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Exploratory Analysis of Cost Variation in Unlisted Companies: Focusing on Cost Stickiness and Cost Anti-stickiness

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Abstract

The purpose of this study is to focus on cost stickiness and cost anti-stickiness and, by using financial data from unlisted companies to conduct quantitative analysis, to uncover aspects of cost variation and their underlying mechanisms among the group of unlisted companies that previous research has yet to clarify. Analyzing a large-scale financial data set from unlisted companies, it was confirmed that the results, both for samples excluding the construction and financial sectors and for samples including only the construction sector, did not contradict the findings of Anderson et al. (2003) and Banker et al. (2014). It was also concurrently verified that these results are consistent with the estimated outcomes of empirical studies focusing on publicly listed companies in Japan. This research, which analyzed a large-scale financial panel data set of unlisted companies, is likely the first of its kind in the world. Through this study, it is believed that we have been able to present the potential for expanding existing research on cost variability, which has predominantly been analyzed using published data from listed companies.

Keywords

cost stickiness, anti-cost stickiness, unlisted companies, cost behavior,

1. Introduction

According to traditional management accounting discussions, companies are thought to set a predetermined amount for the planned distribution of profits as their target profit and manage their business activities to realize this target. However, when it comes to sales revenue, the decision-making power may not always be on the company's side. This is because the components of sales revenue, such as selling price and sales volume, are affected by external environmental factors like economic conditions, market maturity, economic trends, and customer evaluations. In this respect, variation in sales revenue are considered one of the important management risks that companies need to deal with (Yasukata and Kajiwara, 2009, p.64), and managers are expected to address this risk by adjusting costs in line with the increase or decrease in sales revenue. During this process, the phenomena of cost stickiness and cost anti-stickiness—where the rate of cost increase when sales increase and the rate of cost decrease when sales decrease are asymmetric—have been widely observed (Anderson et al., 2003; Weiss, 2010; Kama and Weiss, 2013; Hirai & Shiiba, 2006; Kitada, 2016; Yasukata et al., 2017). Specifically, cost stickiness refers to the phenomenon where the rate of cost decrease when sales decrease is relatively smaller than the rate of cost increase when sales increase (Anderson, 2003), and cost anti-stickiness refers to the phenomenon where the rate of cost decrease when sales decrease is relatively larger (Weiss, 2010).

Regarding the mechanisms by which cost stickiness and cost anti-stickiness occurs, there are prominent theories such as the cost adjustment delay (Anderson, 2003; Hirai & Shiiba, 2006), the rational decision-making (Anderson, 2003; Banker et al., 2014; Hirai & Shiiba, 2006; Yasukata & Kajiwara, 2009), and the managerial preference related to agency problems (Chen et al., 2012; Kama and Weiss, 2013). In recent years, various factors have been observed to be associated with cost stickiness, including corporate governance and regulations of various countries (Calleja et al., 2006; Chen et al., 2012; Banker et al, 2013), vulnerabilities in internal controls (Kim et al, 2022), and tax avoidance behaviors (Xu and Zheng, 2020).

In Japanese enterprises, there has been a growing body of progressive research on cost stickiness since Hirai & Shiiba (2006). It is believed that understanding the trends in cost variation, including cost stickiness, among Japanese enterprises will lead to a deeper understanding of their revenue structures and profit variability (Kitada, 2016).

However, quantitative research on cost variation in Japanese companies, not limited to cost stickiness, has been largely based on publicly available financial data of listed companies, and there has been hardly any quantitative research conducted on unlisted companies, except for Fukushima et al. (2014). It is said that by performing statistical analysis on publicly available financial data, it is possible to gain insights into the general tendencies of cost variation, their factors, or their outcomes (Yasukata et al., 2017, p.5). While the general trends of cost variation in listed companies are becoming clear through the accumulation of empirical analyses, on the other hand, according to the research report of Ministry of Economy, Trade and Industry (METI, 2015, p.7), there are about 2.42 million unlisted companies in Japan. Considering that the number of listed companies in Japan as of May 10, 2023, is 3,883, it means that more than 99% of the companies in Japan are unlisted.

The purpose of this study is to focus on cost stickiness and, by using financial data from unlisted companies to conduct quantitative analysis, to uncover aspects of cost variation and their underlying mechanisms among the group of unlisted companies that previous research has yet to clarify. This aims to contribute not only to the understanding of Japanese enterprises but also to the expansion of the international research field on cost variation.

The structure of this study is as follows. First, in Section 2, we review the literature relevant to this study, and then in Section 3, we establish working hypotheses for the analysis using financial data from unlisted companies. In Section 4, we describe the analytical methods, and in Section 5, we present the results. Section 6 is devoted to the discussion. Finally, in Section 7, we outline the limitations of this study and prospects for future research.

