before) and the sample after 2004 (*04 a*: after) (Table 5-1). By using the DID method, the impact of municipalities' mergers on ME cost management can be clarified.

Table 5-1. The concept of the research method using DID

	the merging LPE	the non-merging LPE
Before mergers	Tb	C04b
After mergers	Ta	C04a

Table 5-2 shows the descriptive statistics. The first row is the whole sample of MEs, the sample of merging MEs is described in the second to fourth rows, and the sample of non-merging MEs is described in the fifth to last rows. Each row includes data on costs, revenues, total assets, labor costs, and the natural logarithms of each of

these items. The operating 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 this study includes them in the analysis, taking into consideration the influence of survival bias when they are excluded.

Based on the descriptive statistics, there are two notable characteristics of the data for the whole sample. The first is that the operating balances of the MEs are not in deficit on average, which confirms the soundness of the MEs' financial conditions. The second is that the scale of the total assets is large on average. MEs mainly operate in the field of living infrastructure businesses, such as water supply and transportation, so they require a large scale of facilities.

Next, the sample of merging MEs can illustrate the differences between MEs before and after merging. After mergers, each descriptive statistic increases. However, when the sample of merging MEs is compared with the sample of non-merging MEs, the descriptive statistics are not actually larger for the merging sample. This result implies that mergers were mainly conducted among small municipalities[32]. In addition, the descriptive statistic values are similar for the sample after mergers and the sample after 2004. Therefore, it can be confirmed that the mergers triggered the integration of the scale of organizations and the size of management resources to the same level nationwide. The descriptive statistics as a whole do not indicate any serious defect points that would affect the subsequent data analysis. Further analysis in Panel B of Table 5-2 tests the variables for the significant factors that could influence the regression, multicollinearity and auto-correlation. The results of variance inflation

[32] Municipal mergers took place mainly in small towns and villages with populations of less than 10,000.

factor (VIF) show less than 10 for all variables, therefore, the regression model does not suffer from multicollinearity.

Table 5-2. Descriptive statistics and Multicollinearity test

Panel A: Descriptive statistics

(*Scale: 1,000Yen)

		Mean	Standard deviation	Minimum	Lower quartile	Median	Upper quartile	Maximum	Number
Total	Cost*	2,234,484	5,816,274	70	212,608	579,221	1,773,730	138,555,307	33,343
	Revenue*	2,364,273	6,800,584	0	231,560	600,730	1,847,786	155,059,483	
	Assets*	21,038,800	94,308,914	0	2,088,846	4,807,965	12,450,678	2,541,838,318	
	Labor costs*	739,697	2,214,170	0	33,811	87,991	449,036	71,593,318	
	ln cost t/cost t-1	0.0036	0.0755	-0.4951	-0.0277	0.0012	0.0305	0.5049	
	ln revenue t/revenue t-1	0.0008	0.0692	-0.5630	-0.0235	-0.0026	0.0209	0.5567	
	ln assets t/revenue t	2.1000	1.1478	-4.4576	1.4706	2.2461	2.6643	10.4686	
	ln laborcosts t/revenue t	-1.6528	0.8551	-9.4928	-2.2103	-1.7596	-0.9068	4.8141	
Merging LPEs	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 cost t/cost t-1	0.0073	0.0824	-0.4951	-0.0265	0.0035	0.0344	0.5015	
	ln revenue t/revenue t-1	0.0043	0.0749	-0.5630	-0.0221	-0.0012	0.0236	0.5567	
	ln assets t/revenue t	2.1570	1.2003	-4.4576	1.4875	2.2847	2.7311	10.4686	
	ln laborcosts t/revenue t	-1.6390	0.8651	-9.4928	-2.1810	-1.7226	-0.9029	4.8141	
Before merging	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 cost t/cost t-1	0.0049	0.0832	-0.4829	-0.0312	0.0023	0.0362	0.4994	
	ln revenue t/revenue t-1	0.0046	0.0716	-0.5331	-0.0219	-0.0002	0.0243	0.5567	
	ln assets t/revenue t	1.9983	1.0481	-1.2580	1.5540	2.1825	2.5709	7.2456	
	ln laborcosts t/revenue t	-1.5987	0.7529	-6.7757	-2.0658	-1.6674	-1.1141	1.3749	
After merging	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 cost t/cost t-1	0.0094	0.0816	-0.4951	-0.0227	0.0043	0.0328	0.5015	
	ln revenue t/revenue t-1	0.0041	0.0777	-0.5630	-0.0223	-0.0019	0.0228	0.5522	
	ln assets t/revenue t	2.2940	1.3023	-4.4576	1.3406	2.3696	2.9307	10.4686	
	ln laborcosts t/revenue t	-1.6748	0.9526	-9.4928	-2.3051	-1.7783	-0.7692	4.8141	
Non-merging LPEs	Cost*	2,454,460	7,229,431	70	228,071	588,874	1,724,902	138,555,307	16,294
	Revenue*	2,604,771	8,613,233	0	251,688	605,077	1,774,170	155,059,483	
	Assets*	22,952,670	116,811,269	0	2,174,621	4,796,150	11,473,424	2,541,838,318	
	Labor costs*	830,268	2,777,758	0	35,706	87,698	435,267	71,593,318	
	ln cost t/cost t-1	-0.0003	0.0673	-0.4888	-0.0290	-0.0009	0.0271	0.5049	
	ln revenue t/revenue t-1	-0.0029	0.0624	-0.5555	-0.0249	-0.0042	0.0179	0.5557	
	ln assets t/revenue t	2.0402	1.0868	-0.9765	1.4559	2.2080	2.5917	9.5736	
	ln laborcosts t/revenue t	-1.6672	0.8445	-7.5961	-2.2380	-1.8056	-0.9153	2.8236	
Before year 2003	Cost*	2,585,264	7,712,654	70	239,456	612,466	1,782,246	138,555,307	4,570
	Revenue*	2,727,313	8,954,398	0	278,081	649,147	1,897,055	155,059,483	
	Assets*	21,490,734	114,647,468	23,443	1,964,422	4,313,413	10,289,971	2,522,033,662	
	Labor costs*	962,359	3,290,307	0	46,235	4,570	540,741	71,593,318	
	ln cost t/cost t-1	-0.0012	0.0705	-0.4764	-0.0323	-0.0028	0.0283	0.4891	
	ln revenue t/revenue t-1	-0.0008	0.0642	-0.4787	-0.0246	-0.0030	0.0216	0.4119	
	ln assets t/revenue t	1.8485	1.0462	-0.9765	1.1709	2.0704	2.4401	7.7124	
	ln laborcosts t/revenue t	-1.5023	0.7280	-5.6854	-2.0342	-1.6125	-0.7975	0.4056	
After year 2004	Cost*	2,403,473	7,031,767	614	223,416	581,222	1,684,709	118,566,459	11,724
	Revenue*	2,557,004	8,476,441	0	244,548	588,118	1,749,064	153,775,911	
	Assets*	23,522,530	117,643,851	0	2,266,671	4,999,271	12,076,649	2,541,838,318	
	Labor costs*	778,780	2,548,522	0	32,448	78,485	395,739	57,693,471	
	ln cost t/cost t-1	0.0001	0.0661	-0.4888	-0.0277	-0.0002	0.0264	0.5049	
	ln revenue t/revenue t-1	-0.0037	0.0617	-0.5555	-0.0249	-0.0045	0.0167	0.5557	
	ln assets t/revenue t	2.1152	2.2603	-0.8090	1.5794	2.2603	2.6559	9.5736	
	ln laborcosts t/revenue t	-1.7325	0.8780	-7.5961	-2.3190	-1.8866	-1.0262	2.8236	

Panel B: Multicollinearity test

Variance inflation factors
Total

Explanatory Variable	VIF
Revenues $_{i,t}$	1.01699
Assets $_{i,t}$	1.434737
Labor_Costs $_{i,t}$	1.436802

Merged MEs

Explanatory Variable	VIF
Revenues $_{i,t}$	1.017016
Assets $_{i,t}$	1.359291
Labor_Costs $_{i,t}$	1.3614

Non-merged MEs

Explanatory Variable	VIF
Revenues $_{i,t}$	1.016901
Assets $_{i,t}$	1.552837
Labor_Costs $_{i,t}$	1.557585

VIF= centered variance inflation factor.

5.2 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, in this analysis, the author verifies *Hypothesis 5-1* using the model of Anderson et al. (2003). To verify *Hypotheses 5-1-1* and *5-1-2* and in order to use the DID method, the samples are classified as merging (before and after) and non-merging (before the year 2004 and after the year 2004).

Model 5-1

$$ln\left[\frac{Cost_{i,t}}{Cost_{i,t-1}}\right] = \beta_0 + \beta_1 * ln\left[\frac{Re\,v\,enue_{i,t}}{Re\,v\,enue_{i,t-1}}\right] + \beta_2 * Decrease\_Dummy_{i,t} * ln\left[\frac{Re\,v\,enue_{i,t}}{Re\,v\,enue_{i,t-1}}\right] + \varepsilon_{i,t} \quad (5.1)$$

The operating expenses of municipal enterprises are substituted for *cost*. Additionally, *revenue* uses operating revenues as a proxy variable for the activity amount. *Decrease_dummy* is a dummy variable that takes a value of one when the operating revenue decreases between period *t* and the previous period and a value of zero otherwise. All of the data are given as natural logarithms. If β_2 is zero, the operating revenue and operating expenses have a proportional relationship, but if β_2 is negative, it indicates evidence of sticky costs. Conversely, if β_2 is positive, it indicates anti-sticky costs.

In order to verify *Hypotheses 5-2-1* and *5-2-2*, it is necessary to capture the changes in cost behavior due to the passage of time after mergers. Holzhacker et al. (2015) adopt a time trend dummy to reflect changes over time, so the same method is used in this analysis.

Model 5-2

$$ln\left[\frac{Cost_{i,t}}{Cost_{i.t-1}}\right] = \beta_0 + \beta_1 ln\left[\frac{Re\,v\,enue_{i,t}}{Re\,v\,enue_{i,t-1}}\right] + \beta_2 * Decrease\_Dummy_{i,t} * ln\left[\frac{Re\,v\,enue_{i,t}}{Re\,v\,enue_{i,t-1}}\right] + \beta_3 * timetrend + \beta_4 * Decrease\_Dummy_{i,t} * ln\left[\frac{Re\,v\,enue_{i,t}}{Re\,v\,enue_{i,t-1}}\right] * timetrend + \varepsilon_{i,t} \quad (5.2)$$

In the sample of merging MEs, *timetrend* is one in the year of the merger and increases by one in the subsequent years. In the sample of non-merging MEs, *timetrend* is one in the year 2004 and increases by one in subsequent years. The use of *timetrend* can show the change in the degree of sticky costs over time.

Next, in order to verify *Hypotheses 5-3* and *5-4*, 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 5-3. In order to

use the DID method, the samples are also classified as merging (before and after) and non-merging (before the year 2004 and after the year 2004).

Model 5-3

$$ln\left[\frac{Cost_{i,t}}{Cost_{i,t-1}}\right] = \beta_0 + \beta_1 * ln\left[\frac{Re\,v\,enue_{i,t}}{Re\,v\,enue_{i,t-1}}\right] + \beta_2 * Decrease\_Dummy_{i,t}$$
$$* ln\left[\frac{Re\,v\,enue_{i,t}}{Re\,v\,enue_{i,t-1}}\right] + \sum_{m=3}^{4} \beta_m\, Controls_{i,t,m} + \sum_{n=5}^{6} \beta_n\, Controls_{i,t,n}$$
$$* Decrease\_Dummy_{i,t} * ln\left[\frac{Re\,v\,enue_{i,t}}{Re\,v\,enue_{i,t-1}}\right] + \varepsilon_{i,t} \quad (5.3)$$

Controls represent total assets divided by operating revenue and labor costs divided by operating revenue, respectively.

6 Analysis Result

The study utilizes the managerial cost accounting concepts of cost behavior and cost elasticity through the lens of the economic theories of adjustment costs and economies of scale to obtain insights into how the cost management of integrated MEs affects (1) management resources (material and human resources) as endogenous factors, (2) the administrators' future expectations and (3) population changes as exogenous factors. To test the robustness of the results, the author also examines productivity by estimating RTS using the Cobb-Douglas production function, given the theoretical background of duality. The results of Model 5-1 are shown in Table 5-3. To verify *Hypotheses 5-1-1* and *5-1-2*, the samples of merging MEs was divided into samples before and after the merger, and sample of non–merging MEs was divided into samples before and after 2004, and each sample was analyzed using model 5-1. Each coefficient for both merging and non-merging MEs was significant. The results confirm the effectiveness of the random effects model for the sample of merging MEs before the merger. For the other samples, the fixed effects model was effective.

In Panel A, the value of β_2 was 0.1671 before the mergers, indicating a positive value. However, after the mergers, the value of β_2 changed to -0.3366, a negative value. In other words, in the sample with mergers, the cost behavior changed dramatically from anti-sticky costs (β_1=0.5117 < $\beta_1+\beta_2$=0.6788) before mergers to sticky costs (β_1=0.6746 < $\beta_1+\beta_2$=0.3380) after mergers. On the other hand, in the sample of non-merging MEs, β_2 was 0.3012 in the sample before 2004 but changed to 0.0880 after 2004. In the sample of non-merging MEs, the cost behavior showed anti-sticky costs both before and after the year 2004.

Table 5-3. Asymmetric cost behaviors before and after mergers for merging MEs and before and after 2004 for non-merging MEs according to model 5-1

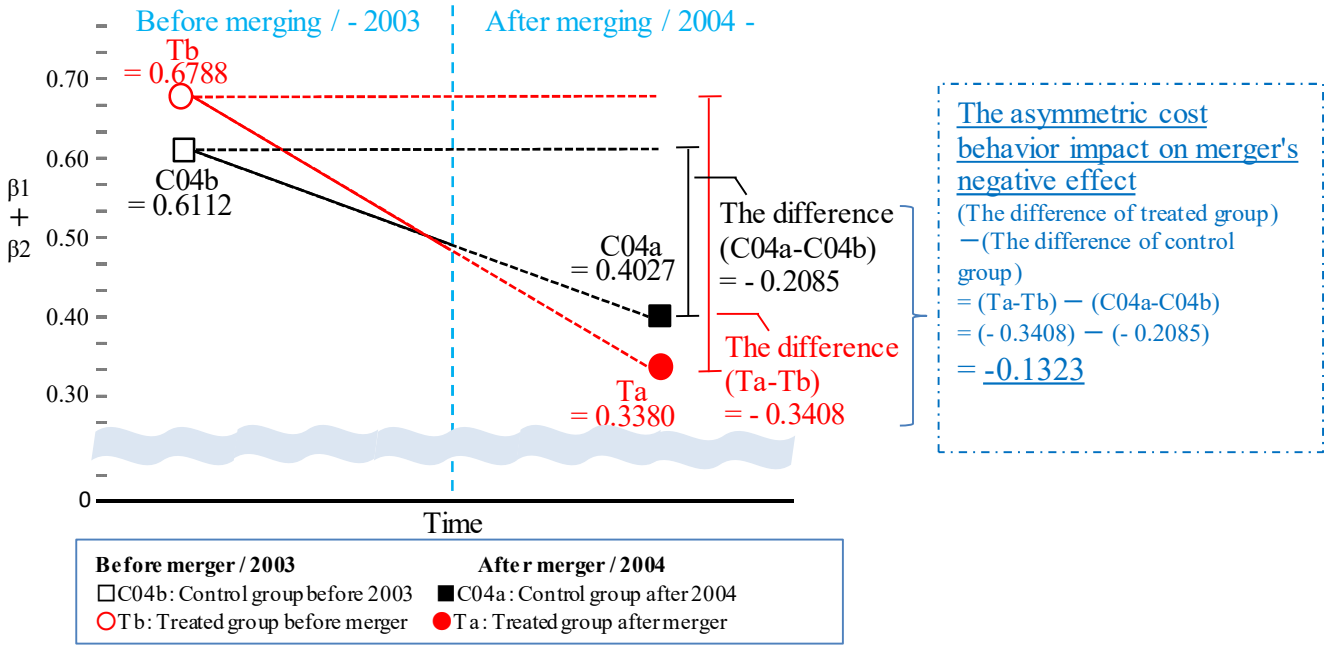
	Panel A; The merging LPE		Panel B; The Non-merging LPE	
	Before merging	After merging	Before 2003	After 2004
β_0	0.0058***	0.0000	0.0051***	0.0030***
	5.50	0.02	3.74	3.96
β_1	0.5117***	0.6746***	0.3100***	0.3147***
	30.33	44.35	10.21	17.67
β_2	0.1671***	-0.3366***	0.3012***	0.0880***
	5.58	-12.49	6.04	3.16
$Adj.R^2$	0.2515	0.2711	0.1767	0.1098
N	7,882	9,128	4,563	11,677
Panel data	Fixed effects	Fixed effects	Fixed effects	Fixed effects
DW	2.2055	2.3959	2.8282	2.5001

Note: For β_0, β_1, and β_2, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test.
*, **, and *** denote significance at levels of 0.1, 0.05, and 0.01. $Adj.R^2$, N, and DW mean Adjusted R^2, Number of observations, and Durbin-Watson ratio, respectively.

The author examines the cost behavior impact on municipality mergers using the DID method. In Figure 5-2, the value of $\beta_1+\beta_2$ is extracted and shown. The value of $\beta_1+\beta_2$ for merging MEs changed from 0.6788 (0.5117 + 0.1671) before mergers to 0.3380 (0.6746 - 0.3366) after mergers. Thus, the difference in this value after mergers (*Ta*: 0.3380) relative to its value before mergers (*Tb*: 0.6788) was -0.3408 for the sample of merging MEs. On the other hand, the value of $\beta_1+\beta_2$ for the sample of non-

merging MEs changed from 0.6112 (0.3100 + 0.3012) before 2004 to 0.4027 (0.3147 + 0.0880) after 2004. Therefore, the difference in this value after 2004 (*C04a*: 0.4027) relative to its value before 2004 (*C04b*: 0.6112) was -0.2085 for the sample of non-merging MEs. Thus, the difference in the differences is *(Ta-Tb) - (C04a-C04b)* = (-0.3408) - (-0.2085) = -0.1323. Therefore, the sticky costs are larger for merging MEs than for non-merging MEs, which confirms that sticky costs were strengthened by the mergers, and both *Hypotheses 5-1-1* and *5-1-2* are supported.

Figure 5-2. Effects of mergers on cost and behavior based on the DID method



Next, the author confirms the change in post-merger cost behavior by using model 5-2. The analysis results are shown in Table 5-4. Changes in sticky costs over time can be confirmed by β_4. In the sample of merging MEs, β_4 was -0.0381, whereas in the sample of non-merging MEs, β_4 was -0.0283. For this reason, it can be confirmed that sticky costs are strengthened as time passes following mergers in the sample of merging MEs. Therefore, *Hypotheses 5-2-1* and *5-2-2* are supported.

