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Cost Manipulation in Japanese Defense Procurement Contracts: Forcusing on Opportunistic Cost-Shifting

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Abstract

This study identifies serious problems in Japanese defense procurement from the management accounting perspective, especially regarding cost overcharging. There is an inherent conflict of interest between the Japanese Ministry of Defense (MoD) and its contract partner firms. While the MoD tries to procure as effectively and efficiently as possible, contracting firms attempt to maximize profit from transactions with the defense department. Furthermore, most items in defense contracts have no market price. Such items are priced by multiplying the profit rate by the cost. This pricing structure incentivizes companies to execute contracts inefficiently, that is, firms may have an incentive to overcharge by manipulating costs. This is particularly significant due to the contract provision that requires the return of excess profit. Therefore, we aim to detect such overcharging by analyzing data from individual contracts containing this provision. We use a profit distribution approach to verify whether firms manipulate costs, and a cost manipulation and logistic regression approach to test our hypothesis about the factors that promote cost manipulation. Our result strongly suggests that many firms inflate costs to maximize profits, and partly support our hypotheses.

Keywords

Defense Procurement, Earnings Management, Cost manipulation, Overcharging

1. Introduction

Public sectors entities make various contracts to fulfill their duties, called public contracts. Among them, a specific type of contract made to purchase goods and services are called government procurement contracts, paid for through taxes. Because the effective and efficient use of taxes is an important duty of the public sector, it must execute government procurement effectively and efficiently. Furthermore, the public sector must maintain accountability to taxpayers.

Among the various types of government procurement, defense procurement is the most important to monitor because it represents a large portion of government budgets. It is also significant in Japan, where the budget for defense procurement has consistently been about 2 trillion yen in recent years (Japan Ministry of Defense Equipment Procurement and Construction Office, 2014). Furthermore, reflecting Japan's complex defense environment, the Japanese defense budget tends to increase each year. Thus, defense procurement contracts receive great scrutiny in Japan. Therefore, we focus primarily on defense contracts in this study.

From management accounting perspective, we can identify serious problems with defense contracts. First, there is an inherent conflict of interest between the government and its contract partner companies. While the government tries to execute procurement as effectively and efficiently as possible, contracting firms attempt to maximize profit from transactions with the defense department.

Second, most items in defense contracts have no market price. Therefore, such items must be priced based on the accumulation of appropriate costs plus profits to the contract firms, calculated by multiplying the profit rate by the cost. Under this profit structure, if contracting firms produce defense items at lower cost, they obtain lower profits. This pricing structure essentially incentivizes companies to manipulate costs (i.e., overcharging) and execute contracts inefficiently.

Although some previous studies indicate the presence of overcharging, no previous research discusses this theme using directly related empirical data. A contract provision specific to Japanese defense contracts requires the return of excess profit, and thus provides a good example to verify the presence of overcharging. This provision stipulates that if actual prices (actual costs plus profits) are lower than the initial prices determined in the contracts, firms must return the excess profits (initial prices minus actual prices). Thus, firms may try to maintain high costs, even if they can produce the contract items at a lower cost (i.e., firms may have a strong incentive to overcharge). The Acquisition, Technology, and Logistics Agency (ATLA) in Japan provided us with Defense Department procurement contract data for 2009–2014, which we analyze to verify the presence of overcharging directly.

In addition to investigating the presence of overcharging with a focus on Japanese defense contract data, we also identify the factors that promote cost manipulation. For this purpose, we use the CM ratio and logistic regression approaches to test several hypotheses about cost manipulation factors.

The remainder of this paper proceeds as follows. The second section introduces the contract provision requiring the return of excess profit. The third section reviews the previous literature on the subject. The fourth section describes the research methodology. The fifth section presents the sample selection and descriptive statistics. The sixth section reports the analysis and results. Finally, the last section discusses the findings, contributions, limitations, and suggestions for future research.