2. Literature review

As mentioned earlier, there are numerous empirical analyses that have accumulated using publicly reported financial data on the topic of cost stickiness on the downside. While analyses using more advanced statistical models are increasing, this section provides an overview of the analytical model by Anderson et al. (2003), which has become the substantial platform for cost variation analysis, as well as the analytical model by Banker et al. (2014), which further developed it. The reasons for selecting these two models are twofold: they are both the most fundamental and important models in the analysis of cost stickiness on the downside, and because there has been no existing research using the financial data that are the subject of this analysis, it was deemed appropriate to use these two models as the starting point for the analysis.

2.1 The analytical model of Anderson (2003)

The phenomenon whereby the rate of cost increase during a rise in sales is greater than the rate of cost decrease during a decline in sales has been previously pointed out by Noreen and Soderstrom (1997), Cooper and Caplan (1998), and others. Among this cost asymmetry, in particular, the concept that the increase in costs associated with a rise in the degree of operation is greater than the decrease in costs associated with an equivalent reduction in the degree of operation is what has been termed 'cost stickiness' (Table 1). The existence of this cost stickiness was demonstrated by Anderson et al. (2003) through an analytical model that utilized large-scale published financial data (hereinafter referred to as the ABJ model).

(Figure 1 here)

ABJ model:

$$\Delta lnSGA_{i,t} = \beta_0 + \beta_1 \Delta lnSALES_{i,t} + \beta_2 D_{i,t} \Delta lnSALES_{i,t} + \varepsilon_{i,t}$$

The definitions of the variables in the above model are as follows. First, $SGA_{i,t}$ and $SALES_{i,t}$ represent, for company i in period t, the selling, general and administrative expenses (hereafter referred to as SG&A expenses) and sales revenue, respectively. Next, $D_{i,t}$ is a dummy variable that takes the value of 1 if the sales revenue of company i has decreased from period $t\text{-}1$ to t, and 0 otherwise. if the variation of SG&A expenses is asymmetrical, $\beta 2$ takes on either a positive or negative value. If it is symmetrical, the coefficient $\beta 2$ becomes zero; Here, if $\beta 2$ takes on a negative value, it is estimated that the variation of SG&A expenses is downwardly sticky. Analyses using publicly available financial data from Japanese domestic companies have observed results that are consistent with Anderson et al. (2003) (Hirai & Shiiba, 2006; Yasukata et al., 2017) (Table 1).

(Table 1 here)

Following the pioneering work of Anderson et al., a large number of empirical studies have been accumulated (for example, Calleja et al., 2006; Hirai & Shiiba, 2006; Weiss, 2010; Kama and Weiss, 2010; Chen et al., 2012; Kama and Weiss, 2013; Banker et al, 2013, etc.). In addition, this series of studies has also revealed the existence of cost anti-stickiness, namely the phenomenon where the rate of cost reduction during a decrease in sales is relatively larger (Weiss, 2010). However, Anderson et al. (2003) seemed not necessarily capture this anti-stickiness of costs separately.

2.2 The Analytical Model of Banker et al. (2014)

Banker et al. (2014) extended the analytical model proposed by Anderson et al. (2003) into a two-period model and conducted a detailed analysis that individually captured both cost stickiness and anti-stickiness. Banker and his colleagues, under the assumption that two factors—surplus resources and the prediction of future sales—affect cost variability through managerial decision-making, focused on the two-period variation of sales. They set up four situational patterns by combining the previous period’s increase or decrease in revenue with the current period’s increase or decrease. Namely, the patterns are: 'previous period increase & current period increase', 'previous period increase & current period decrease', 'previous period decrease & current period increase', and 'previous period decrease & current period decrease'.

The hypotheses set by Banker et al. are as follows. Firstly, in the case of an increase in revenue in the previous period, it is expected that the resources acquired up to the previous period would be consumed within that period. In that case, it is thought that few surplus resources would be carried over to the next period, namely the current period. Therefore, if further revenue increase is expected in the current period, an incentive to avoid opportunity loss during demand increase will operate, and the decision to acquire additional resources in the current period would likely be chosen. Conversely, if a decrease in revenue is expected in the current period, an incentive to avoid opportunity loss in case the decrease in demand is temporary will operate, and it is believed that the company will choose to maintain surplus resources up to an acceptable level. From the above, it is expected that in the case of increased revenue in the previous period, the cost variability is downwardly sticky (Figure 2).