Table 5-4. Results of time trend tests using model 5-2

	Panel A; The merging LPE	Panel B; The Non-merging LPE
β_0	0.0039***	0.0024***
	3.90	2.62
β_1	0.6019***	0.3304***
	49.29	23.01
β_2	-0.0238	0.2281***
	-0.91	8.59
β_3	-0.0006**	0.0002
	-2.27	1.29
β_4	-0.0381***	-0.0283***
	-7.82	-7.26
$Adj.R^2$	0.2431	0.1468
N	17,010	16,240
DW	2.4361	2.3897
Panel data	Fixed effects	Fixed effects

Note: From β_0 to β_4, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test. *, **, and *** denote significance at levels of 0.1, 0.05, and 0.01. $Adj.R^2$, N, and DW mean Adjusted R^2, Number of observations, and Durbin-Watson ratio, respectively

Next, the author verifies whether resource adjustment costs affect the cost management associated with expanding management resources due to the mergers. Then, *Hypotheses* from *5-3-1* to *5-4-2* are verified using model 5-3. The results are shown in Table 5-5.

First, considering *Hypotheses 5-3-1* and *5-3-2*, the author confirms the influence on the cost behavior accompanying the adjustment of material resources. The effect of total assets represented by material resources is shown by β_5. For the sample of merging MEs, shown in Panel A of Table 5-5, the negative value increased from -0.0641 before a merger to -0.1328 after a merger. These results confirmed that the merging MEs' sticky costs strengthened due to the influence of the volume of total assets after a merger relative to that before a merger, supporting *Hypothesis 5-3-1*.

Furthermore, a merger's effect on material resources can be confirmed using the DID method. The analysis result for non-merging MEs is confirmed in Panel B of Table 5-5; the value of β_5 was -0.0745 before 2004 but changed to -0.1020 after 2004. The value of β_5 is also shown in Panel A of Figure 5-3. Observing Panel A of Figure 5-3, there is a larger change in material resource adjustment costs for merging MEs than there is for non-merging MEs. The value of β_5 for the sample of merging MEs, that is, for the treated group, is -0.1328 - (- 0.0641) = - 0.0687, and in the sample of non-merging MEs, that is, the control group, this value is -0.1020 - (- 0.0745) = - 0.0275. The difference between the treated group and the control group is -0.0687 - (- 0.0275) = - 0.0412. This value indicates the influence of mergers on the cost behavior accompanying the adjustment of material resources. Because this value is negative, it is clear that the merger of municipal enterprises expanded the size of total assets, strengthening sticky costs. Therefore, this result supports *Hypothesis 5-3-2*.

Next, the author confirms *Hypotheses 5-4-1* and *5-4-2*, which describe the influence on cost behavior accompanying the adjustment of human resources. The influence of labor costs, which represent human resource costs, is shown by β_6, and both panels A and B of Table 5-5 show meaningful results at the 1% level. The value of β_6 in Panel A of Table 5-5 became less negative from -0.2253 before a merger to -0.0809 after a merger. Therefore, for merging MEs, the impact on sticky costs driven by human resource costs weakened after a merger. As a result, *Hypothesis 5-4-1* is not supported.

In addition, the author compared the analysis results for the sample of merging MEs and the sample of non-merging MEs using the DID method. Panel B of Table 5-5 shows that the value of β_6 was -0.1202 before the year 2004 but became less negative after 2004, with a value of -0.0516. The values of β_6 for the samples of merging and non-merging MEs re also shown in Panel B of Figure 5-3. Comparing the samples of

merging and non-merging MEs, there are noticeable changes for merging MEs relative to non-merging MEs. The value of β_6 is -0.0809 - (- 0.2253) = 0.1444 for the treatment group, or the sample of merging MEs, whereas for the control group, which is the sample of non-merging MEs, it was -0.0516 - (- 0.1202) = 0.0686. The difference between the sample of merging MEs and that of non-merging MEs is 0.1444 - 0.0686 = 0.0758. This result indicates the influence of human resource costs due to a merger based on the DID method. This value is positive, which contrasts the result for material resource costs. For this reason, merging MEs mitigated the impact of sticky costs driven by human resource costs. Therefore, *Hypothesis 5-4-2* is not supported.

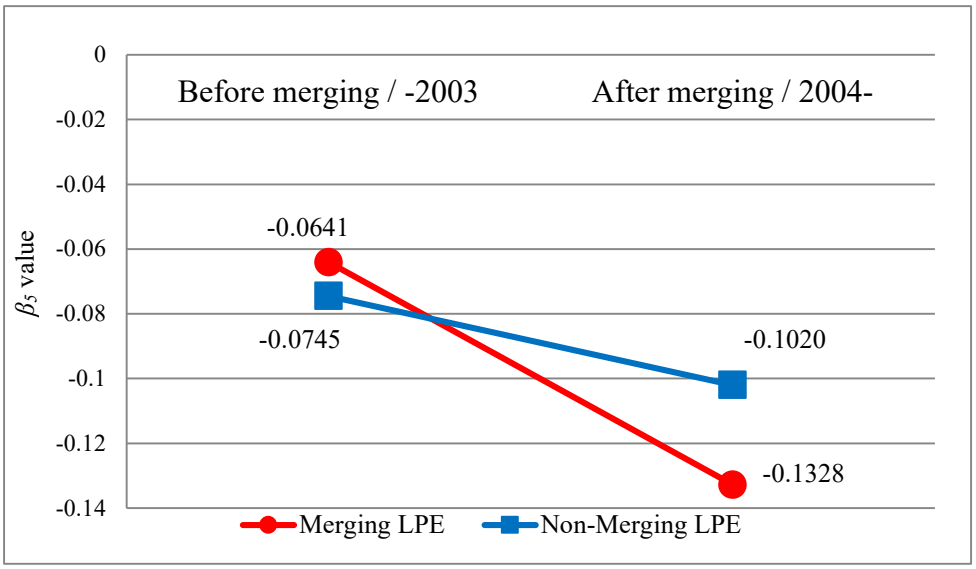
Table 5-5. The influence on asymmetric cost behavior due to the size of total assets and labor costs

	Panel A; The merging LPE		Panel B; The Non-merging LPE	
	Before merging	After merging	Before 2003	After 2004
β_0	0.0216	0.0590***	-0.0012	0.0108
	1.26	5.51	-0.46	1.32
β_1	0.5180***	0.7214***	0.3895***	0.3139***
Rev	23.57	48.50	16.63	17.83
β_2	0.0603	-0.1566***	0.2209***	0.2265***
*DD*Rev*	1.08	-4.43	4.81	6.89
β_3	0.0373***	-0.0011	0.0021***	0.0161***
Assets	5.22	-0.29	1.67	5.09
β_4	0.0550***	0.0331***	-0.0010	0.0235***
Labor cost	9.88	10.23	-0.57	8.95
β_5	-0.0641***	-0.1328***	-0.0745***	-0.1020***
*DD*Rev*Assets*	-2.76	-9.92	-3.28	-8.05
β_6	-0.2253***	-0.0809***	-0.1202***	-0.0516***
*DD*Rev*Labor cost*	-7.21	-4.09	-3.59	-3.26
$Adj.R^2$	0.2255	0.3368	0.2262	0.1295
N	7.776	8.722	4.510	11.368
DW	2.6022	2.4313	2.2136	2.5296
Panel data	Fixed effects	Fixed effects	Random effects	Fixed effects

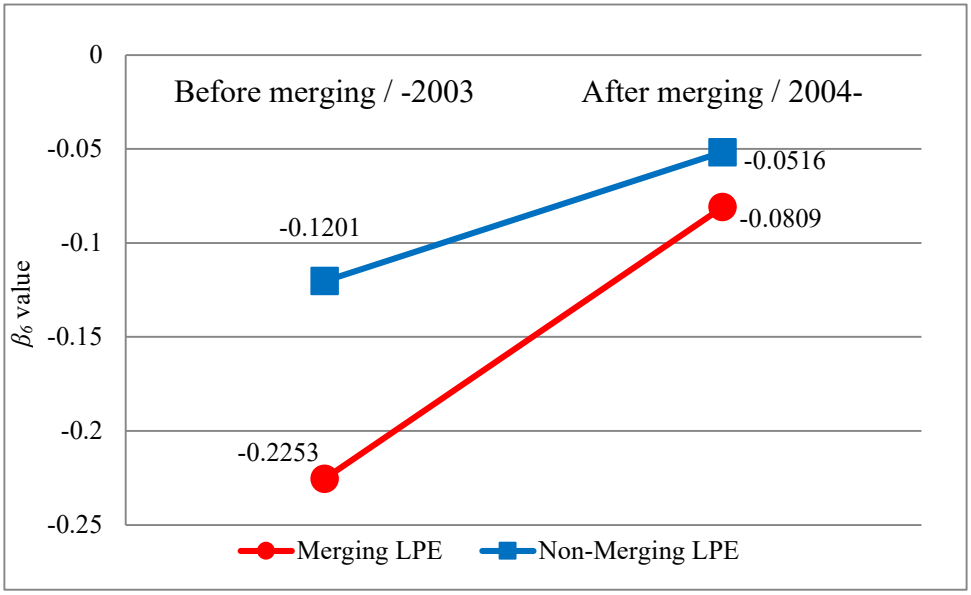
Note: From β_0 to β_6, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test.
*, **, and *** denote significance at levels of 0.1, 0.05, and 0.01.
$Adj.R^2$, N, and *DW* mean Adjusted R^2, Number of observations, and Durbin-Watson ratio, respectively.

Figure 5-3. Changes in the impact on cost behavior due to total assets and labor costs

Panel A: Impact on total assets to cost behavior



Panel B: Impact on labor costs to cost behavior



The findings made by this research entail three significant suggestions. First, the analysis results show that MEs not only lose their capability of flexible resource adjustment but also fail to achieve benefits from economies of scale even though they aim to achieve the economy of scale effects that occur as a result of integration. In particular, MEs increase the adjustment costs of material resources after integration.

One reason why administrators cannot make restructuring decisions when integrating is the integration of facilities might reduce convenience for residents. Conversely, human resource adjustment costs decrease after integration. The author conjectures that administrators might make efforts to flexibly adjust human resources instead of high material committed resources.

Second, regarding the interaction with the adjustment costs and decision makers' expectations, ME administrators in integrated MEs hold constantly optimistic positions, regardless of whether revenues decrease. Conversely, nonintegrated ME administrators adopt a seriously pessimistic position to prepare for future declining demand. Therefore, the adjustment costs might be smaller in nonintegrated MEs than in integrated MEs.

Third, the results of the analysis of the interaction between cost elasticity and population changes due to municipal mergers show positive effects only for the labor-intensive service industries. Similar results are obtained by robustness checks in the Cobb-Douglas production function. Conversely, capital-intensive service industries cannot enjoy cost effectiveness as a benefit of the scale economy. Because municipal mergers occur in small municipalities, the population growth benefits may not be enjoyed at this point. The author suggests that integrated MEs must expand not only their management resources but also their service territory to exceed those of nonintegrated MEs.

A limitation of this study is the need to consider agency problems in integrated MEs. Many studies on asymmetric cost behavior indicate that due to self-interest or to expand their business, decision makers do not always make rational decisions. Future research should clarify whether this problem might apply to public sector organizations, especially MEs. From a practical perspective, future studies should also measure the scale of cost-effective municipal mergers, the ideal population size, and the optimal

management resources. Detailed investigations of municipal mergers and research on the cost management of public organizations, especially that of MEs, are needed.

7 Conclusion

This study obtained some interesting results through the empirical analysis of the cost behavior of MEs in Japan. First, the author was able to clarify the cost behavior of public organizations, for which research on cost management is an underdeveloped field. Second, the current study focused on the relationship between mergers and resource adjustment costs as a factor in asymmetric cost behavior. To verify this point, this study adopted the DID method. Then, this study compared merging MEs before and after the merger period and compared them with a sample of MEs that did not merge. The findings of this chapter include not only the evidence of the asymmetric cost behavior of MEs, which are one type of public organization, but also the evidence that mergers make managing resource adjustments more difficult for ME administrators from the perspective of an RBV.

The significant point of this study is the evidence of sticky costs after mergers in the sample of merging MEs. In contrast, anti-sticky costs were found for non-merging MEs. Hence, mergers tended to strengthen sticky costs. This study examined these results for two aspects of organization size and management resources. Due to a merger, the organization size and management resources expand, so the burden of resource adjustment costs increases.

First, the author argues that it is difficult to make quick cost management decisions when the size of an organization increases due to a merger 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 MEs, a functional organizational system is adopted. For this

reason, 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 (Cordeiro 1999). Therefore, 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 2006). Thus, 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 a result of mergers, as the size of an organization grows, the author argues that, for the cost management of MEs, decision-making slows and flexible resource adjustment becomes more difficult after mergers. In future research, it is necessary to verify more clearly the relationship between sticky costs and the internal (incorporating) effect of the functional organization system.

Secondly, the author clarifies that the adjustment costs of management resources due to municipal mergers have an impact on cost management. As municipalities merge, human resources and material resources are integrated, and the size of management resources increases. With the integration of management resources, subsequent resource adjustment becomes more difficult than it was before the merger. Therefore, the author hypothesized that the sticky costs appeared as management resource adjustment costs increased after the merger. As the result of the analysis, material resources acted to strengthen sticky costs after a merger. In terms of material resources, when a merger occurred, the adjustment and flexibility of material resources decreased. Consequently, the diseconomies of scale rather than synergies may occur due to mergers. This result may be due the inability to abolish facilities because an ME cannot discontinue utility service even if it is inefficient or unprofitable. In other words, in the case of material resources, municipal mergers increase the committed capacity cost.

In contrast, for human resources, mergers tended to weaken cost stickiness. In other words, administrators of MEs manage to flexibly maintain their cost adjustment capabilities in the case of human resources. That is, the MEs 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. The author hypothesized that the fact that managers actively utilized irregular staff was influenced by the high ability to adjust human resources. Public organizations, including MEs, reduced the recruitment of regular staff and instead adopted a large number of non-regular staff in order to reform the administration[33]. In human resources, the conversion from regular staff to non-regular staff, that is, cost management to shift from fixed costs to variable costs, was carried out. As a result, administrators can decrease the adjustment costs of human resources and may be able to maintain the flexibility of cost adjustment. Since this study does not compare non-regular staff and regular staff in this analysis, future research needs to confirm this hypothesis in detail.

This study pointed out that municipal mergers might not function effectively for cost management. The author does not intend to argue that municipal mergers are entirely unsuccessful. Notably, the DID method which this study adopts is the simply way comparing with each coefficient estimation of both merging and non-merging sample, therefore, to obtain the rigorous empirical results regarding with merger and cost management of MEs, future research is also required to improve the models and the tests. Additionally, in future research, it is necessary to clarify what kind of mergers do improve efficiency and effectiveness in terms of cost management.

---

[33] According to the national report, the number of irregular officials was 456,000 in 2005, but it increased to 599,000 in 2012.

VI Free Riding, Empire Building, and Cost Management Prior to and Post Municipal Enterprise Mergers in Japan

1 Introduction

Mergers in public sector organizations (PSOs)[34] have emerged across the globe[35] in recent decades. However, surprisingly, most PSO mergers that aimed to improve cost efficiency, profitability and effective service provision[36] were not fully supported by rigorous empirical research and reliable analysis (e.g., Holzer et al. 2009). In fact, public finance and public economics researchers have verified the cost reduction effects of PSO mergers and measured the economies of scale in these mergers; however, these studies have reported mixed results without concluding whether the mergers of PSOs solve their financial problems; thus, the effects of PSO mergers have remained controversial to date (e.g., Tavares 2018). Despite this issue perhaps being of interest in various research fields, only scant literature has paid attention to both the managerial behavior associated with PSO mergers and their cost management. Therefore, this study aims to examine the cost driver mechanisms accompanying PSO mergers' effects and clarifies how managerial discretion affects the rational cost management decisions of merged PSOs. Notably, the author focuses on the next two major problems[37] with merged PSOs that are caused by a loss of capability for resource adjustment decisions in conjunction with mergers.

---

[34] Mergers in PSOs are defined as consolidation processes in public organizations and are often synonymous with both amalgamation and annexation (e.g., Tavares 2018).

[35] Mergers in PSOs have occurred in many diverse places, such as Asian countries, European countries, Oceanian countries, the US, and Canada (e.g., Holzer et al. 2009; Tavares 2018).

[36] PSO mergers might be expected to produce larger territorial units, with potential impacts on economic efficiency, managerial effectiveness, and democratic outcomes (e.g., Holzer et al. 2009; Tavares 2018).

[37] Regarding the PSO's cost inefficiency in association with mergers, some researchers have indicated both political effects (e.g., Weingast et al. 1981) and fundamental bureaucratic influences (e.g., McGuire 1981); however, it remains unclear whether these influences significantly affect PSOs' cost management in conjunction with mergers.

The first problem is the opportunistic spending associated with free-rider effects, which are derived from the common pool problem theory[38]. These free-riding incentives arise when the costs of an activity that benefit a small group are shared among a wider group (e.g., Jordahl and Liang 2010), which was formalized as the "law of 1/n"[39] by Weingast et al. (1981). In the context of municipality mergers, "last-minute spending"[40] prior to merging is promoted by administrators' opportunism. As a result, studies have reported that PSOs suffer from high debt problems (e.g., Nakazawa 2016).

The second problem is the practice of empire building[41] regarding agency theory, which involves managers' engagement in activities for their own benefit rather than for the benefit of the organizations' shareholders (e.g., Jensen and Meckling 1976). Some studies have asserted that managers make acquisitions for their own interests at the expense of the organizations' shareholders, which is consistent with conglomerate mergers or mergers and acquisitions (e.g., Amihud and Lev 1981; Morck et al.1990). Additional studies have shown that expanding the size of a public organization via a merger provides administrators with opportunities to engage in private rent-seeking activities, such as overly generous employment terms, overinvestment in assets and fringe benefits (e.g., Bertrand and Mullainathan 2003). Both of these major problems

---

[38] This theory has been illustrated in depth by many scholars (e.g., Tullock 1959) and discussed in relation to the merger of municipalities (e.g., Jordahl and Liang 2010; Blom-Hansen 2010; Hansen 2014; Saarimaa and Tuliainen 2015; Nakazawa 2016).

[39] The "law of 1/n" is explained as follows. As the number of groups increase, any one group absorbs a smaller share of a project's costs since projects are paid for out of a "common pool." Each group then internalizes all of the marginal benefits from its project but incurs only 1/n-th of its marginal costs. There are free-riding incentives that increase n, and the same is true for the project size, total common pool spending, and inefficiency (e.g., Weingast et al. 1981).