(Figure 2 here)

In the case of a revenue decrease in the prior period, it is expected that the company would be unable to fully utilize the resources acquired up to that point, resulting in excess resources being carried over to the current period. Even under these circumstances, if an increase in revenue is anticipated in the current period, an incentive to avoid opportunity losses associated with rising demand would likely come into play, similar to the scenario of prior period revenue increase. Therefore, it is considered likely that the company would choose to acquire new resources in the current period. However, since the prior period was characterized by a revenue decrease and excess resources were maintained, the degree of new resource acquisition would presumably be less than in the case of a prior period revenue increase. Conversely, if a revenue decrease is expected in the current period under these circumstances, it would lead to two consecutive periods of declining revenue, and management's forecast may become pessimistic. Moreover, since the company has maintained excess resources similar to the previous pattern, there is a high likelihood that incentives to avoid the additional risk of these excess resources will operate. Thus, it is conceivable that the company would choose to incur resource adjustment costs and opt to reduce excess resources. Therefore, it is expected that in the case of a prior period revenue decrease, the cost variation would be anti-stickiness in nature (Figure 3).

(Figure 3 here)

Banker and colleagues conducted a verification using a large-scale publicly disclosed financial data analysis model of U.S. companies (hereinafter referred to as the BBCM model) and demonstrated that the hypothesized scenarios do actually occur (Banker et al. 2014).

BBCM model:

$$\Delta lnSGA_{i,t} = \beta_0 + I_{i,t-1}(\beta_1^{PIncr}\Delta lnSALES_{i,t} + \beta_2^{PIncr}D_{i,i}\Delta lnSALES_{i,t}) + D_{i,t-1}(\beta_1^{PDecr}\Delta lnSALES_{i,t} + \beta_2^{PDecr}D_{i,i}\Delta lnSALES_{i,t}) + \varepsilon_{i,t}$$

The definitions of the variables in the above model are as follows. First, $SGA_{i,t}$ and $SALES_{i,t}$ represent, for company *i* in period *t*, SG&A expenses and sales revenue, respectively. Next, $D_{i,t}$ is a dummy variable that takes the value of 1 if the sales revenue of company *i* has decreased from period *t-1* to *t*, and 0 otherwise. In addition, $I_{i,t-1}$ ($D_{i,t-1}$) is also a dummy variable that takes the value of 1 if the sales in period *t-1* have increased (decreased) compared to period *t-2* for company *i*.

As well as the results of ABJ model, analyses using publicly available financial data from Japanese domestic companies have observed results that are consistent with Banker et al. (2014) (Kitada, 2016; Yasukata et al., 2017) (Table 2).

(Table 2 here)

3. Hypothesis setting

The focus of this research is on unlisted companies within Japan. While there has been a considerable amount of quantitative research conducted using publicly available financial data on the cost variation of listed companies, there is a lack of such research on unlisted companies. This is not unique to Japan; for instance, other than Hall (2016) who compared decision-making concerning the labor cost structures of listed and unlisted banks in the United States, there has been no significant research found internationally. A major reason for this is the difficulty in obtaining financial data from unlisted companies. Overcoming this challenge to conduct quantitative research on unlisted companies could greatly contribute to the international study of cost variation.

With this context in mind, this study attempts to construct hypotheses. The financial data of unlisted companies used in this study is being used for the first time in research related to cost stickiness. Therefore, it is not clear whether the cost stickiness or anti-stickiness observed in listed companies will be seen in this dataset. Consequently, this study sets working hypotheses related to the basic model of Anderson et al. (2003) and Banker et al. (2014) and discusses whether the dataset is appropriate as a starting point for future analysis, including its suitability for the study.

Hypothesis 1: The relative magnitude of an increase in SG&A costs for an increase in sales revenue is greater than the relative magnitude of a decrease in

SG&A costs for a decrease in sales revenue.

Hypothesis 2a: Conditional on a prior sales increase, costs in the current period are sticky, on average; i.e., they rise more for concurrent sales increases than they fall for equivalent sales decreases.

Hypothesis 2b: Conditional on a prior sales decrease, costs in the current period are anti-sticky, on average; i.e., they rise less for concurrent sales increases than they fall for equivalent sales decreases.

Hypothesis 3: For a given magnitude of a current sales increase, costs rise to a greater extent, on average, following a prior sales increase than following a prior sales decrease.

4. Analysis method

4.1 The Overview of the Sample

The data used for analysis were extracted from the corporate financial database (COSMOS1) and the company profile database (COSMOS2), both owned by Teikoku Databank, Ltd. Specifically, the analysis targets the figures from the consolidated financial statements for Japanese companies with headquarters in Japan for the fiscal years from March 2001 to March 2022. For companies that have not adopted the consolidated accounting system, the numbers from their individual financial statements were used. Samples with a fiscal period of less than 12 months, as well as samples with missing values for the variables used, were excluded from the analysis. In addition, Sales and SGA data were winsorized at the top and bottom 1 percent.