[40] Blom-Hansen (2010) expressed opportunistic spending before amalgamation as "last-minute spending" before "closing time" in his research.

[41] The empire building motive has been illustrated in various contexts, such as private rent-seeking or achieving an opportunistic purpose, simultaneously putting an organization at higher risk and lowering the optimal return for shareholders, which is regarded as a fundamental agency problem (e.g., Williamson 1964).

demonstrate that decision makers are driven to spend more opportunistically, even when they have fiscal problems.

To explore the cost management effects due to PSO mergers, the current study applies the asymmetric cost behavior methodology (i.e., sticky costs or anti-sticky costs) since notions of cost behavior are a key element in cost management, and sticky costs are a well-documented issue in the management accounting research field (e.g., Banker and Byzalov 2014). Therefore, this study addresses an important research topic, i.e., verifying the effects of PSO mergers associated with cost management that arise from the phenomenon of asymmetric cost behavior[42]. Furthermore, to achieve a more profound understanding of the impacts of PSO mergers on their cost management, this study fills this gap by clarifying administrators' managerial discretion and its underlying motives. Specifically, regarding the two overspending tendencies (i.e., free-riding incentives and empire-building incentives) that lurk behind PSO mergers, this research aims to determine whether these two incentives in PSOs prior to and following mergers have a negative impact on cost stickiness (i.e., bad cost stickiness).

To apply the asymmetric cost behavior methodology, the author focuses on Japanese municipal enterprises (hereafter MEs) as a representative of PSOs for three reasons. First, the author can adopt not only public economics approaches but also management accounting research approaches that analyze for-profit companies[43]. Second, the author can analyze a large number of samples with long-term windows and obtain robust evidence. Third, this study is motivated by extending the research subject to local government (Bradbury and Scott 2018; Cohen et al. 2017) and other PSO types

---

[42] Cohen et al. (2017) argued that understanding how costs "behave" in PSOs could help to render PSOs more effective through the better allocation and management of costs.

[43] The accounting principle of MEs is based on the accrual basis, not on the cash basis, adopted by many public organizations, and it uses almost the same accounting method as the method used by commercial enterprises.

since the asymmetric cost behavior literature appears to ignore PSOs as a research object[44].

Many asymmetric cost behavior studies initially documented that cost stickiness arises because managers make deliberate decisions as they trade off the adjustment costs of committed resources against the corresponding holding costs (e.g., Guenther et al. 2014). Simultaneously, studies have denoted that the asymmetric cost behavior should be consistent with either rational resource management in the long run by avoiding excessive adjustment costs (i.e., good cost stickiness) or wasteful overspending due to administrators' opportunism (i.e., bad cost stickiness)[45] (e.g., Banker and Byzalov 2014; Reimer 2019). Thus, this paper calls for the exploration of a potential decision makers' cost driver mechanism associated with mergers to encourage "good" stickiness and deter "bad" stickiness.

To investigate the effects of free-riding incentives on cost behavior in pre-merger PSOs, the author employs the population fluctuation based on the 1/n approach that many previous studies have supported (e.g., Hinnerich 2009). Additionally, the author examines the effects of the empire-building incentive in post-merger PSOs that employ free cash flow (e.g., Chen et al. 2012; Brüggen and Zehnder 2014). The author further separates the discretionary component from administrators' backgrounds to explore the behaviors primarily driven by opportunistic managerial motives.

---

[44] Empirical studies of asymmetric cost behavior have excluded PSOs, such as utilities or other regulated industries, since they have argued that public services adopt a different accounting system (Shust and Weiss 2014) and that cost behavior analysis models only apply to competitive business fields because these markets reduce measurement errors due to a potential pricing effect (Weiss 2010). However, the same studies tested the cost behavior among local governments and revealed evidence of the asymmetric cost behavior among them that arises from the bureaucratic nature of the organization (e.g., Bradbury and Scott 2018; Cohen et al. 2017).

[45] Rational resource management represents desirable managerial behavior, which contributes to creating value, whereas wasteful overspending due to administrators' opportunism is interpreted as a sign of value-destroying overspending (e.g., Banker and Byzalov 2014).

The current results demonstrate that the free-riding incentive promotes administrators' opportunistic overspending prior to mergers and, as a result, loses the capacity for flexible cost adjustment. Specifically, free-riding effects facilitate administrators in overspending even when their revenue decreases (bad cost stickiness). Inversely, after mergers, the free cash flow (hereafter, FCF) that substitutes for empire-building effects lessens the degree of cost stickiness rather than inducing cost stickiness. This latter finding refutes the hypothesis that presumes that administrators in the post-merger period might overspend in their own self-interest, exercise resource perquisites, and invest beyond the optimal level under the cloak of public interest[46] even when sales activity decreases. The findings suggest instead that agency-driven incentives to meet earnings or avoid losses diminish the degree of cost stickiness rather than induce cost stickiness in the post-merger period. Additionally, the author reveals that administrators have a political background influences their ability to accelerate cost stickiness in the interaction with their free-riding effects. These results are robust to the potential managerial discretion that might bias cost stickiness when using other alternative variables and estimating cost stickiness over a long time.

Accordingly, this study makes several contributions to two streams of research that are fundamentally based on managerial behavior but have thus far been examined entirely independently of each other: the PSO merger effect and asymmetric cost behavior. First, this study expands the scope of the application of cost behavior research methodologies to other PSO types. Second, this research identifies the roles of management discretion in resource adjustment decisions, which are especially important at the time of PSO mergers. Namely, the author extends the understanding of

---

[46] The concept of public interest can be defined as both the importance of services (i.e., that are necessary and convenient for everyday life) and the roles and responsibilities of governments (e.g., Pesch 2006).

asymmetric cost behavior in the context of PSO mergers by identifying each causal link with the pre-merger free-riding effect and the post-merger empire-building effect. Third, the author reveals that whether administrators have political backgrounds influences their ability to accelerate cost stickiness in the interaction with their free-riding effects. Fourth, the results advance the understanding of the precautions required when merging PSOs in practice. Scholars and policymakers have remained in separate realms, with academic research having a very limited influence on PSO reforms (e.g., Tavares 2018). Thus, the current results are expected to provide insights that inform further decisions regarding whether to expand the scale of PSO reforms.

The remainder of this study is organized as follows. Section 2 presents the characteristics and corporate governance system of MEs and provides a brief review of municipal mergers in Japan. The author proposes the hypotheses in section 3. Section 4 explains the research methodology, including the sample data, variable measures, and models. Section 5 describes and discusses the analysis results, including additional subsample analysis. Finally, section 6 concludes with a summary and indicates the study's limitations and problems; it also provides suggestions for future research.

2 Characteristics of Municipal Enterprises and Municipal Mergers in Japan

2.1 Characteristics of Municipal Enterprises and Governance Systems

MEs in Japan are described as a type of PSOs that provide semipublic (i.e., nonrival or nonexcludable) goods/services (e.g., Kinugasa 2010). Their businesses include, for instance, water supply, transportation, electricity, gas power, hospitals, and other businesses that are run by local governments according to their own rules. The organization types of MEs are divided into two categories based on three perspectives

concerning taxonomy[47] (Saussier and Klien 2013): directly managed organizations—a component of the local public bodies—and corporatized organizations that operate independently. Corporatized entities are funded by user fees and managed by an administrator independently of local public bodies. These MEs (hereafter, this study addresses only corporatized MEs) must decide to manage not only to recover their costs but also to obtain profits from their businesses.

Regarding governance systems, MEs are generally configured with fewer executives and board members than private sector organizations; they usually have only one administrator and a few vice administrators[48]. Administrators are appointed by the mayor and approved by Congress for a four-year term in office, and their dismissal is restricted during this term by legal regulations since the ME is required to be managed and to serve stably. Therefore, an administrator in an ME possesses nearly all of the decision rights regarding the management of the ME, such as cost management, planning investments, and hiring employees, independent of the local government. In contrast to these enormous powers and decision rights, the United Nations (2008) reports that ME administrators receive only civil servant salaries in exchange for job security; additionally, their compensation is not linked to the MEs' revenue.

2.2 Integration of Municipal Enterprises and Municipal Mergers in Japan

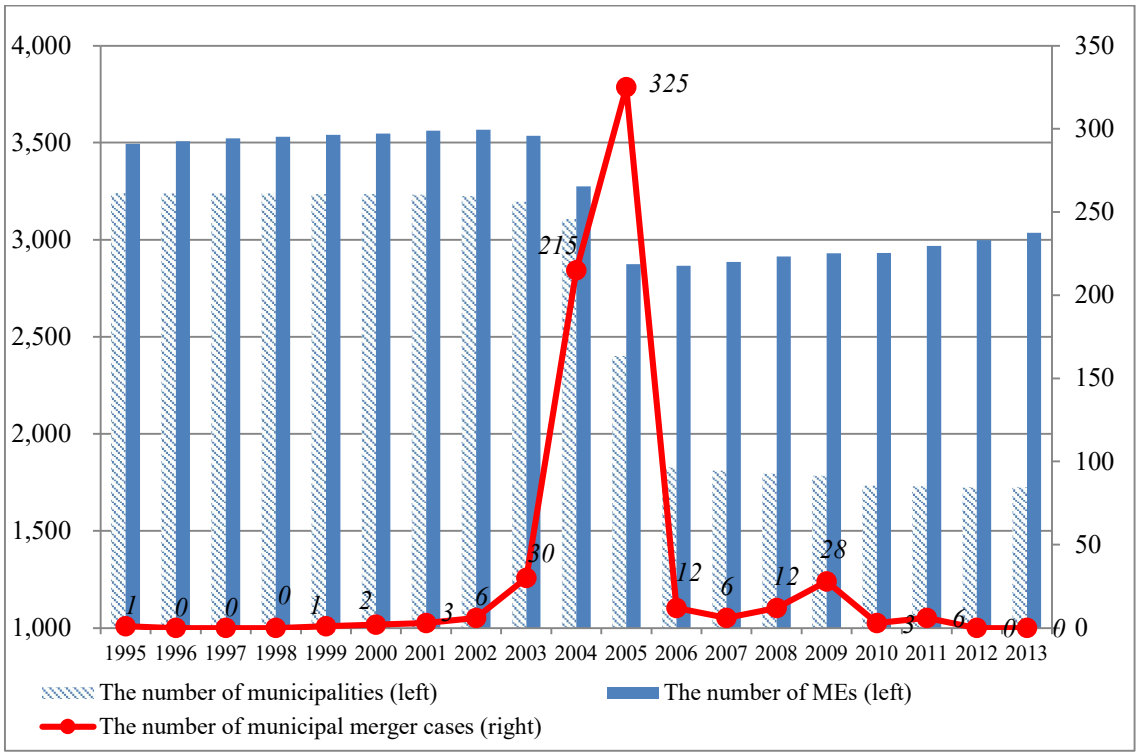
In Japan, many municipal mergers have been conducted among municipalities since 1999; this process reached its peak between 2004 and 2005, which nearly halved the number of municipalities, from 3,240 in 1995 to 1,725 in 2013 (Figure 6-1). The

[47] Saussier and Klien (2013) split MEs from the viewpoints of decision-making rights, organizational control, and property rights.

[48] In some small municipalities, the mayor might double as the administrator instead of appointing an independent administrator to avoid the burden of additional payroll or in the cases of small business-scale MEs.

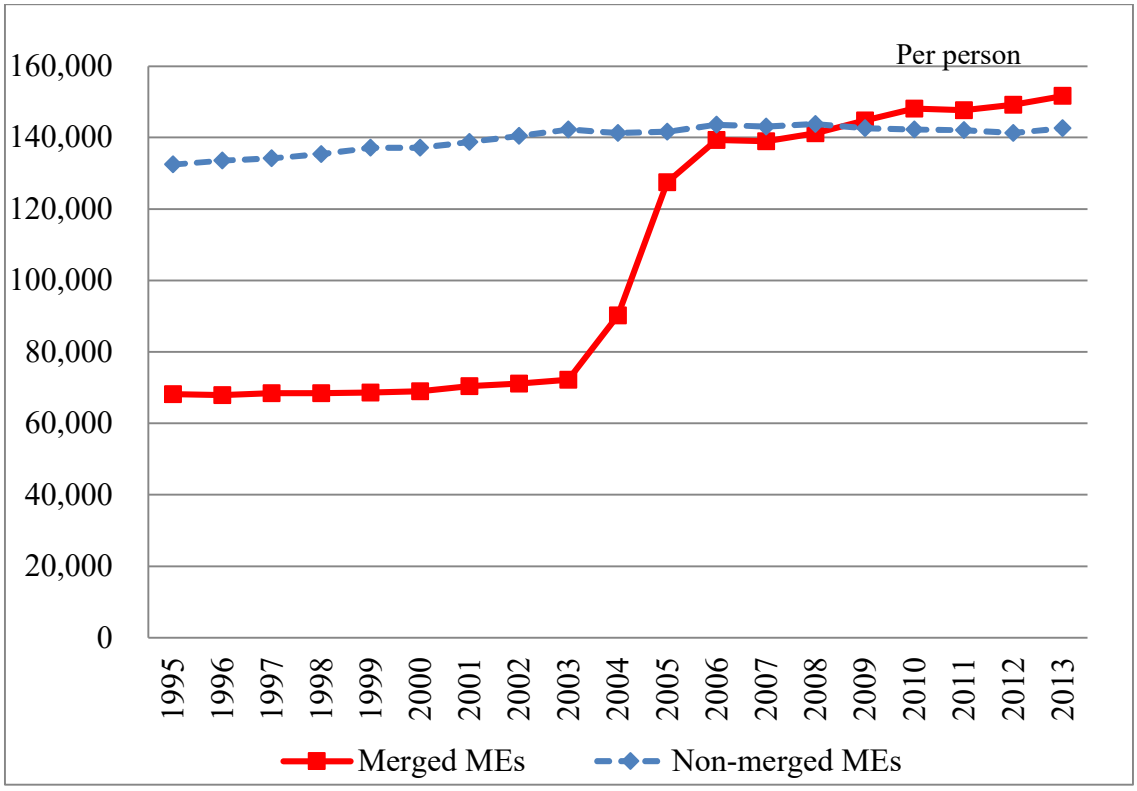
nationwide increase in municipal mergers occurred for the following three reasons[49]: the pressure for efficiency improvements caused by the long-term downturn in the Japanese economy; the influence of the decline in population and the expansion of the depopulation area; and the requirement for effective and high-quality public services. ME mergers are also expected to strengthen their financial basis, secure profitability, and increase knowledge sharing to enhance the synergy effects. Finally, the number of MEs decreased from 3,567 businesses in 2002, when they reached a maximum, to 2,866 businesses in 2006, when they reached a minimum, and finally increased to 3,035 businesses in 2013 (Figure 6-1). The merger approval period spanned 595 days on average, ranging from 112 to 1,491 days (Nakazawa 2016). As a result, the population size of the merged municipalities has more than doubled (Figure 6-2).

Figure 6-1. Trends in the number of MEs, municipal mergers, and municipalities



[49] For details, refer to the Japanese government report "Evaluation, verification and analysis of 'the municipal merger of the Heisei area,'" published in 2008.

Figure 6-2. Trends in the average populations of both merged and non-merged municipalities (MEs)



3 Background and Hypotheses Development

3.1 Asymmetric Cost Behavior Phenomenon and Literature Review

The traditional model of cost behavior—a linear model with fixed and variable costs—assumes that costs are strictly proportional to activity levels (e.g., Noreen 1991). This model is based on three assumptions: (1) there exists a single cost driver (2) with constant returns to scale and (3) a volume elasticity of variable costs that is symmetric (e.g., Holzhacker et al. 2015). However, recent empirical studies have shown an asymmetric response of costs to increases and decreases in activity, namely, sticky costs

and anti-sticky costs[50] (e.g., Anderson et al. 2003; Weiss 2010). The asymmetric cost behavior studies have argued that the traditional cost behavior model neglects managerial discretion in cost management and noted that the asymmetric cost behavior is induced by (1) adjustment costs, (2) managers' expectations, and (3) managerial incentives (e.g., Banker and Byzalov 2014). Therefore, asymmetric cost behavior should be consistent with either rational resource management in the long-term firm value by avoiding excessive adjustment costs (i.e., good cost stickiness) or unnecessary overspending due to the manager's personal benefit maximization (i.e., bad cost stickiness) (e.g., Banker and Byzalov 2014; Reimer 2019). Therefore, the rationale underlying cost stickiness is that managers do not always make decisions that result in the best outcomes for shareholders. Previous studies have thus noted that any effort to infer the sources of sticky costs should be undertaken considering the motivations for managers' resource adjustments (e.g., Dierynck et al. 2012; Kama and Weiss 2013). Thus, the rationale for the hypotheses is to combine asymmetric cost behavior regarding merged MEs with the two managerial incentives described below.

3.2 Theoretical Background and Hypotheses Development

3.2.1 Free-riding Incentives Pre-merger

Free-riding incentives based on common pool problem theory arise in circumstances in which the number of groups increase, and any individual group absorbs a smaller share of the project's costs since projects are paid for out of a "common pool" (e.g., Jordahl and Liang 2010). This economic principle is also referred to as the "law of 1/n" in the political science field (e.g., Weingast et al. 1981). The problem has been further

[50] Sticky costs (anti-sticky costs) are defined as when costs decrease less (more) when sales activity falls than they increase when sales activity rises equally (Anderson et al. 2003; Weiss 2010).

examined empirically concerning the merger of municipalities (e.g., Hinnerich 2009; Saarimaa and Tukiainen 2015; Nakazawa 2016). These studies showed that merged municipalities face common pool problems such as opportunistically investing in excessive resources, expanding management capacity, spending mostly on current expenditures and conclusively increasing debts. Accordingly, mergers offer PSO administrators an incentive to overspend to improve the public service level before mergers because the new PSO after the merger subrogates the load. This opportunistic overspending tendency is enhanced when the decision processes regarding spending are atomized (Kristensen 1980). Therefore, the author postulates that an upcoming merger of MEs could lead to administrators' opportunistic overspending regardless of the decreased sales activity. If the hypothesis is supported, the results indicate that some of the cost stickiness observed might actually be "bad." Based on this conjecture, the following hypothesis is framed:

Hypothesis 6-1: The free-riding incentive in pre-merger municipal enterprises leads to further opportunistic overspending despite decreased activities.