It should be noted that the unlisted companies targeted in this analysis are not necessarily subject to an accounting audit by external auditors, and therefore, the accuracy of the financial data may not be as guaranteed compared to listed companies. However, Teikoku Databank, Ltd., which holds the data used in this study, is a leading domestic credit research firm targeting companies, and the various information it holds is used in credit assessments for companies. If a company refuses to provide information upon request from the firm, or provides incorrect information, such behavior is highly likely to damage the company's creditworthiness; hence, there is little incentive to engage in such behavior. Although the financial data may contain unintended errors, it is common for tax accountants to check the content of the financial statements used for tax filing and payment processes. Therefore, it is judged that there are no particular problems with the reliability of the data used in this study.

(Table 3 here)

The industry classification adopts the "Major Categories" set by Teikoku Databank Ltd. Upon aggregating the sample sizes by industry, the construction industry accounted for 52.8% of the total sample, excluding companies belonging to the banking, securities, and insurance industries (Table 3). It is anticipated that if an analysis were conducted including the sample from the construction industry, the results would strongly reflect the tendencies specific to the construction industry. Therefore, this study will perform the analysis on two separate groups: one excluding the construction industry and the other consisting solely of the construction industry.

4.2 Analysis model

In this study, the ABJ model is used for the purpose of testing working hypothesis 1, and the BBCM model is used for the purpose of testing working hypotheses 2a, 2b, and 3, respectively.

ABJ Model (Testing of Working Hypothesis 1):

$$\Delta lnSGA_{i,t} = \beta_0 + \beta_1 \Delta lnSALES_{i,t} + \beta_2 D_{i,t} \Delta lnSALES_{i,t} + \varepsilon_{i,t}$$

BBCM Model (Testing of Working Hypothesis 2a, 2b and 3):

$$\Delta lnSGA_{i,t} = \beta_0 + I_{i,t-1}(\beta_1^{PIncr} \Delta lnSALES_{i,t} + \beta_2^{PIncr} D_{i,i} \Delta lnSALES_{i,t})$$
$$+ D_{i,t-1}(\beta_1^{PDecr} \Delta lnSALES_{i,t} + \beta_2^{PDecr} D_{i,i} \Delta lnSALES_{i,t}) + \varepsilon_{i,t}$$

The definitions of each variable are as described in sections 2.1 and 2.2. Additionally, as control variables, fiscal year dummies and industry dummies (based on the major classification by Teikoku Databank) are added. Hypothesis 1 will be supported if, in the ABJ model, the coefficient $\beta 2$ is significantly negative. Hypothesis 2a will be supported if the coefficient β_2^{PIncr} is significantly negative, and Hypothesis 2b will be supported if the coefficient β_2^{PDecr} is significantly positive. Hypothesis 3 will be supported if the coefficient $\beta_1^{PIncr} > \beta_1^{PDecr}$ and both coefficients are significant.

5. Results

Table 4 presents the descriptive statistics for the sample used in this study. A characteristic observed across all samples is that both sales and general administrative expenses have a large standard deviation. This indicates that there is a significant variation in the values within each sample. Furthermore, the sample consisting solely of construction industry firms is smaller in value compared to the entire sample set, suggesting that it comprises relatively small-scale enterprises.

(Table 4 here)

(Table 5 here)

The following is a brief description of the estimation results using the ABJ model and the BBCM model. The analysis method employs the ordinary least squares. For both sets of estimation results, the values in parentheses represent standard errors based on two-way clustering by firm and year.

The estimation results of the ABJ model were as indicated in Table 5. In presenting the results, reference was made to Yasukata et al. (2017, p.84, Figure 4.3), comparing with the results of Anderson et al. (2003) and those estimated by Hirai & Shiiba (2006) and Yasukata et al. (2017) using the same model for Japanese listed companies. It is noted that the studies on Japanese listed companies by Hirai & Shiiba (2006) and Yasukata et al. (2017) observed results consistent with the empirical findings of Anderson et al. (2003). As a result of the analysis, in the sample excluding the construction and financial industries, β_1 was significantly positive at .473, and β_2 was significantly negative at -.139. Moreover, in the sample consisting only of the construction industry, β_1 was significantly positive at .301, and β_2 was significantly negative at -.042. This suggests that the relative increase in selling, general and administrative expenses associated with an increase in sales is greater than the relative decrease in these expenses associated with a decrease in sales. Therefore, Hypothesis 1 is supported.

(Table 6 here)

The analysis results of the BBCM model were as shown in Table 6. In presenting the analysis results, similar to the estimations for the ABJ model, reference was made to Yasukata et al. (2017, p.90, Figure 4.7), and a comparison was drawn with the estimation results of Banker et al. (2014) and the results estimated by Kitada (2016) and Yasukata et al. (2017) using the same model for Japanese listed companies. It should be noted that the studies targeting Japanese listed companies by Kitada (2016) and Yasukata et al. (2017) observed results that were consistent with the empirical findings of Banker et al. (2014).

First, we test Hypothesis 2a. The results of the analysis show that in the sample excluding the construction and financial industries, β_1^{Pincr} was significantly positive at .580, and β_2^{Pincr} was significantly negative at -.309. Furthermore, in the sample consisting only of the construction industry, β_1^{Pincr} was significantly positive at .438, and β_2^{Pincr} was significantly negative at -.250. This suggests that under the condition of increased sales from the previous period, costs increase more for an equivalent increase in current sales and decrease less for an equivalent decrease in sales, indicating the occurrence of cost stickiness. Therefore, Hypothesis 2a is supported.

Second, we test Hypothesis 2b. The results of the analysis indicate that in the sample excluding the construction and financial industries, β_1^{PDecr} was significantly positive at .402, and similarly, β_2^{PDecr} was significantly positive at .001. In the sample consisting only of the construction industry, β_1^{PDecr} was significantly positive at .236, and β_2^{PDecr} was significantly positive at .100. This suggests that under the condition of decreased sales from the previous period, costs rise less for an equivalent increase in current sales and decrease even more for an equivalent decrease in sales, indicating the occurrence of cost anti-stickiness. Therefore, Hypothesis 2b is supported.

Finally, we test Hypothesis 3. The results of the analysis show that for the sample excluding the construction and financial industries, β1Pincr was .580 and β1PDecr was .402; for the construction industry only sample, β1Pincr was .438 and β1PDecr was .236, with both results significantly indicating β1PIncr > β1PDecr. This suggests that given the magnitude of the current period's sales increase, the costs in the current period increase more on average when the previous period's sales have increased rather than decreased. Therefore, Hypothesis 3 is supported.

6. Conclusion

In this study, we focused on cost stickiness and cost anti-stickiness, which has become the core of recent research on cost variation, and performed a quantitative analysis using financial data from unlisted companies. By doing so, we attempted to unveil some aspects of cost variation and the underlying mechanisms within groups of companies that prior research has not yet addressed. Below, after discussing the results of our analysis, we will describe the future outlook of this study, its academic contributions, and the limitations of our research.

Analyzing a large-scale financial data set from unlisted companies, it was confirmed that the results, both for samples excluding the construction and financial sectors and for samples including only the construction sector, did not contradict the findings of Anderson et al. (2003) and Banker et al. (2014). It was also verified that these results are consistent with the estimated outcomes of empirical studies focusing on publicly listed companies in Japan. Needless to say, private firms have different contexts from public companies. For example, they are not assumed to have a separation between ownership and management, they are not affected by the laws and business practices associated with going public, and they do not have ongoing audits by external auditors or monitoring by external investors, among other things. These unique contexts of private companies might have led to the observation of a different tendency in cost stickiness compared to public companies.

However, in our analysis, the same tendencies as in public companies were observed. There are two main possibilities for this:

The first possibility is that the contextual differences between public and private companies do not affect the expression of either downward cost stickiness or anti-stickiness. However, since Hall (2016) reports differences in tendencies due to the distinction between public and private companies, it can be inferred that this first possibility is difficult to generalize. Furthermore, even among public companies, those with weak corporate governance (Chen et al., 2012) or weak internal controls (Kim et al., 2022) have been observed to exhibit cost stickiness for various reasons. While weaknesses in governance structures and internal controls could also be applicable to many private companies, they are unlikely to explain the anti-stickiness of costs that was observed in our analysis.

The second possibility is that private companies may have different factors causing cost stickiness or anti-stickiness compared to public companies. For example, the strong ownership due to the lack of separation between ownership and management, involvement of financial institutions, or the impact of resource availability could be influencing cost variation in private companies. Additionally, a characteristic of the sample used in this study is the large variation in the data. This suggests that the private companies included in the sample vary widely in size, from small to large. If so, it is conceivable that the patterns of both cost stickiness and anti-stickiness could be affected by company size. By delving deeper into this second possibility, it could be possible to further expand research in cost variation studies.

The contributions of this study are as follows. First, it has been clarified that the analysis models of Anderson et al. (2003) and Banker et al. (2014) are applicable also to private companies. We were able to confirm the robustness of the analysis models that serve as a platform for cost variation studies, using a sample that differs from those in previous research, namely, private companies. Second, to the best of our knowledge, this study is probably the first in the world to analyze large-scale financial panel data of private companies. It has been able to demonstrate the potential to expand existing cost variation studies, which have mostly been analyses using publicly disclosed data of listed companies.

Finally, the limitations of the research are as follows. First, the majority of the financial data used for analysis was unaudited, and when compared to publicly disclosed data of listed companies, there are certain constraints on the objectivity of the data and the uniformity of accounting treatments. Second, when conducting an analysis over multiple past years, there is a possibility that the sample size may become extremely small. This is due to the reduction in sample size resulting from taking logarithmic differences, as well as the fact that not many firms have submitted financial data over a period long enough to enable analysis over multiple years.

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References

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

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

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

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.