3.2.2 Empire Building Post-merger

The empire-building incentive is defined as an agency cost that relates to managers' tendency to grow an organization beyond its optimal size or to spend more money to maintain unutilized resources to increase personal utility and acquire greater status (Williamson 1964), power (Jensen 1986), and compensation (Shleifer and Vishny 1989). Against decreasing sales activity, personal empire-building considerations result in agency costs when self-interested managers neglect necessary resource reductions that have become redundant to avoid a loss of status or power. Asymmetric cost behavior studies have argued that cost stickiness might be a signal of this benefit extraction in the form of managerial empire building and have found evidence for this conjecture by

documenting a negative association with cost stickiness (e.g., Chen et al. 2012; Brüggen and Zehnder 2014). These studies assumed that the effect of a higher FCF, as a proxy for stronger empire-building incentives, yields the expected algebraic sign. Specifically, mergers provide the opportunity for managers to engage in behaviors that enhance overspending in their own self-interest or value-destroying overinvestment for personal benefit since managerial resources are likely to be extended by mergers (Amihud and Lev 1981; Morck et al. 1990). If these inferences are supported, the results might also show evidence of bad cost stickiness after the mergers. By applying insights from these studies to managers' opportunistic spending decisions, the author predicts that ME mergers might give administrators a greater opportunity to overinvest to maximize their self-interests instead of considering improving the profitability of MEs, regardless of decreased sales activity. The author posits the following hypothesis:

Hypothesis 6-2: The empire-building incentive in post-merger municipal enterprises leads to further opportunistic spending when activities decrease.

4 Methodology

4.1 Sample Selection

The author obtained 19 years of financial and operational data for 49,049 businesses from the financial reports in the "Municipal Enterprise Yearbook," municipality population data from the "Basic Resident Register Annual Population Report," and municipal merger information from "The Merged Municipalities' Data Collection," which was edited by the Ministry of Internal Affairs and Communications in Japan. The Municipal Enterprise Yearbook includes not only the financial data but also the detailed activity data of each ME in each year. The Basic Resident Register Annual Population Report discloses information about the residents registered in each municipality in every

year. The Merged Municipalities' Data Collection contains the name of the merged municipalities and the date of the merger. The analysis period starts in fiscal year 1995, when municipalities began to consider mergers. The ME laws in Japan were revised in 2014, and accounting methods were changed; therefore, to avoid bias due to these changes, the end of the analysis period is set as 2013, which yields a time period of 19 years. To alleviate the potential problems caused by outliers and influence points, the author winsorized the top and bottom 1% of the observations on each tail of dependent variables. The final sample features 45,181 firm-years, with an average of 3,793 observations per business.

4.2 Empirical Model

4.2.1 Free-riding effect measurement

To test *Hypothesis 6-1*, the author employs the "law of 1/n" approach with the index of the free-rider effect. The free-riding phenomenon is examined by using ex post information and comparing the demographic information to determine, first, whether the municipalities including the MEs considered merging by participating in negotiations and, second, whether they actually merged. Specifically, for municipality (including the ME) *i* in merger *j*, the author defines the free-riding treatment variable as $1-N_i/N_j$ according to prior studies (e.g., Hinnerich 2009), where N_i is the population of municipality *i* that participates in a merger, and N_j is the total population of the post-merger municipality *j*, including municipality *i*. The free-riding incentive for PSO administrators should depend on the unit with the smaller population size before the merger relative to the population size of the total common pool (e.g., Jordahl and Liang 2010).

4.2.2 Empire-building effect measurement

To examine *Hypothesis 6-2*, the author uses FCF, Post and the interaction with both FCF and Post variables to capture managers' empire-building incentives. FCF indicates the financial resources available to managers (e.g., Chen et al. 2012; Brüggen and Zehnder 2014) and is included to control for empire-building incentives (e.g., Jensen 1986); this measure has provided robust statistical evidence as an agency variable in previous studies (e.g., Richardson 2006). Following the FCF model specified by Copeland et al. (1994), FCF is defined as operating income before depreciation minus the change in working capital, and capital expenditures[51]. Here, FCF is scaled by total tangible assets[52]. Post indicates a binary variable that is set to one if it means after the merger in the merged ME sample and is set to zero otherwise. Then, the author examines the interaction terms between FCF and Post to measure the empire-building effects.

4.2.3 Control variables

Consistent with previous cost behavior and public administration literature, the author incorporates two groups of control variables, including both endogenous and exogenous factors. First, the author adds two corporate governance variables[53] (Gov_Var) that are specific to PSOs: one variable controls for the number of *auditors (Auditors)* [54], an

[51] Operating income is taken from the profit and loss statement. The change in working capital is the difference of accounts receivable plus inventory less the difference in accounts payable. Capital expenditure equals the difference of tangible assets plus depreciation; both are taken from balance sheet statements.

[52] The author statistically verify whether the FCF variable is significantly different between merged and non-merged MEs. The t-test result shows the significant differences between them (t-value = 3.99; $p < 0.01$).

[53] Chen et al. (2012) found that the corporate governance variable drives down cost stickiness, and they concluded that corporate governance is an effective remedy for wasteful overspending behavior.

[54] Deis and Giroux (1992) argued that the number of auditors determines the audit quality and originates good corporate governance for PSOs.

indicator variable that is equal to one if the number of auditors on the audit committee are increased above legal standards[55] and is zero otherwise; and one variable controls for the election year *(Election)*[56], which is an indicator variable that is equal to one if a year is an election year and is zero otherwise. The author assumes that the auditor variable mitigates cost stickiness and that sound corporate governance is an effective remedy for preventing wasteful overspending (e.g., Deis and Giroux 1992); conversely, the author postulates, in accordance with prior research, that the election variable drives up cost stickiness due to political uncertainty (e.g., Cohen et al. 2017; Lee et al. 2019).

The second group of control variables consists of economic variables (Econ_Var) that Anderson et al. (2003) and subsequent cost behavior researchers have found to have an impact on cost stickiness, specifically, *Tangible Assets intensity (Tangi_Assets)*, which is calculated as the ratio of total tangible assets to revenue, *Labor Costs intensity (Labor_Costs)*, which is calculated as the ratio of the total costs of employees to revenue, and *GDP Growth (Growth),* which is the percentage of growth in the real gross domestic product during year t[57]. The coefficients of the economic variable interaction terms are negatively associated with cost stickiness and are largely consistent with prior literature (e.g., Anderson et al. 2003; Banker et al. 2013). The author also includes a variable to control for *Successive-Decrease dummy (Successive_Decrease),* which is activated for the firm-year observations when revenue decreased in the preceding period. The author postulate based on prior research that this last variable drives down cost stickiness due to deliberate management decisions (e.g.,

---

[55] The number of auditors is stipulated by law, with four in each the 20 ordinance-designated cities and two in other cities, towns and villages. However, the fixed number of auditors can be increased by each municipality's ordinance.

[56] Cohen et al. (2017) and Lee et al. (2019) empirically found that sticky cost behavior is stronger during election years, and they argued that the political uncertainty surrounding elections can cause asymmetric cost responses to activity changes (i.e., cost stickiness).

[57] The source of Japanese GDP is based on the following URL: https://www.esri.cao.go.jp/en/sna/data/sokuhou/files/2019/qe194_2/gdemenuea.html

Anderson et al. 2003). An overview of the variables used in the analysis and their exact specifications are provided in the Appendix.

4.2.4 Model specification

The author primarily uses the dummy interaction specification suggested by the model of Anderson et al. (2003) (hereafter, the ABJ model) to estimate asymmetric cost behavior.

Model 6-1

$$\ln\left[\frac{C_{i,t}}{C_{i,t-1}}\right] = \beta_0 + \beta_1 * \ln\left[\frac{R_{i,t}}{R_{i,t-1}}\right] + \beta_2 * Dec\_D * \ln\left[\frac{R_{i,t}}{R_{i,t-1}}\right] + \varepsilon_{i,t} \quad (6.1)$$

where i is a business index, and t is a time index; costs (*C*) are operating expenditures substituted for costs, revenues (*R*) are operating revenues used as a proxy for the activity, and *Decrease_Dummy (Dec_D)* is one if operating revenues in t are lower than operating revenues in t-1 and is zero otherwise. In the ABJ model, an increase in costs can be measured by β_1, and a decrease can be measured by $\beta_1+\beta_2$. Therefore, a significant and negative β_2 indicates the presence of sticky costs.

To test *Hypotheses 6-1* and *6-2*, The author expand model 6- 1 by including both the free-riding measure (*Free_rider*) and the empire-building measure (*Empire_building*) as an interaction term (*Dec_D*ln(*$R_{i,t} / R_{i,t-1}$*)*) to measure their impact on cost stickiness and as a singular variable to control for the general impact on cost changes. Additionally, the author includes the control variables related to cost behavior. This calculation can be formulated as follows:

Model 6-2

$$\ln\left[\frac{C_{i,t}}{C_{i,t-1}}\right] = \beta_0 + \beta_1 * \ln\left[\frac{R_{i,t}}{R_{i,t-1}}\right] + \beta_2 * Dec\_D_{i,t} * \ln\left[\frac{R_{i,t}}{R_{i,t-1}}\right] + \beta_3 * Free\_rider_{i,t} * Dec\_D_{i,t}$$
$$* \ln\left[\frac{R_{i,t}}{R_{i,t-1}}\right] + \beta_4 * FCF_{i,t} * Dec\_D_{i,t} * \ln\left[\frac{R_{i,t}}{R_{i,t-1}}\right] + \beta_5 * Post_{i,t} * Dec\_D_{i,t}$$
$$* \ln\left[\frac{R_{i,t}}{R_{i,t-1}}\right] + \beta_6 * Empire\_building_{i,t} * Dec\_D_{i,t} * \ln\left[\frac{R_{i,t}}{R_{i,t-1}}\right]$$
$$+ \sum_{k=7}^{8} \beta_k \, Gov\_var_{i,t,k} * Dec\_D_{i,t} * \ln\left[\frac{R_{i,t}}{R_{i,t-1}}\right] + \sum_{l=9}^{12} \beta_l \, Econ\_var_{i,t,l} * Dec\_D_{i,t}$$
$$* \ln\left[\frac{R_{i,t}}{R_{i,t-1}}\right] + \beta_{13} * Free\_rider_{i,t}$$
$$+ \beta_{14} * FCF_{i,t} + \beta_{15} * Post_{i,t} + \beta_{16} * Empire\_building_{i,t}$$
$$+ \sum_{m=17}^{18} \beta_m \, Gov\_ver_{i,t,m} + \sum_{n=19}^{22} \beta_n \, Econ\_ver_{i,t,n} + \varepsilon_{i,t} \quad (6.2)$$

The author expects β_3 and β_6 to be negative, which would indicate greater cost stickiness for MEs with both free-riding and empire-building effects. The author reports six specifications based on model 6-1 and 6-2. First, the author simply checks the cost fluctuation direction with β_1 and β_2 when revenue decreases. Second, the author adds the *free-riding* variable and the *FCF*, *Post*, and *empire-building* variables with two steps. Next, the author adds the *governance* and *economic control* variables, and finally, the author includes all of the variables to check the robustness. The data are organized as a pooled regression panel data model and are estimated with panel data analysis[58].

[58] This paper analyzes the following steps and then lists the optimal results in the results tables. First, the author carries out the pooled ordinary least squares; the author next estimates with the fixed effects model, which controls both the cross-section and year; then, the author tests the results with the F-test. As a second step, the author estimates with the random effects model and test the results with Hausman test. In this research, Breusch-Pagan test which can compare between pooled model and random effects model are omitted.

5 Results

5.1 Descriptive Statistics

Table 6-1 shows the descriptive statistics that contain both merged MEs, including pre- and post-merger, and non-merged MEs. In each panel of Table 6-1, the operating balances of the MEs were not in deficit on average, which confirms the robustness of the MEs' financial conditions. By comparing the annual expenditure and revenue in both merged MEs and non-merged MEs, this study finds that the scales of both the annual expenditure and revenue for the former are not larger than those for the latter. These results imply that ME mergers are mainly conducted among small MEs. However, in splitting the merged ME sample into pre-merger and post-merger samples, both the annual expenditure and revenue more than double due to the mergers.

For reasons of brevity, the author focuses on the variables pertinent to the analysis. The average *free-rider* values are 0.0089 (median = 0.0000) in Panel A of Table 6-1, 0.0168 (median = 0.0000) in Panel B of Table 6-1, and 0.0199 (median = 0.0000) in Panel C of Table 6-1. Free-rider has little impact on both the total and merged ME samples since even the upper quartile is zero[59]. In both the post-merger and non-merger samples, *free-rider* values indicate zero in each column because they appear only before the mergers. Regarding *empire-building* index, the average values are -0.0105 (median = 0.0000) in Panel A of Table 6-1, -0.0197 (median = 0.0000) in Panel B of Table 6-1, and -0.0526 (median = -0.0051) in Panel D of Table 6-1. In both the pre-merger and non-merger samples, *empire-building* values are zero since they appear

[59] Based on the "law of 1/n" approach, the Free-rider estimation appears only a few times before MEs are merged. As a result, the value of Free-rider reveals mainly a small impact in the descriptive statistics.

only after the mergers. Additionally, *FCF* indicates a minus on average, which implies a tendency that increases the debt due to the operating fund shortage in general[60].

Table 6-1. Descriptive statistics

Panel A; Total

* thousand Japanese Yen

	Mean	Standard deviation	Minimum	Lower quartile	Median	Upper quartile	Maximum	Number
Annual Expenditure $_{i,t}$*	2,071,053	5,671,967	0	186,591	511,907	1,592,657	150,000,000	49,049
Annual Revenue $_{i,t}$*	2,190,601	6,575,564	0	205,600	538,651	1,646,488	164,000,000	
Costs $_{i,t}$	0.0097	0.1587	-5.5253	-0.0255	0.0044	0.0364	6.9744	45,181
Revenues $_{i,t}$	0.0051	0.1721	-10.1022	-0.0215	0.0000	0.0273	5.6506	
Free_rider $_{i,t}$	0.0089	0.0509	0.0000	0.0000	0.0000	0.0000	0.8571	
FCF $_{i,t}$	-0.1181	3.5928	-296.2769	-0.0805	-0.0101	0.0800	119.2931	
Post $_{i,t}$	0.1991	0.3994	0.0000	0.0000	0.0000	0.0000	1.0000	
Empire_building $_{i,t}$	-0.0105	0.1200	-13.1052	0.0000	0.0000	0.0000	7.6938	
Auditors $_{i,t}$	0.1055	0.3072	0.0000	0.0000	0.0000	0.0000	1.0000	
Election $_{i,t}$	0.2247	0.4174	0.0000	0.0000	0.0000	0.0000	1.0000	
Tangi_Assets $_{i,t}$	1.8059	1.2682	-5.8593	1.0977	2.0002	2.4464	10.4664	
Labor_Cost $_{i,t}$	-1.5429	0.8643	-9.4928	-2.1169	-1.6524	-0.7671	5.0043	
Successive_Decrease $_{i,t}$	0.4866	0.4998	0.0000	0.0000	0.0000	1.0000	1.0000	
Growth $_{t}$	0.8824	1.9974	-5.4000	-0.1000	1.4000	2.0000	4.2000	

Panel B; Merged MEs

	Mean	Standard deviation	Minimum	Lower quartile	Median	Upper quartile	Maximum	Number
Annual Expenditure $_{i,t}$*	1,768,889	3,709,959	0	166,303	456,825	1,498,832	49,143,211	26,464
Annual Revenue $_{i,t}$*	1,871,659	4,087,751	0	178,281	484,653	1,563,331	54,168,696	
Costs $_{i,t}$	0.0151	0.1743	-5.5253	-0.0242	0.0068	0.0410	6.9744	23,975
Revenues $_{i,t}$	0.0112	0.1687	-5.7054	-0.0200	0.0015	0.0308	5.6506	
Free_rider $_{i,t}$	0.0168	0.0689	0.0000	0.0000	0.0000	0.0000	0.8571	
FCF $_{i,t}$	-0.0547	0.9565	-13.1052	-0.0861	-0.0130	0.0170	119.2931	
Post $_{i,t}$	0.3753	0.4842	0.0000	0.0000	0.0000	1.0000	1.0000	
Empire_building $_{i,t}$	-0.0197	0.1641	-13.1052	0.0000	0.0000	0.0000	7.6938	
Auditors $_{i,t}$	0.1047	0.3062	0.0000	0.0000	0.0000	0.0000	1.0000	
Election $_{i,t}$	0.2269	0.4189	0.0000	0.0000	0.0000	0.0000	1.0000	
Tangi_Assets $_{i,t}$	1.8581	1.3090	-2.3472	1.1287	2.0339	2.5030	10.4664	
Labor_Cost $_{i,t}$	-1.5317	0.8712	-9.4928	-2.0850	-1.6253	-0.7816	5.0043	
Successive_Decrease $_{i,t}$	0.4682	0.4990	0.0000	0.0000	0.0000	1.0000	1.0000	
Growth $_{t}$	0.8915	1.9408	-5.4000	-0.1000	1.4000	2.0000	4.2000	

[60] In fact, the average debt of the post-merged MEs was approximately double the average debt of the pre-merged MEs according to the Municipal Enterprise Yearbook.

(Continued)

Panel C; Pre-merged MEs

	Mean	Standard deviation	Minimum	Lower quartile	Median	Upper quartile	Maximum	Number
Annual Expenditure $_{i,t}$*	1,424,975	3,174,436	0	143,790	321,924	1,047,389	37,417,805	16,743
Annual Revenue $_{i,t}$ *	1,538,498	3,600,216	0	165,852	364,832	1,141,738	54,168,696	
Costs $_{i,t}$	0.0205	0.1612	-2.7030	-0.0247	0.0093	0.0474	6.9744	14,978
Revenues $_{i,t}$	0.0198	0.1473	-3.1250	-0.0183	0.0053	0.0372	5.6506	
Free_rider $_{i,t}$	0.0199	0.0749	0.0000	0.0000	0.0000	0.0000	0.8571	
FCF $_{i,t}$	-0.0560	1.1927	-3.3355	-0.0935	-0.0195	0.0169	119.2931	
Post $_{i,t}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Empire_building $_{i,t}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Auditors $_{i,t}$	0.0774	0.2673	0.0000	0.0000	0.0000	0.0000	1.0000	
Election $_{i,t}$	0.2233	0.4164	0.0000	0.0000	0.0000	0.0000	1.0000	
Tangi_Assets $_{i,t}$	1.7092	1.1923	-2.2844	1.1940	1.9396	2.3575	8.7624	
Labor_Costs $_{i,t}$	-1.5069	0.7667	-8.0745	-1.9938	-1.5885	-0.8889	2.6866	
Successive_Decrease $_{i,t}$	0.4385	0.4962	0.0000	0.0000	0.0000	1.0000	1.0000	
Growth $_{t}$	1.0307	1.4222	-5.4000	0.1000	1.1000	2.2000	4.2000	

Panel D; Post-merged MEs

	Mean	Standard deviation	Minimum	Lower quartile	Median	Upper quartile	Maximum	Number
Annual Expenditure $_{i,t}$*	2,361,229	4,422,753	0	265,693	776,992	2,222,455	49,143,211	9,721
Annual Revenue $_{i,t}$ *	2,445,479	4,758,871	0	241,029	767,891	2,268,865	47,553,970	
Costs $_{i,t}$	0.0059	0.1938	-5.5253	-0.0235	0.0031	0.0314	6.2259	8,997
Revenues $_{i,t}$	-0.0030	0.1986	-5.7054	-0.0228	-0.0021	0.0210	4.5564	
Free_rider $_{i,t}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
FCF $_{i,t}$	-0.0526	0.2647	-13.1052	-0.0701	-0.0051	0.0171	7.6938	
Post $_{i,t}$	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
Empire_building $_{i,t}$	-0.0526	0.2647	-13.1052	-0.0701	-0.0051	0.0171	7.6938	
Auditors $_{i,t}$	0.1502	0.3572	0.0000	0.0000	0.0000	0.0000	1.0000	
Election $_{i,t}$	0.2331	0.4228	0.0000	0.0000	0.0000	0.0000	1.0000	
Tangi_Assets $_{i,t}$	2.1060	1.4495	-2.3472	0.9859	2.2197	2.8426	10.4664	
Labor_Costs $_{i,t}$	-1.5729	1.0205	-9.4928	-2.2708	-1.7180	-0.6422	5.0043	
Successive_Decrease $_{i,t}$	0.5177	0.4997	0.0000	0.0000	1.0000	1.0000	1.0000	
Growth $_{t}$	0.6597	2.5660	-5.4000	-0.1000	1.5000	2.0000	4.2000	

Panel E; Non-merged MEs

	Mean	Standard deviation	Minimum	Lower quartile	Median	Upper quartile	Maximum	Number
Annual Expenditure $_{i,t}$*	2,425,115	7,315,006	0	216,790	580,580	243,947	580,580	22,585
Annual Revenue $_{i,t}$*	2,564,321	8,606,154	0	1,688,386	580,580	1,745,246	164,000,000	
Costs $_{i,t}$	0.0036	0.1389	-3.8732	-0.0266	0.0019	0.0318	6.9036	21,206
Revenues $_{i,t}$	-0.0018	0.1756	-10.1022	-0.0229	-0.0008	0.0235	3.9109	
Free_rider $_{i,t}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
FCF $_{i,t}$	-0.1898	5.1437	-296.2769	-0.0743	-0.0074	0.0189	1.5992	
Post $_{i,t}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Empire_building $_{i,t}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Auditors $_{i,t}$	0.1063	0.3083	0.0000	0.0000	0.0000	0.0000	1.0000	
Election $_{i,t}$	0.2221	0.4157	0.0000	0.0000	0.0000	0.0000	1.0000	
Tangi_Assets $_{i,t}$	1.7469	1.2178	-5.8593	1.0654	1.9680	2.3826	10.3866	
Labor_Cost $_{i,t}$	-1.5556	0.8564	-7.6283	-2.1482	-1.6896	-0.7559	4.0799	
Successive_Decrease $_{i,t}$	0.5073	0.5000	0.0000	0.0000	1.0000	1.0000	1.0000	
Growth $_{t}$	0.8722	2.0595	-5.4000	-0.1000	1.5000	2.0000	4.2000	

Panel A of Table 6-2 presents the Spearman and Pearson correlations among the key variables used in the analysis. These variables are consistent with the expectations (the correlations are small in magnitude overall). Further analysis in Panel B of Table 6-2 tests the variables for the significant factors that could influence the regression, multicollinearity and auto-correlation. The variance inflation factor (VIF) is less than 10 for all variables, which indicates that multicollinearity is not a concern in the estimation of the models. Thus, the regression model does not suffer from multicollinearity.

Table. 6-2 Multicollinearity tests

Panel A: Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) *Costs* $_{i,t}$	1.0000											
(2) *Revenues* $_{i,t}$	0.6524 ***	1.0000										
(3) *Free_rider* $_{i,t}$	0.0773 ***	0.0705 ***	1.0000									
(4) *FCF* $_{i,t}$	-0.0079 *	-0.0083 *	0.0012	1.0000								
(5) *Post* $_{i,t}$	-0.0128 ***	-0.0290 ***	0.0308 ***	0.0089 *	1.0000							
(6) *Empire_building* $_{i,t}$	-0.0511 ***	-0.0139 ***	0.0000	0.0281 ***	-0.1905 ***	1.0000						
(7) *Auditors* $_{i,t}$	-0.0170 ***	-0.0123 **	0.0131 ***	0.0108 **	0.0712 ***	0.0154 ***	1.0000					
(8) *Election* $_{i,t}$	-0.0184 ***	-0.0321 ***	0.0067	0.0000	0.0107 **	-0.0090 *	-0.0013	1.0000				
(9) *Tangi_Assets* $_{i,t}$	0.0647 ***	0.0380 ***	0.0099 **	0.1177 ***	0.1003 ***	0.1037 ***	-0.0299 ***	0.0109 **	1.0000			
(10) *Labor_Costs* $_{i,t}$	-0.0502 ***	-0.1033 ***	0.0004	-0.0412 ***	-0.0455 ***	-0.1290 ***	0.0604 ***	-0.0056	-0.5371 ***	1.0000		
(11) *Successive_Decrease* $_{i,t}$	-0.0451 ***	-0.0347 ***	-0.0098 **	-0.0044	0.0318 ***	-0.0076	0.0162 ***	0.0175 ***	0.0069	0.0242 ***	1.0000	
(12) *Growth* $_{t}$	0.0276 ***	0.0390 ***	0.0454 ***	0.0014	-0.0564 ***	0.0171 ***	-0.0046	-0.0546 ***	-0.0097 **	0.0040	-0.0190 ***	1.0000

*significant at the 10% level,**significant at the 5% level, ***significant at the 1% level.

Panel B: Variance inflation factors

Explanatory Variable	VIF
Revenues $_{i,t}$	1.02202
Free_rider $_{i,t}$	1.008681
FCF $_{i,t}$	1.015397
Post $_{i,t}$	1.066951
Empire_building $_{i,t}$	1.065757
Auditors $_{i,t}$	1.01123
Election $_{i,t}$	1.00452
Tangi_Assets $_{i,t}$	1.441461
Labor_Costs $_{i,t}$	1.437667
Successive_Decrease $_{i,t}$	1.003825
Growth $_{t}$	1.009806

VIF= centered variance inflation factor.

5.2 Analysis Results

To test the asymmetric cost behavior signal, i.e., sticky or anti-sticky, the author first employs model 6-1 for the total sample's cost behavior (Column 1 of Table 6-3). Consistent with the findings of studies on asymmetric cost behavior, these estimates indicate that cost behavior is sticky on average (Column 1: $\beta_1 = 0.6952$, $\beta_2 = -0.2894$, both values $p < 0.01$). This result indicates that costs increase on average by 0.70% for a 1% increase in sales activity and decrease on average by 0.41 for a 1% decrease in sales activity.

In an extension analysis, the author estimates the model with the interaction term for both free riding and empire building to test the hypotheses. To address this point carefully, the author employs five specifications based on model 6-2. The analysis results are shown in Columns 2 to 6 of Table 6-3. Each result reported is based on the fixed effects model of the panel data analysis according to the results of the F-test and Hausman test. The specification of Column 6, which is the highest value of the adjusted R^2 ($Adj.\ R^2 = 0.5294$) in five specifications, is the most statistically satisfactory fit and reliable estimation among the five specifications. The results of the analysis include the following significant implications.

The author finds strong evidence for free riding's negative effects on cost stickiness. The significant and negative coefficient of the *free-rider* effect in the interaction with cost stickiness ($\beta_3 = -0.4244$, $t = -2.25$) in Column 6 of Table 6-3 indicates that costs are stickier when MEs contemplate merging. The evidence shows that administrators tend to overspend beyond the optimal size and retain committed resources before mergers, even when sales activities would decrease. Thus, these results support *Hypothesis 6-1*.

On the other hand, the *empire-building* coefficients with *FCF* and the interaction with both *FCF* and *Post* are not consistent through the five specifications; the estimator of β_4 of the interaction terms with both *FCF* and sticky costs are insignificant from Columns 2 to 4 and are negative and (marginally) significant values in Columns 5 and 6 of Table 6-3. Conversely, the estimator of β_6, which indicates the empire-building effects for sticky costs in post-merger, exhibits negative values in Columns 3 and 4 and, conversely, positive values in Columns 5 and 6 of Table 6-3. According to the results in Column 6 of Table 6-3, the significant and positive coefficient of the *empire-building* effect in the interaction with cost stickiness ($\beta_6 = 0.0151$, $t = 2.38$) indicates that the administrators would prefer to avoid losses or earnings decreases and diminish cost stickiness than to obtain more power and status for their own benefit. From the above, the prediction, i.e., *Hypothesis 6-2*, is partly supported. The results imply that the reputation or evaluation of administrators might partly prevent self-interested opportunistic overspending in post-merged MEs.

Regarding the corporate governance variables, the author finds negative and significant coefficients in the interaction between cost stickiness and the indicator variable for *election years* ($\beta_8 = -0.0882$, $t = -8.35$). The election-year result is consistent with prior studies, which implies that political uncertainty yields high sticky-cost conditions for MEs. Unexpectedly, the coefficient of *auditor* variable is insignificant ($\beta_7 = -0.0134$, $t = -0.97$), indicating that the number of auditors might not act to change the costs in general.

Regarding the economic control variables, the author finds a significant estimation in conjunction with cost stickiness. The significant and negative coefficients of both *tangible asset intensity* ($\beta_9 = -0.0156$, $t = -6.24$) and *labor cost intensity* ($\beta_{10} = -0.0711$, $t = -24.77$) in Column 6 of Table 6-3 provide that more employees and assets

accompanying the mergers might accelerate the cost stickiness because of high adjustment costs incurred. These results are consistent with Anderson et al. (2003) and subsequent cost behavior research that argues that cost stickiness increases with the adjustment costs that would be incurred to decrease committed resources. Regarding successive decreases, the author finds no significant effect of *successive decreases* (β_{11} = 0.0047, t = 0.45) in conjunction with cost stickiness in Column 6. The significant and negative coefficient of *Growth* (β_{12} = -0.0130, t = -5.27) in Column 6 of Table 6-3 shows that the degree of cost stickiness is greater in higher GDP growth periods than in weak economic situations. This result implies that administrators would consider a revenue decrease to be temporary in strong economic conditions.

Table 6-3. Estimates of cost stickiness with free-riding and empire-building effects

Variable		Pred. Sign	(1) Coefficient	(1) t-stat	(2) Coefficient	(2) t-stat	(3) Coefficient	(3) t-stat	(4) Coefficient	(4) t-stat	(5) Coefficient	(5) t-stat	(6) Coefficient	(6) t-stat
β_0			-0.0009	-1.33	-0.0009	-1.36	-0.0009	-0.94	-0.0013	-0.88	0.0369	8.41 ***	0.0372	8.33 ***
β_1	$\Delta lnR_{i,t}$	+	0.6952	102.68 ***	0.6918	103.36 ***	0.6745	102.29 ***	0.6775	103.31 ***	0.7217	126.15 ***	0.7209	125.99 ***
β_2	***Dec_D* $\Delta lnR_{i,t}$***	−	**-0.2894**	-34.04 ***	**-0.2618**	-30.70 ***	**-0.2725**	-30.39 ***	**-0.2682**	-27.74 ***	**-0.0635**	-4.34 ***	**-0.0236**	-1.53
Interaction Terms: (variable *$Dec\_D * \Delta lnR\ i,t$)														
β_3	***Free_rider*** $_{i,t}$	−			**-0.7145**	-3.25 ***	**-0.9525**	-4.37 ***	**-1.0945**	-5.00 ***	**-0.3439**	-1.83 *	**-0.4244**	-2.25 **
β_4	*FCF* $_{i,t}$	−			0.0010	1.62	0.0010	1.60	0.0004	0.67	-0.0010	-2.07 **	-0.0009	-1.78 *
β_5	*Post* $_{i,t}$						0.0775	7.38 ***	0.0525	4.68 ***	-0.0482	-5.03 ***	-0.0539	-5.29 ***
β_6	***Empire_building*** $_{i,t}$	−					**-0.1314**	-17.69 ***	**-0.1323**	-17.75 ***	**0.0216**	3.41 ***	**0.0151**	2.38 **
β_7	*Auditors* $_{i,t}$	+							0.0847	5.15 ***			-0.0134	-0.97
β_8	*Election* $_{i,t}$	−							-0.0291	-2.77 ***			-0.0882	-8.35 ***
β_9	*Tangi_Assets* $_{i,t}$	−									-0.0203	-8.33 ***	-0.0156	-6.24 ***
β_{10}	*Labor_Costs* $_{i,t}$	−									-0.0687	-24.48 ***	-0.0711	-24.77 ***
β_{11}	*Successive_Decrease* $_{i,t}$	+									0.0372	3.88 ***	0.0047	0.45
β_{12}	*Growth* $_t$	−									-0.0107	-4.51 ***	-0.0130	-5.27 ***
Standalone Variables:														
β_{13}	*Free_rider* $_{i,t}$				0.0643	4.46 ***	0.0632	4.40 ***	0.0535	3.88 ***	0.0562	5.25 ***	0.0553	5.17 ***
β_{14}	*FCF* $_{i,t}$				-0.0004	-1.27	0.0000	-0.06	-0.0001	-0.20	-0.0004	-1.71 *	-0.0004	-1.57
β_{15}	*Post* $_{i,t}$						-0.0131	-4.07 ***	-0.0137	-4.76 ***	0.0031	1.36	0.0028	1.24
β_{16}	*Empire_building* $_{i,t}$						-0.2855	-36.68 ***	-0.2848	-36.57 ***	-0.0287	-3.88 ***	-0.0297	-4.03 ***
β_{17}	*Auditors* $_{i,t}$								0.0087	0.76			0.0028	0.31
β_{18}	*Election* $_{i,t}$								-0.0017	-1.17			-0.0013	-1.14
β_{19}	*Tangi_Assets* $_{i,t}$										0.0136	7.64 ***	0.0136	7.62 ***
β_{20}	*Labor_Costs* $_{i,t}$										0.0339	18.78 ***	0.0337	18.65 ***
β_{21}	*Successive_Decrease* $_{i,t}$										-0.0061	-6.21 ***	-0.0069	-6.97 ***
β_{22}	*Growth* $_t$										-0.0005	-2.07 **	-0.0006	-2.37 **
Adj.R^2			0.3512		0.3613		0.3838		0.3829		0.5286		0.5294	
Durbin-Watson stat			2.1394		2.1580		2.1311		2.1295		2.1689		2.1695	
Panel data analysis			fixed effects		fixed effects		fixed effects		fixed effects		fixed effects		fixed effects	
F-test (statistic)			1.09 ***		1.09 ***		1.29 ***		1.26 ***		2.50 ***		2.50 ***	
Hausman test (Chi-Sq. statistic)			129.88 ***		117.14 ***		604.11 ***		620.40 ***		543.09 ***		647.23 ***	
N			45,181		45,025		45,025		45,025		43,650		43,650	

Note: From β_0 to β_{22}, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test. *, **, and *** denote significance at levels of 0.1, 0.05, and 0.01.

Adj.R^2 and N mean Adjusted R^2 and Number of observations, respectively.

5.3 Robustness Check

To check the robustness of the results described above, the author assesses the sensitivity of these results in two distinct respects: by adopting alternative definitions of both free rider and empire building and by adding other relevant control variables. Regarding alternative definitions, the author uses revenue instead of population as the proxy for free-riding incentives[61] as *Free_rider(REV)* and use an alternative measure of FCF as the proxy for free-riding incentives[62] as *Empire_building(FCFE)*. In Columns 1 to 6 of Table 6-4, the analysis using this approach partly yields similar estimation results in Table 6-3.

Regarding additional control variables, the author includes corporate governance and economic variables, namely, a corporate governance variable that controls for *population intensity (Population)*[63], which is calculated as the total population living in the municipality, and *Debt interest intensity (Debt_Interest)* [64], which is calculated as the ratio of debt interest to revenue for the economic variables. To avoid multicollinearity concerns, the author includes these two variables instead of *auditors (Auditors)* and *Tangible Assets intensity (Tangi_Assets)*. In Column 6 of Table 6-4, contrary to the prediction, the coefficient of the sticky-cost interaction estimations of

[61] Saarimaa and Tukiainen (2015) used revenue instead of population as a proxy for free riders.
[62] Considering the high debt problems after the mergers, the author also calculates free cash flow to equity (FCFE) as an alternative measure of FCF. Following the FCFE model specified by Damodaran (2006), FCFE is defined as net income plus depreciation minus capital expenditures minus the change in working capital and plus net changes in the long-term debt issued. Then, FCFE is scaled by total tangible assets. The definition is referred to in the Appendix.
[63] Cohen et al. (2017) argued that the population, i.e., the inhabitants of a municipality, influences the cost management of PSOs based on the OECD 2008 report, and they added the population to their model by only employing a standalone variable. They did not test population intensity in the interactions with sticky costs. the author predicts that the population with the right to choose a politician would restrain sticky costs concerning mergers through rational decisions.
[64] Cohen et al. (2017) employed the ABJ model with debt intensity to estimate the local Greek government cost behavior.

Population (β'_7 = -0.0250, t = -5.32) shows a statistically significant and negative estimation. This result provides that the population might accelerate the cost stickiness rather than mitigate it. Thus, the scale of the population might not act to strengthen the corporate governance variable for MEs. The coefficient of the sticky-cost interaction estimations of *Debt interest* (β'_9 = -0.0217, t = -8.02) indicates that increasing the debt interest leads to further cost stickiness, as expected. Accordingly, these results are almost robust to the potential managerial discretion that might bias cost stickiness when using another alternative variable and to estimating cost stickiness over a long period.