Cooper, R., and R. Kaplan. 1998. *The Design of Cost Management Systems: Text, Cases, and Readings*. Upper Saddle River, NJ: Prentice Hall.

Fukushima, M., K. Arai., and T. Matsuo. 2014. The Effect of the Discretionary Costs' Behavior on CVP Analysis. *Accounting Progress* 15: 26-37.

Hall, M. C. 2016. Does Ownership Structure Affect Labor Decisions?. *The Accounting Review* 91(6): 1671-1696.

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

Kama. I., and D. Weiss. 2013. Do earnings targets and managerial incentives affect sticky costs?. Journal of Accounting Research 51 (1): 201-224.

Kenji, Y., K. Arai, and M. Fukushima. 2017. *Selling, General, and Administrative Costs: Theory and Empirical Evidence*. Chuokeizai-Sha.

Kenji, Y. and T. Kajiwara. 2009. Cost Behavior of Selling, General and Administrative Costs and Cost of Good Sold: The Roles of Sales Forecasts. *The Journal of Cost Accounting Research* 33 (1): 64-75.

Kim, J-B., J.J. Lee, and J. C. Park. 2022. Internal Control Weakness and the Asymmetrical Behavior of Selling, General, and Administrative Costs. *Journal of Accounting, Auditing & Finance* 37(1): 259-292.

Ministry of Economy, Trade and Industry. 2015. *An Overview of Systems and Practices*

Concerning Corporate Information Disclosure and Shareholders' Meeting Processes in Japan and Other Countries. 7.

Noreen, E., and N. Soderstrom. 1997. The Accuracy of Proportional Cost Models: Evidence from Hospital Service Departments. *Review of Accounting Studies* 2: 89-114.

Tomohisa, K. 2016. Cost Anti-stickiness in Japanese Firms. *The Journal of Management Accounting, Japan* 24(1): 47-64.

Weiss, D. 2010. Cost behavior and analysts' earnings forecasts. The Accounting Review 85 (4): 1441-1471.

Xu, S., and K. Zheng. 2020. Tax Avoidance and Asymmetric Cost Behavior. *Journal of Accounting, Auditing & Finance* 35(4): 723-747.

Tables & Figures

Table 1. Analysis Results using the ABJ Model -Previous Research

Variables	coefficients	Pred. Sign	Yasukata et al. (2017)	Hirai & Shiiba (2006)	ABJ (2003)
$\Delta \ln SALES_{i,t}$	β_1	+	**.583** ***	**.635** **	**.546** **
			(.031)	(.008)	(.003)
$D_{i,t} \Delta \ln SALES_{i,t}$	β_2	−	**-.169** ***	**-.140** **	**-.191** **
			(.049)	(.002)	(.007)
AR^2			.433	.393	.366
Observations			19,392	20,539	63,958

*** <.001 ** <.01

Yasukata et al. (2017) p.84 figure 4.3

Table 2. Analysis Results using the BBCM Model -Previous Research

Variables	coefficients	Pred. Sign	Yasukata et al. (2017)	Kitada (2016)	BBCM (2014)
$I_{i,t-1} \Delta \ln SALES_{i,t}$	β_1^{PIncr}	+	**.676** ***	**.728** **	**.741** **
			(.019)	(.015)	(.003)
$I_{i,t-1} D_{i,t} \Delta \ln SALES_{i,t}$	β_2^{PIncr}	−	**-.423** ***	**-.423** **	**-.413** **
			(.030)	(.031)	(.004)
$D_{i,t-1} \Delta lnSALES_{i,t}$	β_1^{PDeccr}	+	**.428** ***	**.396** **	**.419** **
			(.023)	(.026)	(.004)
$D_{i,t-1} Di,t\Delta lnSALES_{i,t}$	β_2^{PDecr}	+	**.075** **	**.133** **	**.175** **
			(.028)	(.036)	(.006)
AR^2			.457	.458	.433
Observations			19,392	72,586	155,689

*** <.001 ** <.01

Yasukata et al. (2017) p.90 figure 4.7

Table 3 Sample distribution excluding financial institutions

	All samples		All samples excluding construction	
Industries	number of samples	%	number of samples	%
Agriculture	11,434	0.30%	11,434	0.71%
Forestry & Hunting	2,132	0.10%	2,132	0.13%
Fishing	714	0.00%	714	0.04%
Mining	4,428	0.10%	4,428	0.27%
Manufacture	417,597	12.20%	417,597	25.87%
Wholesale, Retail & Food and Beverage	629,121	18.40%	629,121	38.97%
Real Estate	107,686	3.10%	107,686	6.67%
Transportation & Communication	92,682	2.70%	92,682	5.74%
Electricity, Gas & Water	4,755	0.10%	4,755	0.29%
Service	343,651	10.00%	343,651	21.29%
Construction	1,807,299	52.80%	-	-
合計	3,421,499	100.00%	1,614,200	100.00%

Financial industries (i.e. Banking, Securities & Insurance) are excluded from all samples beforehand.