Table 6-4. Robustness tests

Variable	Pred. Sign	(1)		(2)		(3)		(4)		(5)		(6)	
		Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
β_0		-0.0005	-0.76	-0.0013	-1.43	-0.0015	-1.01	0.0362	8.30 ***	0.0367	8.26 ***	0.1143	1.51
β_1 $\Delta lnR_{i,t}$	+	0.6868	101.65 ***	0.6875	103.31 ***	0.6907	104.50 ***	0.7172	124.73 ***	0.7162	124.50 ***	0.7506	131.98 ***
β_2 Dec_D* $\Delta lnR_{i,t}$	−	**-0.2519**	-29.13 ***	**-0.2817**	-31.02 ***	**-0.2728**	-27.87 ***	**-0.0463**	-3.12 ***	**-0.0065**	-0.42	**0.1245**	2.44 **
Interaction Terms: (variable *Dec_D *$\Delta lnR_{i,t}$)													
β_3 Free_rider (REV) $_{i,t}$	−	**-0.0889**	-2.89 ***	**-0.0724**	-2.32 **	**-0.1708**	-5.04 ***	**0.0271**	1.07	**0.0263**	0.91	**-0.0149**	-0.55
β_4 $FCFE_{i,t}$	−	-0.0037	-4.97 ***	-0.0026	-3.62 ***	-0.0036	-4.90 ***	-0.0024	-4.10 ***	-0.0021	-3.62 ***	-0.0011	-1.89 *
β_5 $Post_{i,t}$				0.1039	9.82 ***	0.0734	6.53 ***	-0.0551	-5.71 ***	-0.0590	-5.81 ***	-0.0150	-1.26
β_6 Empire_building (FCFE) $_{i,t}$	−			**-0.2050**	-18.58 ***	**-0.2005**	-18.04 ***	**0.0195**	2.08 **	**0.0087**	0.92	**0.0487**	2.81 ***
β_7 $Auditors_{i,t}$	+					0.1165	6.56 ***			-0.0177	-1.13		
β'_7 Population $_{i,t}$	+											**-0.0250**	-5.32 ***
β_8 $Election_{i,t}$	−					-0.0426	-4.03 ***			-0.0923	-8.76 ***	-0.1418	-12.43 ***
β_9 $Tangi\_Assets_{i,t}$	−							-0.0218	-8.77 ***	-0.0166	-6.46 ***		
β'_9 Debt_Interest $_{i,t}$	−											**-0.0217**	-8.02 ***
β_{10} $Labor\_Costs_{i,t}$	−							-0.0699	-24.39 ***	-0.0723	-23.96 ***	-0.0610	-19.16 ***
β_{11} $Successive\_Decrease_{i,t}$	+							0.0336	3.50 ***	0.0007	0.07	-0.0265	-2.48 **
β_{12} $Growth_t$	−							-0.0113	-4.76 ***	-0.0136	-5.43 ***	-0.0028	-1.10
Standalone Variables:													
β_{13} $Free\_rider\ (REV)_{i,t}$		0.0913	6.06 ***	0.0930	6.08 ***	0.0786	5.27 ***	0.1079	8.90 ***	0.1092	8.99 ***	0.0961	8.11 ***
β_{14} $FCFE_{i,t}$		-0.0026	-5.11 ***	-0.0017	-3.31 ***	-0.0018	-3.59 ***	-0.0016	-4.14 ***	-0.0015	-3.97 ***	-0.0011	-2.85 ***
β_{15} $Post_{i,t}$				0.0083	2.54 **	0.0071	2.44 **	0.0076	3.36 ***	0.0076	3.34 ***	0.0100	3.66 ***
β_{16} $Empire\_building\ (FCFE)_{i,t}$				-0.3319	-34.34 ***	-0.3274	-33.79 ***	-0.0392	-4.27 ***	-0.0418	-4.55 ***	-0.0437	-4.21 ***
β_{17} $Auditors_{i,t}$						0.0081	0.70			0.0010	0.11		
β'_{17} $Population_{i,t}$												-0.0062	-0.85
β_{18} $Election_{i,t}$						-0.0017	-1.22			-0.0016	-1.43	-0.0019	-1.74 *
β_{19} $Tangi\_Assets_{i,t}$								0.0143	8.08 ***	0.0143	8.07 ***		
β'_{19} $Debt\_Interest_{i,t}$												-0.0058	-6.10 ***
β_{20} $Labor\_Costs_{i,t}$								0.0343	19.02 ***	0.0340	18.87 ***	0.0359	19.76 ***
β_{21} $Successive\_Decrease_{i,t}$								-0.0065	-6.58 ***	-0.0073	-7.35 ***	-0.0069	-7.13 ***
β_{22} $Growth_t$								-0.0005	-2.05 **	-0.0006	-2.37 **	-0.0005	-2.21 **
$Adj.R^2$		0.3618		0.3809		0.3803		0.5289		0.5297		0.5402	
Durbin-Watson stat		2.1581		2.1255		2.1262		2.1669		2.1677		2.1342	
Panel data analysis		fixed effects		fixed effects		fixed effects		fixed effects		fixed effects		fixed effects	
F-test (statistic)		1.12 ***		1.25 ***		1.22 ***		2.50 ***		2.51 ***		2.63 ***	
Hausman test (Chi-Sq. statistic)		136.48 ***		496.82 ***		502.93 ***		571.35 ***		670.54 ***		695.72 ***	
N		45,025		45,025		45,025		43,650		43,650		42,906	

Note: From β_0 to β_{22}, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test. *, **, and *** denote significance at levels of 0.1, 0.05, and 0.01.

$Adj.R^2$ and N mean Adjusted R^2 and Number of observations, respectively.

5.4 Additional Subsample Analysis

To capture further detailed agency incentives for free riding and empire building, the author performs an additional test of whether a decision concerning resource adjustment is made in the future interest of the MEs or is abused for the administrator's self-interest with administrator attribution. The author partitions the sample into two different subsamples[65] based on administrator attribution, which is differentiated between the administrators who have a bureaucratic background (bureaucrats) and the administrators who have a political background (politicians)[66] (Table 6-5).

The author finds contrasting results between the two subsample groups of bureaucrats and politicians. In Column 1 of Table 6-5, the significant and positive coefficients for both sticky costs ($\beta_2 = 0.1617$, $t = 3.14$) and the free-rider interaction term ($\beta_3 = 1.0948$, $t = 3.66$) indicate that the bureaucrats mitigate sticky costs not only before mergers but also on average. Conversely, in Column 2 of Table 6-5, the (marginally) significant and negative coefficients for both sticky costs ($\beta_2 = -0.0360$, $t = -2.16$) and the free-rider interaction term ($\beta_3 = -0.4219$, $t = -1.81$) show that the politicians might accelerate cost stickiness before mergers. Regarding empire-building effects, the author finds a significant and positive coefficient in Column 1 ($\beta_6 = 0.2256$, $t = 3.09$), indicating that bureaucrats would prefer to avoid losses or earnings decreases and diminish cost stickiness than to obtain more power and status for their own benefit.

---

[65] Before splitting the sample, the author carries out statistical difference tests (i.e., t-test) for key variables such as operating costs ($t = 2.42$; $p < 0.05$), operating revenue ($t = -1.58$; $p > 0.1$), free-rider, FCF ($t = 8.63$; $p < 0.01$), and empire-building ($t = -1.33$; $p > 0.1$) between (1) Bureaucrats and (2) Politicians. However, the author could not find significant differences for all variables. When comparing the coefficients, the same equation should be the preferred approach. This additional subsample analysis leaves room for improvement in analytical methods.

[66] Jacobsen (2006) reports the local authority politicians and bureaucrats in 30 Norwegian municipalities and where differences in spending preferences were empirically investigated; then, as a result, his paper shows that bureaucrats seem to be less expansive than their political counterparts.

According to the results of the additional subsample analysis, the politicians might be motivated to make decisions to achieve more political and social objectives, including reputation and re-election, rather than economic efficiency and profit maximization. Conversely, the results also imply that the bureaucrats might have other agency incentives, e.g., achieving a high level of cost efficiency performance to prevent losses or secure profits rather than retaining slack resources when revenues decrease[67].

[67] The literature on managerial incentives has shown that managers are likely to cut off slack resource costs when they must meet a particular performance benchmark (Dierynck et al. 2012; Kama and Weiss 2013).

Table 6-5. Subsample analysis: Administrator attribution

Variable		Pred. Sign	(1) Bureaucrats			(2) Politicians		
			Coefficient	t-stat		Coefficient	t-stat	
β_0			0.0064	2.65	***	0.0469	9.22	***
β_1	$\Delta lnR_{i,t}$	+	0.6023	39.42	***	0.7308	119.68	***
β_2	**$Dec\_D^{*}\Delta lnR_{i,t}$**	−	**0.1617**	3.14	***	**-0.0360**	-2.16	**
Interaction Terms: (variable $^{*}Dec\_D^{*}\Delta lnR\,i,t$)								
β_3	**$Free\_rider_{i,t}$**	−	**1.0948**	3.66	***	**-0.4219**	-1.81	*
β_4	$FCF_{i,t}$	−	0.0148	0.21		-0.0005	-0.82	
β_5	$Post_{i,t}$		0.2806	7.31	***	-0.0792	-7.11	***
β_6	**$Empire\_building_{i,t}$**	−	**0.2256**	3.09	***	**0.0056**	0.77	
β_7	$Auditors_{i,t}$	+	-0.1286	-3.88	***	0.0295	1.72	*
β_8	$Election_{i,t}$	−	-0.0353	-1.03		-0.0880	-7.79	***
β_9	$Tangi\_Assets_{i,t}$	−	-0.1527	-16.99	***	-0.0110	-3.94	***
β_{10}	$Labor\_Costs_{i,t}$	−	0.0317	3.08	***	-0.0765	-22.52	***
β_{11}	$Successive\_Decrease_{i,t}$	+	-0.0811	-2.03	**	0.0039	0.35	
β_{12}	$Growth_{t}$		0.0060	0.72		-0.0170	-6.41	***
Standalone Variables:								
β_{13}	$Free\_rider_{i,t}$		0.1002	6.31	***	0.0569	4.64	***
β_{14}	$FCF_{i,t}$		-0.0157	-3.46	***	-0.0003	-1.05	
β_{15}	$Post_{i,t}$		0.0057	2.85	***	0.0058	2.06	**
β_{16}	$Empire\_building_{i,t}$		0.0012	0.15		-0.0353	-3.89	***
β_{17}	$Auditors_{i,t}$		-0.0053	-2.89	***	-0.0010	-0.05	
β_{18}	$Election_{i,t}$		-0.0029	-1.37		-0.0010	-0.83	
β_{19}	$Tangi\_Assets_{i,t}$		0.0009	1.03		0.0107	5.30	***
β_{20}	$Labor\_Costs_{i,t}$		0.0030	2.20	**	0.0357	18.03	***
β_{21}	$Successive\_Decrease_{i,t}$		-0.0048	-2.60	***	-0.0076	-6.95	***
β_{22}	$Growth_{t}$		0.0002	0.47		-0.0006	-2.47	**
Adj.R^2			0.4567			0.5382		
Durbin-Watson stat			1.9987			2.1705		
Panel data analysis			pooled			fixed effects		
F-test (statistic)			1.02			2.55	***	
Hausman test (Chi-Sq. statistic)			-			584.99	***	
N			5,747			37,903		

Note: From β_0 to β_{22}, the coefficient estimates are based on panel data analysis that is chosen by both F-test and Hausman test. *, **, and *** denote significance at levels of 0.1, 0.05, and 0.01. $Adj.R^2$ and N mean Adjusted R^2 and Number of observations, respectively.

6 Conclusion

This study utilizes the managerial cost-accounting concepts of cost behavior through the lens of the economic theories of both the common pool problem and the agency problem to obtain insights into how the cost management of merged MEs affects (1) administrators' free-rider incentives pre-merger and (2) administrators' empire-building incentives post-merger. Specifically, the author examines managerial discretion in MEs prior to and following mergers and demonstrate that these two incentives for administrators exert a negative impact on cost behavior (i.e., bad cost stickiness). To examine the cost-driver mechanism through the empirically observed resource adjustment decisions, the current study investigates both merged and non-merged MEs in Japan with a large number of samples with long-term windows while carefully addressing and assessing the sensitivity of the results. The author concludes that some types of managerial discretion induce sticky costs, while other types diminish sticky costs, depending on the underlying motivations at the time of the mergers.

The findings of this study offer some notable suggestions. First, the analysis results in the pre-merger periods show that the free-riding incentives for administrators yield high cost stickiness. An opportunistic overspending tendency in previously merged MEs is promoted even when sales activity decreases. Second, the findings show that administrators' empire-building incentives in post-merger MEs partly act to mitigate the cost stickiness in these MEs. One might assume that MEs' administrators should strictly control their costs because of stakeholders' expectations for cost efficiency after mergers. The results could offer a new perspective on PSOs' cost management and show that FCF might act as an agency incentive to avoid losses or earnings decreases, thereby diminishing cost stickiness rather than promoting an empire-building incentive. The author also proposes that this evidence might provide

administrators with more latitude to focus on long-term value creation, i.e., good cost stickiness. Third, the author reveals that the political backgrounds of administrators influence their ability to accelerate cost stickiness in the interaction with their free-riding effects compared with the bureaucratic backgrounds of administrators. Accordingly, the research determines the roles of management discretion in resource adjustment decisions, which are especially required during the period of PSO mergers. The author extends the understanding of asymmetric cost behavior in the context of both other PSO types and PSO mergers by identifying each causal link with the pre-merger free-riding effect and the post-merger empire-building effect.

Overall, the current study provides incremental explanatory power beyond the differentiation of cost stickiness; however, the phenomenon is not yet fully understood, and further research is desirable since the author cannot completely control administrators' attributes, such as tenure, age, and education. The limitations of this study also provide opportunities for examinations of other specific agency problems of PSOs, such as the fiscal illusion effects (e.g., Chang 2009) and the budget-maximizing bureaucracy effects (e.g., Niskanen 1968; McGuire 1981). However, it remains unclear whether these effects diminish the positive effects of PSO mergers. An important remaining question is how incentives other than free riding and empire building influence administrators' decisions regarding resource adjustments, specifically for MEs. Additionally, further studies that focus on other types of PSOs and PSO mergers are required to discover the detailed mechanisms that underlie the decision making related to cost management in PSOs.

Appendix

Appendix: Variable definitions in the models

Variable	***Definition***
Costs $_{i,t}$ [C]	Operating expenditures of ME i in year t.
Revenues $_{i,t}$ [R]	Operating revenues of ME i in year t.
Decrease_Dummy [Dec_D]	A dummy variable that takes the value of 1 if the operating revenue of ME i in year t is lower than that in the preceding fiscal year (t-1) and is 0 otherwise.
Free_rider $_{i,t}$	1-Ni /Nj, where Ni is the population of municipality i that participates in a merger in Nj, in pre-merged year t, and Nj is the total population of the post-merger municipality, including municipality i.
FCF $_{i,t}$	A natural logarithm ratio of free cash flow, which is given by operating income + depreciation - changes in non-cash working capital - capital expenditure, scaled by total tangible assets in ME i, in a given year t.
Post $_{i,t}$	A binary variable that is set to one if it means after the merger in merged ME i in a given year t., zero otherwise.
Empire_building $_{i,t}$	An interaction term between FCF and Post in ME i, in a given year t.
Auditors $_{i,t}$	An indicator variable that is equal to 1 if the number of audit committee of ME i in year t is increased and is 0 otherwise.
Election_year $_{i,t}$ [Election]	An indicator variable that is equal to 1 if a year t is an election year in municipality i and is 0 otherwise.
Tangible_Assets intensity $_{i,t}$ [Tangi_Assets]	A natural logarithm ratio of total tangible assets calculated as to revenue in ME i, in a given year t.
Labor_Costs intensity $_{i,t}$ [Labor_Costs]	A natural logarithm ratio of the total amount of personal wages calculated as to revenue in ME i, in a given year t.
Successive_Decrease dummy $_{i,t}$ [Successive_Decrease]	An indicator variable that is equal to 1 when the revenue of ME i in year t declined in the preceding period (t-1) and is 0 otherwise.
GDP Growth $_{t}$ [Growth]	The percentage growth in the real gross domestic product during year t.
Free_rider (REV) $_{i,t}$	1-REVi /REVj, where REVi is the revenue of municipality i that participates in a merger in municipality j, in pre-merged year t, and REVj is the total revenue of the post-merger municipality, including municipality i.
FCFE $_{i,t}$	A natural logarithm ratio of free cash flow to equity, which is given by net income + depreciation - changes in non-cash working capital - capital expenditure + net borrowings (new debt issued - debt retired), scaled by total tangible assets in ME i, in a given year t.
Empire_building (FCFE) $_{i,t}$	An interaction term between FCFE and Post in ME i, in a given year t.
Population intensity $_{i,t}$ [Population]	A natural logarithm ratio of the total population living in the municipality i, in a given year t.
Debt_interest intensity $_{i,t}$ [Debt_interest]	A natural logarithm ratio of total debt interest calculated as to revenue in ME i, in a given year t.

VII Concluding Remarks

This dissertation investigates the asymmetric cost behavior in LPEs (including MEs) with long-term windows and empirically demonstrates the fluctuation of costs to discover the cost driver mechanism and its determinants and to explore the consequences for future sustainable management. By providing empirical research results using rich amounts of both fiscal and physical data, the author aims to help fill these gaps and reveal important alternative explanations that provide a new perspective on asymmetric cost behavior. In the following, the first section summarizes the research results (findings, contributions, and policy implications). In the final section, the author discusses the limitations of the study and provide suggestions for future research.

1 Findings, Contributions, and Policy Implications

Chapter II of the dissertation aims to verify the long-term cost behavior of Japanese LPEs by comparing them with Japanese CEs. To obtain robust evidence, the analysis in this paper uses a large number of samples with long-term windows: 115,929 fiscal year data points for LPEs and 84,343 firm year data points for CEs for 40 years from 1974 to 2013. Through several analysis approaches, this paper has five main notable findings. First, the results of the panel data analysis indicate that sticky costs are confirmed for CEs, whereas anti-sticky costs occur among LPEs. Conventional wisdom indicates that LPEs manage their costs less flexibly than private enterprises (CEs), but the results for cost behavior change indicate that LPEs' cost management is not necessarily inflexible regarding cost behavior. The current study implies that the lack of support for this expectation might be driven by management decisions regarding slack resources derived from both accounting system (regulations on dividends, retained earnings, and tax preferential treatment) and management system (redundancies) differences between CEs and LPEs. Additionally, this study suggests that LPE administrators may earn the

legitimacy to retain slack resources, which can easily be reduced when sales activity decreases. Second, the results of the timeline analysis show that LPEs' anti-sticky costs shift to sticky costs even though CEs' cost behavior remains unchanged. After approximately 2000, the research results imply that normative institutional pressure caused LPE administrators to lose their cost adjustment ability. In other words, LPEs gradually lost the redundancy of surplus profits. Due to institutional pressure to protect the public interest, the author conjectures that equipment that becomes obsolete with the passage of time must be repaired or replaced to maintain the quality of public services, even if this involves a revenue decrease. Third, the analysis for each industry provides contradictory results from previous studies: anti-sticky costs in businesses with high-intensity fixed assets industries and sticky costs in businesses with high-intensity labor costs. The diversity of cost behavior in LPEs might be caused by various institutional restrictions, including the nonexclusion of public services (e.g., welfare services for free) and the influence of monopolies. Fourth, the analysis results in the interaction between cost behavior and population changes show that the increasing elderly population and the decreasing total population have a negative impact on LPEs' cost behavior, suggesting that the impact of population changes must be taken into account when considering management needs. the author argues that determining how to reduce surplus capacity costs based on population changes might become an important issue for LPEs since forecasting future population changes provides accurate demand forecasts for cost management. Fifth, the four-year analysis results reveal that LPE administrators may eliminate disproportionate cost responses in the 4-year term as they aim to operate their services in a stable manner and attempt to balance the protection of the public interest and efficiency achievement due to institutional pressure from politicians. In public organizations, including LPEs, it is important to understand how

cost behavior will change due to the premise that public organizations must operate stably over the long term. Having reached these five conclusions, in this research, the author explores how public organization administrators make long-term cost management decisions. This study, which illustrates the characteristics of LPEs' cost behaviors from an academic perspective, has implications for public administrators' ability to manage their future costs.

In chapter III, the author examines the phenomenon of anti-cost stickiness in LPEs. First, to confirm the robustness of the results and to compare them with previous literature (Anderson et al. 2003; Hirai and Shiiba 2006) that analyzes the same period, the author performs the analysis based on 47,920 financial data points for 2,396 LPEs for 20 years from 1979 to 1998. Next, to identify the determinants of anti-sticky costs, the author excludes water supply businesses, which account for approximately 67% of the sample, due to their high impact on the results. It is expected that new findings and knowledge will result from the analysis. Up to 1998, contrary to expectations, LPEs maintained cost adjustment flexibility; anti-sticky costs were confirmed for all LPEs before 1998. However, the results rely largely on water supply businesses, which account for approximately 67% of the total sample. the author also finds two contrasting results for industry type: both anti-sticky costs in water supply businesses and sticky costs in hospitals. These results imply that the different cost structures in water supply businesses and hospitals yield symmetrical results. Namely, this study implies that diverse asymmetric cost behavior is derived from not only the cost structure but also differences in the business environment: legal regulations, market share rates, and pricing methods.

In chapter IV, this section challenges the verification of the drastic change in asymmetric cost behavior from anti-cost stickiness to cost stickiness around the year

2000. To explore the interaction between asymmetric cost behavior and the downside risk of demand, the current study addresses 39,803 financial data points for 4,342 LPEs for 15 years from 1999 to 2013. Through the analysis, this study intends to illustrate the relationship between future demographic changes and management decisions in LPEs. To discover these changes, first, this study focuses on the market share ratio of each industry. Second, the study clarifies the cost behaviors after 2006, when the population began to decline. The findings of this research lead to three significant suggestions. First, the analyses provide evidence of sticky costs after 1999. Second, after 2006, when the downside risk of demand by the population reached its upper limit, a high degree of cost stickiness appeared in LPEs. Third, industries with high market shares, which can manage the optimal resources according to the accurate prediction of future demand based on demographic changes, reveal strong cost stickiness. Administrators, especially in industries with high market share, face a difficult situation that is required to maintain the balance of both service quality and cost and price control under the summary cost method (the low growth in fee income), even though administrators could address decreases in the uncertainty of demand in accordance with precise demand forecasting. This research implies that the high fixed cost structure causes LPEs to not adjust their management resources flexibly.

In chapter V, this part of the dissertation verifies the effects of mergers from the viewpoint of cost management. To test whether merging public organizations acquire advantages (i.e., synergy effects), the current study investigates cost behavior by applying the difference-in-differences method before and after merging the data on MEs. In accordance with resource adjustment costs theory, the author analyzes a panel of 33,343 financial data points from 1999 to 2013. The results of the analysis lead to contradictory findings: evidence of sticky costs after mergers in the sample of merging

MEs. In contrast, on average, anti-sticky costs are found for nonmerging MEs. Regarding adjustment costs, material resources act to accelerate cost stickiness in the interaction with mergers. Conversely, human resources tend to mitigate cost stickiness after mergers. The analysis results show that MEs not only lose their capacity for flexible resource adjustment but also fail to achieve benefits from mergers even though they aim to achieve economies of scale or synergy effects from mergers. Since municipal mergers also expand the organization size and increase management resources, these factors might affect resource adjustment costs, which influence cost behavior. In Japan, policymakers and high-level government bureaucrats have recently considered further management integrations, such as alliances and cooperation across MEs. Thus, this study provides evidence of cost stickiness in mergers and argues for the need to estimate the merger effect accurately from the viewpoint of cost management before making further decisions on scale expansion.

In chapter VI, this part of the dissertation discusses a test of the asymmetric cost behaviors associated with managerial incentives in merged Japanese MEs, including (1) free riding and (2) empire building. To examine the cost driver mechanism through empirically observed resource adjustment decisions, the current study investigates asymmetric cost behavior in interactions with managerial discretion in both merged and nonmerged MEs for a sample of 45,181 fiscal year data points from 1995 to 2013. Then, the author analyzes the role of management discretion in resource adjustment decisions, which are especially necessary during merger periods. The current study extends the understanding of asymmetric cost behavior in the context of both other PSO types and PSO mergers by identifying each causal link with the premerger free-riding effect and the postmerger empire-building effect. As the results of the analysis show, free-riding incentives for administrators, especially those who have political backgrounds, yield

high cost stickiness in the premerger period; conversely, empire-building incentives for postmerger MEs partly act to mitigate cost stickiness. Namely, in the premerger period, administrators' opportunistic overspending tendency, i.e., bad cost stickiness, should be carefully addressed with appropriate monitors. In the postmerger period, administrators should have more latitude to focus on long-term value creation, i.e., good cost stickiness rather than controlling costs strictly for efficiency.

Above all, this doctoral thesis comprehensively reconciles the wide range of research on asymmetric cost behavior in a structured review, addresses a large number of samples with long-term windows while carefully addressing and assessing the sensitivity of the results, and furthermore highlights the relevance of sticky costs for PSO management research by providing important implications from the viewpoint of cost management.

2 Limitations and Future Research

The investigations in this dissertation offer a wide range of valuable insights regarding LPEs' cost management; however, it should be kept in mind that they are also subject to certain limitations, which in turn present a number of possibilities for future research. First, regarding sample selection, including research objects, the sample is restricted in two dimensions. The current study addresses LPEs that operate only in a single local government; however, other types of LPEs remain to be considered, such as intermunicipal corporations, which means cross-regional federations. To explore the optimal size of LPEs, further research should divide the sample into prefectures, cities, towns, and villages and carefully analyze the relationship with each population. Currently, Japan's national and local governments are promoting plans to combine public services through further amalgamations or joint ventures to improve efficiency with economies of scale and thereby resolve the two main issues of population changes

and a deteriorating financial situation. Regarding the relationship between amalgamation and cost management, the major limitation of Chapter V and VI is that the study cannot illustrate the best practices for merged MEs. Future studies should focus on cases in which mergers work well in MEs. Future studies should also provide detailed information about LPEs' cost behavior and propose effective cost management strategies not only in theory but also for practice.

Second, regarding the methodological approach, the current study mainly applies multivariate regression analysis with panel data since the basic empirical cost behavior model in the field of economics applies the cost function. However, there remains considerable potential for future research to examine alternative methodologies. Several studies propose alternative empirical measures. Weiss (2010) develops a firm-level measure of asymmetric cost behavior. Balakrishnan et al. (2014) suggest scaling the dependent variable with lagged sales activity rather than with the lagged total cost. This suggestion is derived from avoiding a nonconstant cost response to activity changes, which is useful under varying proportions of fixed costs across firms. Banker et al.'s (2014) model assumes a standard translog production technology with a fixed capacity resource that is chosen in advance and a variable resource that is chosen after the demand is realized to test how the mix of fixed and variable costs arises from optimal capacity commitments by managers under demand uncertainty. Regarding with panel data analysis, there remains a room to test more robust both cross sectional and time series estimates, applying multivariate regression analysis (e.g., cluster robust standard errors). Furthermore, to avoid the endogeneity concerns in summary cost method, the author needs to consider the simultaneity bias, therefore, the further research are required to adopt the instrumental variable method or propensity score matching method. Future research could analyze these alternative methodologies.

Additionally, another caveat to this asymmetric cost behavior research concerns the fact that the typical measures of asymmetric cost behavior use sales or operating revenue as a proxy for activity. The change in activity, which is measured by sales revenue, can occur because of changes in prices, volume, or both (Anderson and Lanen 2007). As shown in equation (1.7) in chapter I, the driver of costs is the quantity produced, i.e., physical volume measure; therefore, for more precise analyses, the proxy for activity should be chosen carefully. The financial reporting choices for cost asymmetry could be a limitation to be addressed future research.

Third, regarding the theoretical approach to investigating PSOs, although public management researchers have developed various theories regarding the public economy, such as fiscal illusion effects (e.g., Chang 2009), budget-maximizing bureaucracy effects (e.g., Niskanen 1968; McGuire 1981), flypaper effects (e.g., Henderson 1968; Gramlich 1969; Heyndels 2001), and Averch and Johnson effects (e.g., Boyes 1976), it is still unclear whether these effects deter the positive effects of PSO mergers. The limitations of this study provide opportunities for the examination of other specific agency problems of PSOs above all. The current study addresses and applies only a few of them. Future research could analyze these alternative theoretical approaches.

Fourth, regarding the evidence, determinants, and consequences of asymmetric cost behavior, the empirical analyses in this doctoral dissertation contribute to filling the research gap on LPEs. However, there remains considerable potential for future research to discover additional evidence on PSOs' asymmetric cost behavior with new insights into its determinants and consequences. For instance, a more profound understanding of asymmetric cost behavior in PSOs is needed through using both external data, such as geographic information system (GIS) data (e.g., consideration of population density and differences in height between mountains and plains), and

internal data, such as nonfinancial information (e.g., questionnaires or interviews with administrators). A detailed analysis that considers the characteristics of each industry type should also be considered. Future studies can provide information about cost behavior by comparing each types of data propose effective cost management strategies not only in theory but also for practice.

Apart from propositions for future research arising from the limitations and potential extensions of my empirical analyses, the study reveals several possibilities for future contributions to the literature on PSOs' cost management, including asymmetric cost behavior. For instance, in practice, the problem of high debt, including interest, is an important issue for PSOs; therefore, knowledge of cost management could help to solve this problem. There is a continuing need for detailed investigations of and research on public organizations' asymmetric cost behavior, especially that of LPEs.

References of the Dissertation

Akkemik, A. K. (2011). Potential impacts of electricity price changes on price formation in the economy: a social accounting matrix price modeling analysis for Turkey. *Energy Policy* 39: 854-864.

Amihud, Y. and B. Lev. (1981). Risk reduction as a managerial motive for conglomerate mergers. *The Bell Journal of Economics* 12 (2): 605-617.

Anand, J. and H. Singh. (1997). Asset Redeployment, Acquisitions and Corporate Strategy in Declining Industries. *Strategic Management Journal* 18: 99-119.

Anderson, M. C., R. D. Banker. and S. Janakiraman. (2003). Are selling, general, and administrative costs"sticky"?. *Journal of Accounting Research* 41(1): 47-63.

Anderson, S. W. and W. N. Lanen. (2007). Understanding cost management: What can we learn from the evidence on "sticky costs". Working Paper in Social Science Research Network. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=975135.

Averch, H. and L. L. Johnson. (1962). Behavior of the Firm under Regulatory Constraint. *American Economic Review* 52(4): 1053-1069.

Balakrishman, R., M. J. Peterson. and N. S. Soderstrom. (2004). Does capacity utilization affect the "stickiness" of cost?.*Journal of Accounting, Auditing and Finance* 19(3): 283-300.

Balakrishnan, R., L. Eldenburg, R. Krishnan. and N. Soderstrom. (2010). The influence of institutional constraints on outsourcing. *Journal of Accounting Research* 48(4): 767-794.

Balakrishnan, R., E.Labro. and N. Soderstrom. (2014). Cost structure and sticky costs. *Journal of Management Accounting Research* 26(2): 91-116.

Ballantine, J., J. Forker. and M. J. Greenwood. (2008). The governance of CEO incentives in English NHS hospital trusts. *Financial Accountability and Management* 24(4): 385-410.

Banker, R. D. and L. Chen. (2006). Labor Market Characteristics and Cross-Country Differences in Cost Stickiness. Working Paper in Social Science Research Network. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=921419.

Banker, R. D., D. Byzalov. and L. T. Chen. (2013). Employment protection legislation, adjustment costs and cross-country differences in cost behavior. *Journal of Accounting and Economics* 55(1): 111-127.

Banker, R. D. and D. Byzalov. (2014). Asymmetric Cost Behavior. *Journal of Management Accounting Research* 26(2): 43-79.

Banker, R. D., D. Byzalov, M. Ciftci. and R. Mashruwala. (2014a). The Moderating Effect of Prior Sales Changes on Asymmetric Cost Behavior. *Journal of Management Accounting Research* 26(2): 221-242.

Banker, R. D., D. Byzalov. and J. M. Plehn-Dujowich. (2014b). Demand Uncertainty and Cost Behavior. *The Accounting Review* 89(3): 839-865.

Banker, R. D., D. Byzalov., S. Fang. and Y. Liang. (2018). Cost Management Research. *Journal of Management Accounting Research* 30(3): 187–209.

Bel, G. and A. Costas. (2006). Do Public Sector Reforms Get Rusty? Local Privatization in Spain. Journal of Policy Reform, 9(1), 1-24. doi:10.1080/13841280500513084.

Benos, N., N. Mylonidis. and S. Zotou. (2017). Estimating production functions for the US states: *the role of public and human capital. Empirical Economics* 52(2): 691-721.

Bertero, E. and L. Rondi. (2000). Financial pressure and the behaviour of public enterprises under soft and hard budget constraints: evidence from Italian panel data. *Journal of Public Economics* 75(1): 73-98.

Bertrand, M. and S. Mullainathan. (2003). Enjoying the quiet life? Corporate governance and managerial preferences. *Journal of Political Economy* 111 (5): 1043-1075.

Blesse, S. and T. Baskaran. (2016). Do municipal mergers reduce costs? Evidence from a German federal state. *Regional Science and Urban Economics* 59: 54-74.

Blom-Hansen, J. (2010). Municipal amalgamations and common pool problems: The Danish local government reform in 2007. *Scandinavian Political Studies* 33 (1): 51-73.

Boshch, J. M. A. and J. G. Blandon. (2011). The influence of size on cost behavior associated with tactical and operational flexibility. *Estudios de Economia* 38(2): 419-455.

Bradbury, M. E. and T. Scott. (2018). Do managers forecast asymmetric cost behaviour? *Australian Journal of Management* 43 (4): 538-554.

Brasch, H. D. (1927). Zur Praxis der Unkostenschwankungen und ihrer Erfassung. *Betriebswirtschaftliche Rundschau* 4: 65-74.

Brüggen, A. and J. O. Zehnder. (2014). SG&A cost stickiness and equity-based executive compensation: Does empire building matter?. *Journal of management control* 25 (3-4): 169-192.

Calleja, K., M. Steliaros. and D. C. Thomas. (2006). A note on cost stickiness: Some international comparisons. *Management Accounting Research* 17(2): 127-140.

Capron, L., P. Dussage. and W. Mitchell. (1998). Resource Redeployment Following Horizontal Acquisitions in Europe and North America, 1988-1992. *Strategic Management Journal* 19(7): 631-661.

Chang, Y. (2009). Empire Building and Fiscal Illusion? An Empirical Study of Government Official Behaviors in Takings. *Journal of Empirical Legal Studies* 6: 541-584.

Chen, C. X., H. Lu. and T. Sougiannis. (2012). The agency problem, corporate governance, and the asymmetrical behavior of selling, general, and administrative costs. *Contemporary Accounting Research* 29(1): 252-282.

Chen, C., T. Gores. and J. Nasev. (2013). Managerial overconfidence and cost stickiness. Working Paper in Social Science Research Network. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2208622.

Cohen, S., S. Karatzimas. and V. C. Naoum. (2017). The sticky cost phenomenon at the local government level: empirical evidence from Greece. *Journal of Applied Accounting Research* 18(4): 445-463.

Collin, S. Y., T. Tagesson, A. Andersson, J. Cato. and K. Hansson. (2009). Explaining the choice of accounting standards in municipal corporations: Positive accounting theory and institutional theory as competitive or concurrent theories. *Critical Perspectives on Accounting* 20(2): 141-174.

Cooper, R. and R. S. Kaplan. (1988). How Cost Accounting Distorts Product Costs. *Management Accounting* 69 (10): 20-27.

Copeland, T., T. Koller. and J. Murrin. (1994). *Valuation: measuring and managing the value of the company*. John Wiley& Sons, New Jersey.

Cordeiro, W. P. (1999). Can We Learn Management Techniques From the Japanese Ringi Process?. Proceedings of Business Forum.

Cyert, R. M. and J. G. March. (1963). *A Behavioral Theory of the Firm*. N.J: Prentice-Hall.

Dalla Via, N. and P. M. Perego. (2014). Sticky cost behavior: Evidence from small and medium sized companies. *Accounting & Finance* 54(3): 753-778.

Damodaran, A. 2006. *Applied Corporate Finance. Second Edition*, John Wiley& Sons, New Jersey.

De Bruin, H., E. Ten Heuvelhof. and M. Van Twist. (2004). Calculeren voorbij de calculus,in: Essays over de Calculus van het Publiek Belang, Kenniscentrum voor Ordeningsvraagstukken.

Deis, D. R. and G. A. Giroux. 1992. Determinants of audit quality in the public sector. *The Accounting Review* 67 (3): 462-479.

Dexia Crediop. (2004). *Local Public Companies in the 25 Countries of the European Union*. Paris, Dexia.

Dierynck, B., W. R. Landsman. and A. Renders. (2012). Do managerial incentives drive cost behavior? Evidence about the role of the zero earnings benchmark for labor cost behavior in private Belgian firms. *The Accounting Review* 87 (4): 1219-1246.

Dijkgraaf, E. and R. H. J. M. Gradus. (2011). Efficiency Effects of Privatising Refuse Collection: Be Careful and Alternatives Present. Tinbergen Institute Discussion Paper, 2011-156/3. https://papers.tinbergen.nl/11156.pdf.

Dimaggio, P. J. and W. W. Powell. (1983). The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review* 48(2): 147-160.

Dimick, J.B. and A. M. Ryan. (2014). Methods for evaluating changes in health care policy: the difference-in-differences approach. *Journal of the American Medical Association* 312(22): 2401-2402.

Division for Public Administration and Development Management. (2008). *Public Enterprises: Unresolved Challenges and New Opportunities*. Department of Economic and Social Affairs, United Nations.