Table 4 Descriptive Statistics

(unit: JPY)		Mean	S.D.	25%	Median	75%
All samples	Sales	4,000,053	42,827,864	238,923	646,496	1,933,153
	SGA	599,149	6,329,754	57,808	136,295	350,837
Samples excluding construction and financial sectors	Sales	3,688,790	40,877,069	204,856	569,266	1,737,948
	SGA	558,446	6,205,918	51,736	123,648	322,214
Construction sector only	Sales	588,460	4,951,256	66,285	152,715	379,858
	SGA	76,485	453,013	16,911	31,790	64,200

Table 5 Estimation Results Using the ABJ Model

Panel A -Excluding construction and financial sectors

Variables	coefficients	Pred. Sign	Estimates	Yasukata et al. (2017)	Hirai & Shiiba (2006)	ABJ (2003)
$\Delta \ln SALES_{i,t}$	β_1	+	**.473** ***	**.583** ***	**.635** **	**.546** **
			(-.000)	(.031)	(.008)	(.003)
$D_{i,t} \Delta \ln SALES_{i,t}$	β_2	−	**-.139** ***	**-.169** ***	**-.140** **	**-.191** **
			(-.000)	(.049)	(.002)	(.007)
AR^2			.170	.433	.393	.366
Observations			1,614,200	19,392	20,539	63,958

*** <.001 ** <.01

Panel B -Construction industry only

Variables	coefficients	Pred. Sign	Estimates	Yasukata et al. (2017)	Hirai & Shiiba (2006)	ABJ (2003)
$\Delta \ln SALES_{i,t}$	β_1	+	**.301** ***	**.583** ***	**.635** **	**.546** **
			(-.000)	(.031)	(.008)	(.003)
$D_{i,t} \Delta \ln SALES_{i,t}$	β_2	−	**-.042** ***	**-.169** ***	**-.140** **	**-.191** **
			(.000)	(.049)	(.002)	(.007)
AR^2			.166	.433	.393	.366
Observations			1,807,299	19,392	20,539	63,958

*** <.001 ** <.01

Table 6 Estimation Results Using the BBCM Model

Panel A -Excluding construction and financial sectors

Variables	coefficients	Pred. Sign	Estimates	Yasukata et al. (2017)	Kitada (2016)	BBCM (2014)
$I_{i,t-1} \Delta \ln SALES_{i,t}$	β_1^{PIncr}	+	**.580** ***	**.676** ***	**.728** **	**.741** **
			(.000)	(.019)	(.015)	(.003)
$I_{i,t-1} D_{i,t} \Delta \ln SALES_{i,t}$	β_2^{PIncr}	−	**-.309** ***	**-.423** ***	**-.423** **	**-.413** **
			(-.000)	(.030)	(.031)	(.004)
$D_{i,t-1} \Delta lnSALES_{i,t}$	β_1^{PDeccr}	+	**.402** ***	**.428** ***	**.396** **	**.419** **
			(.000)	(.023)	(.026)	(.004)
$D_{i,t-1} Di,t \Delta lnSALES_{i,t}$	β_2^{PDecr}	+	**.001** ***	**.075** **	**.133** **	**.175** **
			(-.000)	(.028)	(.036)	(.006)
AR^2			.176	.457	.458	.433
Observations			1,614,200	19,392	72,586	155,689