Domberger, S. and S. Rimmer. (1994). Competitive Tendering and Contracting in the Public Sector: A Survey. International Journal of the Economics of Business, 1(3), 439-453. doi:10.1080/758536232.

Domberger, S. and P. Jensen. (1997). Contracting Out by the Public Sector: Theory, Evidence, Prospects. Oxford Review of Economic Policy, 13(4), 67-78. doi:10.1093/oxrep/13.4.67.

Drew, J., M. A. Kortt. and B. Dollery. (2015). No Aladdin's Cave in New South Wales? Local Government Amalgamation, Scale Economies, and Data Envelopment Analysis Specification. *Administration and Society* 1(1): 1-21.

Drew, J., M. A. Kortt. and B. Dollery. (2014). Economies of scale and local government expenditure: evidence from Australia. *Administration and Society* 46(6): 632-653.

Edwards, M. M. and Y. Xiao. (2009). Annexation, Local Government Spending, and the Complicating Role of Density. *Urban Affairs Review* 45(2): 147-165.

Eldenburg, L. and R. Krishnan. (2003). Public versus private governance: a study of incentives and operational performance, *Journal of Accounting and Economics* 35(3): 377-404.

Eldenburg, L., B. E. Hermalin, M. S. Weisbach. and M. Wosinska. (2004). Governance, performance objectives and organizational form: evidence from hospitals. *Journal of Corporate Finance* 10(4): 527-548.

Eldenburg, L. and R. Krishnan. (2008). The Influence of Ownership on Accounting Information Expenditures. *Contemporary Accounting Research* 25(3): 739-772.

Endo, S. (2013). Local public enterprises current situation and issues-with the focus on water supply business.*The Japan Economic Research Institute monthly report* 423: 44-53.

Frumkin, P. and J. Galaskiewicz .(2004). Institutional Isomorphism and Public Sector Organizations. *Journal of Public Administration Research and Theory* 14(3): 283-307.

Garcia-Mila, T. and T. J. McGuire. (1992). The contribution of publicly provided inputs to states' economies. *Regional Science and Urban Economics* 22(2): 229-241.

Gonzales, A. R. and S. L. Mehay. (1987). Municipal annexation and local monopoly power. *Public Choice* 52(3): 245-255.

Graebner, M. E., K. M. Eisenhardt. and P. T. Roundy. (2010). Success and failure in technology acquisitions: Lessons for buyers and sellers. *Academy of Management Perspectives* 24(3): 73-92.

Graham, D. J., A. Couto., W. E. Adeney. and S. Glaister. (2003). Economies of scale and density in urban rail transport: effects on productivity. Transportation Research Part E: *Logistics and Transportation Review* 39(6): 443-458.

Grossi, G. and C. Reichard. (2008). Municipal corporatizations in Germany and Italy. *Public Management Review* 10(5): 597-617.

Gü(ue)nther, T. W., A. Riehl. and R. Rößler. (2014). Cost stickiness state of the art of research and implications. *Journal of Management Control* 24(4): 301-318.

Hayashi, Y. and K. Osoguchi. (2004). Supply of Local Public Services and Productivity Analysis. *Kwansei Gakuin University Departmental Bulletin Paper* 58(2): 1-28.

Hansen, S.W. (2014). Common pool size and project size: An empirical test on expenditures using Danish municipal mergers. *Public Choice* 159 (1-2): 3-21.

Hardin, G. (1968). The Tragedy of the Commons. *Science* 162(3859): 1243-1248.

He, D., J. Teruya. and T. Shimizu. (2010). Sticky Selling, General, and Administrative Cost Behavior and its Changes in Japan. *Global Journal of Business Research* 4(4): 1-10.

Hefetz, A. and M. E. Warner. (2007). Beyond the Market versus Planning Dichotomy: Understanding Privatisation and Its Reverse in US Cities. *Local Government Studies* 33 (4): 555–572.

Hefetz, A. and M. E. Warner. (2012). Contracting or Public Delivery? The Importance of Service, Market, and Management Characteristics. *Journal of Public Administration Research and Theory* 22(2): 289-317.

Hinnerich, B. T. (2009). Do merging local governments free-ride on their counterparts when facing boundary reform?. *Journal of Public Economics* 93: 721-728.

Hirai, H. and A. Shiiba. (2006). Cost Behavior of Selling, General, and Administrative costs. *Journal of Management Accounting* 14(2): 15-27.

Hirota, H. and H. Yunoue. (2017). Evaluation of the fiscal effect on municipal mergers: Quasi-experimental evidence from Japanese municipal data. *Regional Science and Urban Economics* 66: 132-149.

Hitt, M., R. E. Hoskisson, D. Ireland. and J. S. Harrison. (1991). Effects of Acquisitions on R&D Inputs and Outputs. *Academy of Management Journal* 34(3): 693-707.

Hodge, G. A. (2000). *Privatization: An International Review of Performance*. Westview Press. Boulder.

Hoffmann, K. (2017). *Cost Behavior: An Empirical Analysis of Determinants and Consequences of Asymmetries*. Copenhagen Business School, Frederiksberg.

Holzer, M., J. Fry., E. Charbonneau., G. Van Ryzin., E. T. Wang. and E. Burnash. (2009). *Literature Review and Analysis Related to Optimal Municipal Size and Efficiency*. Rutgers University Newark, School of Public Affairs and Administration. Newark

Holzhacker, M., R. Krishnan. and M. D. Mahlendorf. (2015). The Impact of Changes in Regulation on Cost Behavior. *Contemporary Accounting Research* 32(2): 534-566.

Hosomi, S. and S. Nagasawa. (2018). Empirical study on asymmetric cost behavior: analysis of the sticky costs of local public enterprises. *Asia-Pacific Management Accounting Journal* 13(2): 55-82.

Jacobsen, D. I. (2006). Public Sector Growth: Comparing Politicians' and Administrators' Spending Preferences. *Public Administration* 84 (1): 185-204.

Jang, Y., N. Yehuda. and S. Radhakrishnan. (2016). Asymmetric Cost Behavior and Value Creation in M&A Deals. Social Science Research Network.

Jensen, M. C. and W. Meckling. (1976). Theory of the firm: Managerial behavior, agency costs, and capital structure. *Journal of Financial Economics* 3(4): 305-360.

Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. American Economic Review 76(3): 323-329.

Jordahl, H. and C-Y. Liang. (2010). Merged municipalities, higher debt: On free-riding and the common pool problem in politics. *Public Choice* 143: 157-172.

Kama, I. and D. Weiss. (2013). Do Earnings Targets and Managerial Incentives Affect Sticky Costs? *Journal of Accounting Research* 51 (1): 201-224.

Kawarata, T. (2005). *Local public enterprises accounts theory*. Seibunsha, Tokyo.

King, R. D., D. R. Dalton., C. M. Daily. and Covin. G. J. (2004). Meta-analyses of the post-acquisition performance: Indications of unidentified moderators. *Strategic Management Journal* 25: 187-200.

Kinugasa, T. (2010). Economics of Local Public Enterprise in Japan. Working Paper, Otemon Gakuin University.

Kitamura, Y. (2009). *Introduction to Micro-Econometrics*. Nippon hyoron sha.tokyo.

Koike, A., K. Sadakane, E. Furuichi. and S. Katayama. (2015). Regional Economic Estimation of Redundancy Effects from Transport Investments. *Journal of Japan Society of Civil Engineers* 71(5): 201-208.

Kristensen, O.P. (1980). The logic of political bureaucratic decision-making as a cause of governmental growth: or why expansion of public programs is a "private good" and their restriction is a "public good". *European Journal of Political Research* 8: 249-264.

Lee, Woo-Jong., J. Pittman. and W. Saffar. (2019). *Political Uncertainty and Cost Stickiness: Evidence from National Elections around the World*. Contemporary Accounting Research, forthcoming.

Lindsay, C. M. (1976). A Theory of Government Enterprise. *Journal of Political Economy* 84(5): 1061-1078.

Liner, G. H. (1992). Annexation Impact on Municipal Effciency. *Review of Regional Studies* 22(1): 75-87.

Local Public Enterprise Division. Local public Enterprise YearBook No. 22 (1974) - No. 61 (2013). Local Public Finance Bureau, Ministry of Internal Affairs and Communications – Japan.

Lubatkin, M. (1983). Mergers and the performance of the Acquiring Firm. *Academy of Management Journal* 8(2): 218-225.

Malik, M. (2012). A Review and Synthesis of 'Cost Stickiness' Literature. Working Paper in Social Science Research Network. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2276760.

Martinsons, M. G. and Davison. R. M. (2007). Strategic decision making and support systems: Comparing American, Japanese and Chinese management. *Decision Support Systems* 43(1): 284-300.

McGuire, T. G. (1981). Budget-maximizing governmental agencies: An empirical test. *Public Choice* 36(2): 313-322.

Mehay, S. L. (1981). The Expenditure Effects of Municipal Annexation. *Public Choice* 36(1): 53-62.

Meyer, J. W. and Rowan. B. (1977). Institutionalized Organizations: Formal Structure as Myth and Ceremony. *American Journal of Sociology* 83(2): 340-363.

Morck, R., A. Shleifer. and R. W. Vishny. (1990). Do managerial objectives drive bad acquisitions?. *Journal of Finance* 45 (1): 31-48.

Murray, H.A. (1975). A Comparing Public and Private Management: An Exploratory Essay. *Public Administration Review* 35: 364-371.

Municipal Merger Promotion Division. (2008). *Evaluation, verification and analysis of 'the municipal merger of the Heisei area'*. Local Administration Bureau, Ministry of Internal Affairs and Communications, Japan.

Municipal Merger Promotion Division. (1999-2020). The Merged Municipalities' Data Collection." Local Administration Bureau, Ministry of Internal Affairs and Communications, Japan. https://www.soumu.go.jp/gapei/gapei.html.

Nagasawa, S. (2018). Asymmetric cost behavior in local public enterprises: exploring the public interest and striving for efficiency. *Journal of Management Control* 29(3-4): 225-273.

Nakai,H. (1988). *Quantitative analysis of contemporary fiscal burden - financial burden problem through national and local governments*. Yuhikaku.Tokyo.

Nakamura, H. (2012). The cost structure of Japan's water supply business. *Modern Society Research* 10: 65-76.

Nakano, K. (2016). Effects of Population and Household Structures on Residential Electricity Demand - A Literature Review and Future Research Agenda -. *The Electric Power Economic Research* 63: 35-49.

Nakazawa, K. (2013). Cost Inefficiency of Municipalities after Amalgamation. *Procedia Economics and Finance* 5: 581-589.

Nakazawa, K. (2016). Amalgamation, free-rider behavior, and regulation. *International Tax and Public Finance* 23(5): 812-833.

Nee, V. and Y. Cao. (2005). Market Transition and the Firm: Institutional Change and Income Inequality in Urban China. *Management and Organization Review* 1(1): 23-56.

Nishioka, H., M. Yamauchi. and Koike. S. (2007a). Implementation status of future estimates of population and households in local governments, usage situation and correspondence to population-related measures-In the case of Municipalities-. *Journal of Population Problems* 63(2): 57-66.

Nishioka, H., M. Yamauchi. and Koike. S. (2007b). Implementation status of future estimates of population and households in local governments, usage situation and correspondence to population-related measures-In the case of Municipalities-. *Journal of Population Problems* 63(4): 56-73.

Nishioka, H., M. Yamauchi. and S. Koike. (2007). Implementation status of future estimates of population and households in local governments, usage situation and correspondence to population-related measures-In the case of Municipalities-. *Journal of Population Problems* 63(4): 56-73.

Niskanen, W. A. (1968). Nonmarket Decision Making: The Peculiar Economics of Bureaucracy. *The American Economic Review* 58(2): 293-305.

Noreen, E. 1991. Conditions under which activity-based costs provide relevant costs. *Journal of Management Accounting Research* 3: 159-168.

Noreen, E. and N. Soderstrom. (1997). The accuracy of proportional cost models: Evidence from hospital service departments. *Review of Accounting studies* 2(1): 89-114.

Ooshima, K. (1971). *The business administration of the public (enterprise enlarged edition)*. Hakuto-shobo, Tokyo.

Oliver, C. (1991). Strategic Responses to Institutional Processes. *The Academy of Management Review* 16(1): 145-179.

Organization for Economic Co-operation and Development. (2008). Budgeting in Greece. *OECD Journal of Budgeting* 3: 1-50.

Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action (Political Economy of Institutions and Decisions)*. Cambridge University Press, Cambridge.

Pamplona, E., C. Fiirst, T. B. J. Silva. and V. C. S. Zonatto. (2016). Sticky costs in cost behavior of the larg-est companies in Brazil, Chile and Mexico. *Contaduría y Administración* 61(4): 682-704.

Pesch, U. (2006), *The Predicaments of Publicness: An Inquiry into the Conceptual Ambiguity of Public Administration*. Eburon Academic Publishers, Utrecht.

Pérez-López, G., D. Prior. and J. L. Zafra-Gómez. (2015). Rethinking New Public Management Delivery Forms and Efficiency: Long-Term Effects in Spanish Local Government. Journal of Public Administration Research and Theory, 25(4), 1157–1183. doi:10.1093/jopart/muu088.

Petersen, M. A. (2009). Estimating standard errors in finance panel data sets: Comparing approaches. *Review of Financial Studies* 22: 435-480.

Population Census Division. *The Report of Population Movement Based on Basic Resident Register system 1995-2013*. Statistics Bureau, Ministry of Internal Affairs and Communications – Japan.

Population Census Division. *Population Census 2005, 2010, and 2015*. Statistics Bureau, Ministry of Internal Affairs and Communications – Japan.

Rainey, Hal G. (1997). *Understanding and Managing Public Organizations*. Jossey-Bass Publishers. New Jersey.

Rainey, Hal G., R.W. Backoff. and C.L. Levine. (1976). A Comparing Public and Private Organizations. *Public Administration Review* 36: 233-246.

Reimer, K. (2019). Asymmetric Cost Behavior. Springer Fachmedien, Wiesbaden.

Richardson, S. (2006). Over-Investment of Free Cash Flow. *Review of Accounting Studies* 11: 159-189.

Saarimaa, T. and J. Tukiainen. (2015). Common pool problems in voluntary municipal mergers. *European Journal of Political Economy* 38: 140-152.

Saussier, S. and M. Klien. (2014). Local Public Enterprises: A Taxonomy. La Chaire EPPP. Sorbonne Business School. https://chaire-eppp.org/local-public-enterprises-a-taxonomy/?lang=en.

Scott, W. R. (2001). Institutions and Organizations. Sage Publications.

Sepasi, S. and H. 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): 4143-4159.

Shleifer, A. and R. Vishny. (1989). Management entrenchment: the case of manager-specific investments. *Journal of Financial Economics* 25(1): 123-139.

Shoup, C. S. (1976). *Collective Consumption and Relative Size of the Government Sector.* Public and Urban Economics, edited by Ronald E. G., 191-212, Lexington Books, Lexington.

Shust, E. and D. Weiss. (2014). Asymmetric Cost Behavior-Sticky Costs Expenses versus Cash Flows. *Journal of Management Accounting Research* 26(2): 81-90.

Smith, M. (2015). *Research Methods in Accounting*. SAGE, London.

Sørensen, R. J. (2007). Does Dispersed Public Ownership Impair Efficiency? The Case of Refuse Collection in Norway. *Public Administration* 85(4): 1045-1058.

Strube, E. (1936). Kostenremanenz und Beschäftigungsschwankungen. *Zeitschrift für Handelswissenschaftliche Forschung* 30(10): 505-541.

Subramaniam, C. and M. W. Weidenmier. (2016). Additional Evidence on the Sticky Behavior of Costs. *Advances in Management Accounting* 26: 275-305.

Tavares, F. A. (2018). Municipal amalgamations and their effects: a literature review. *Regional Studies on Development* 22(1): 5-15.

Treadway, A. B. (1969). On Rational Entrepreneurial Behaviour and the Demand for Investment. *The Review of Economic Studies* 36 (2): 227-239.

Tullock, G. (1959). Problems of majority voting. *Journal of Political Economy* 67: 571-579.

United Nations Department of Economic and Social Affairs. (2008). *Public Enterprises: Unresolved Challenges and New Opportunities*. Publication based on the Expert Group Meeting on Re-inventing Public Enterprise and their Management.

Van Genugten, M. L. (2008). The Art of Alignment: Transaction Cost Economics and Public Service Delivery at the Local Level. Working Paper in University of

Twente. https://research.utwente.nl/en/publications/the-art-of-alignment-transaction-cost-economics-and-the-provision.

Vermeulen, F. and H. Barkema. (2001). Learning through Acquisitions. *The Academy of Management Journal* 44(3): 457-476.

Vogelsang, I. (2006). Electricity Transmission Pricing and Performance-based Regulation. *The Energy Journal* 27(4): 97-126.

Voorn, B., M. L. Van Genugten. and S. Van Thiel. (2017). The efficiency and effectiveness of municipally owned corporations: a systematic review. *Local Government Studies* 43(5): 820-841.

Weingast, B., K. Shepsle. and C. Johnsen. (1981). The political economy of benefits and costs: A neoclassical approach to distributive politics. *Journal of Political Economy* 89: 642-664.

Weiss, D. (2010). Cost behavior and analysts' earnings forecasts. *The Accounting Review* 85: 1441-1474.

Williamson, O. E. (1964). *The Economics of Discretionary Behavior: managerial objectives in a theory of the firm*. Prentice-Hall, Englewood Cliffs.

Wollman, H. (2000). Local Government Modernization in Germany: Between Incrementalism and Reform Waves. *Public Administration* 78(4): 915-936.

Wollmann, H., H. Baldersheim, G. Citroni, G. Marcou. and J. McEldowney. (2010). *The provision of public Services in Europe: Between State, Local Government and Market*. Edward Elgar. Cheltenham.

Yasukata, K., T. Kajiwara, Y. Sima. and T. Kurisu. (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): 141-150.

Yasukata, K. (2012). *The Cost fluctuation analysis of the Japanese enterprises.* Chuo-keizai-sha.Tokyo.

Zanella, F., P. Oyelere. and S. Hossain. (2015). Are Costs Really Sticky? Evidence from publicly listed companies in the UAE. *Applied Economics* 47(60): 6519-6528.

Zucker, L. G. (1977). The Role of Institutionalization in Cultural Persistence. *American Sociological Review* 42(5): 726-743.

Abbreviations

CEO	Chief Executive Officer
CEs	Commercial Enterprises
GDP	Gross Domestic Product
LPEs	Local Public Enterprises
MEs	Municipal Enterprises
NPM	New Public Management
OLS	Ordinary Least Squares
PEs	Public Enterprises
PSOs	Public Sector Organizations
SG&A	Selling, General and Administrative Expenses