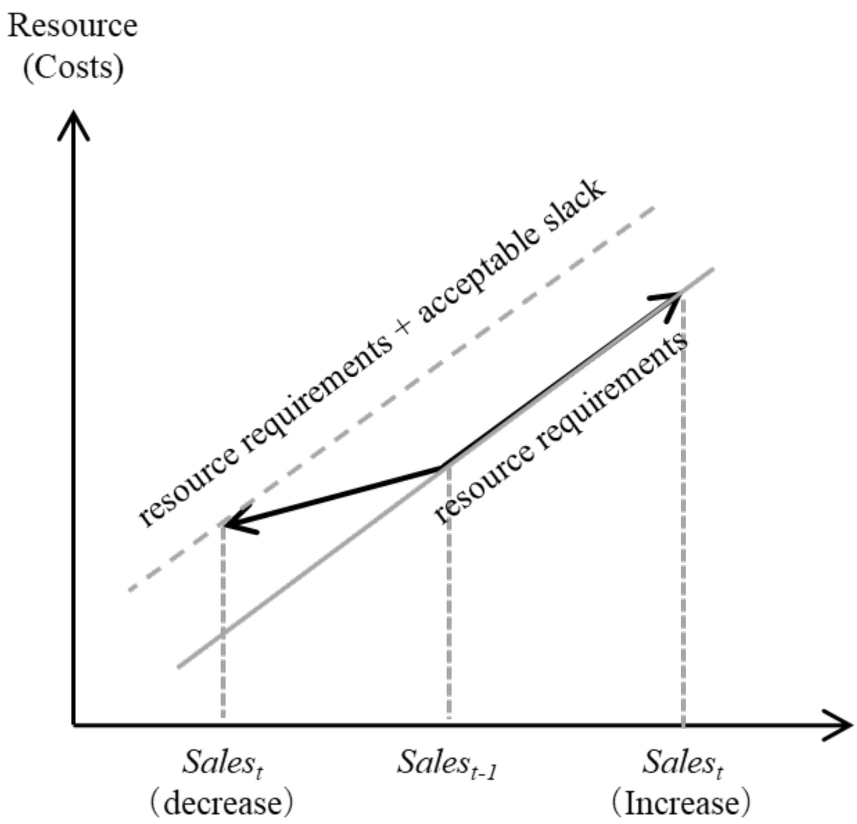
*** <.001 ** <.01

Panel B -Construction industry only

Variables	coefficients	Pred. Sign	Estimates	Yasukata et al. (2017)	Kitada (2016)	BBCM (2014)
$I_{i,t-1} \Delta \ln SALES_{i,t}$	β_1^{PIncr}	+	**.438** ***	**.676** ***	**.728** **	**.741** **
			(-.000)	(.019)	(.015)	(.003)
$I_{i,t-1} D_{i,t} \Delta \ln SALES_{i,t}$	β_2^{PIncr}	−	**-.250** ***	**-.423** ***	**-.423** **	**-.413** **
			(.000)	(.030)	(.031)	(.004)
$D_{i,t-1} \Delta lnSALES_{i,t}$	β_1^{PDeccr}	+	**.236** ***	**.428** ***	**.396** **	**.419** **
			(-.000)	(.023)	(.026)	(.004)
$D_{i,t-1} Di,t \Delta lnSALES_{i,t}$	β_2^{PDecr}	+	**.100** ***	**.075** **	**.133** **	**.175** **
			(.000)	(.028)	(.036)	(.006)
AR^2			.180	.457	.458	.433
Observations			1,807,299	19,392	72,586	155,689

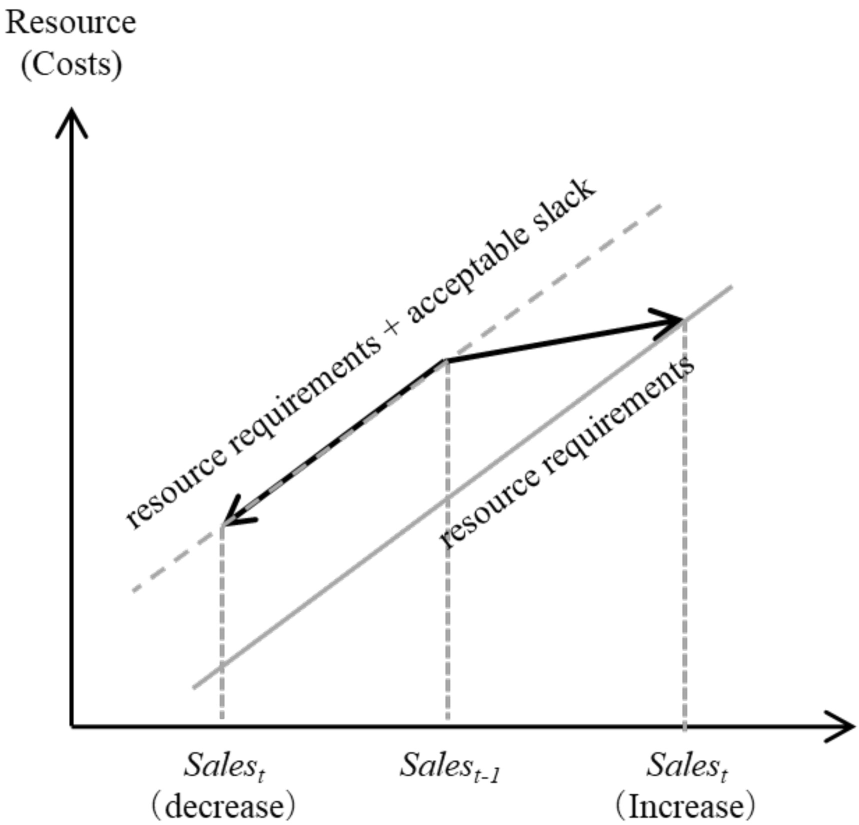
*** <.001 ** <.01

Figure 1. Cost Stickiness Conditioned on Prior Period Revenue Increase



Banker et al. (2014) p.225 figure 1 Panel A

Figure 2. Cost Stickiness Conditioned on Prior Period Revenue Decrease



Banker et al. (2014) p.226 figure1 Panel B