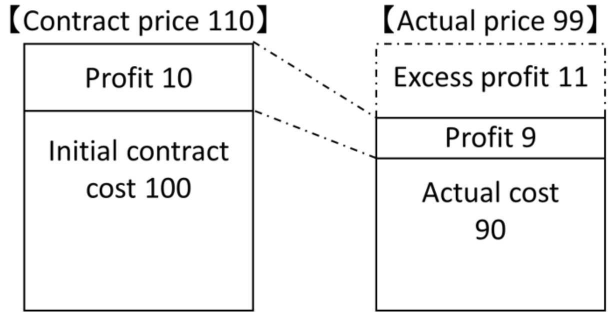
2. Contract Provisions Requiring Firms to Return Excess Profit

In this study, we focus on the contract provision requiring the return of excess profit, which the Japanese government adopts when there is high uncertainty about future costs in defense procurement contracts. This provision is used in fixed-price contracts[1] and stipulates that a contract firm's excess profit must be returned to Japan Ministry of Defense (MoD) when it generates excess profits (Japan MoD, 2010; Japan MoD Equipment Procurement and Construction Office, 2014). In this type of contract, the Japan MoD audits the firm's actual costs. In the course of this audit, if the actual costs are less than the initial costs based on the initial contract, then the firm must return a portion of the contract payment, representing excess profit. Figure 1 illustrates this contract structure.

[1] IFRS (International Financial Reporting Standards) define a fixed-price contract as "a construction contract in which the contractor agrees to a fixed contract price, or a fixed rate per unit of output, which in some cases is subject to cost escalation clauses" (IAS 11).

Based on this definition and the features of defense contracts, we define a fixed-price contract as one in which the contracted firm agrees to a fixed contract price, which in some cases is subject to cost revisiting procedures.

Figure 1: **Structure of the contract provision requiring the return of excess profit**



Note: In this example, we assume that both profit rates are 10%.

Source: Japan MoD (2010)

The problem with this contract structure is that it gives no incentive to the contracted firms to work toward cost reduction and may, in fact, inhibit cost reduction. In this type of contract, if firms achieve a cost reduction, they must return excess profit. Furthermore, as Figure 1 shows, cost reduction reduces the firm's profit. In this contractual arrangement, we presume that contract firms attempt to maximize their profit by maintaining the initial cost determined at the time the contract was executed (i.e., contract firms have an incentive to overcharge).

The Board of Audit of Japan (2012) noted several incidents of this type of overcharging in which firms manipulated their product cost, particularly manufacturing overhead, to gain a larger profit than was actually earned. We believe that these cases provide evidence of a negative performance incentive.

3. Literature Review and Hypothesis Development

3.1. Literature Review

Although numerous studies address the relationships and controls between buyers and suppliers, the number of studies of this type of overcharging is limited. In this section, we provide an overview of the literature.

Under the condition of information asymmetry, firms have suspicions about the opportunistic behavior of their counterparts. Accordingly, many firms develop various interfirm control mechanisms (Anderson & Dekker 2005; Dekker & Abeele, 2010) and governance designs (Dekker, 2008).

Some studies argue for cost manipulations in defense contracts as an opportunistic behavior. Rogerson (1992) utilizes a mathematical model to describe overhead allocation in U.S. defense procurement, concluding that defense contract firms have an incentive to shift the cost of non-defense items to defense items. Thomas and Tung (1992) note a similar cost-shifting incentive under a cost compensation contract using quantitative evidence and conclude that defense contract firms could reduce the cost of non-defense items by overfunding pension plans when employees work on defense contracts and withdrawing excess pension assets when employees work on non-defense business. Lichtenberg (1992) demonstrates the relative profitability of defense and non-defense contracts using an empirical analysis of 9,300 annual segment data points from 1983–1989. His results show that the return on assets (ROA) of defense segment contracts as a whole is 68%–82% higher than the ROA of non-defense segment contracts.

In contrast, McGowan and Vendrzyk (2002) conclude that there is no evidence that defense contract firms manipulate costs. To compare ROA, they divide all segments into three types: defense segments, non-defense segments, and segments that produce both items (i.e., mixed segments). Using data from 1984–89 and 1994–1998, they find that although there are significant differences between the ROA of defense segments and the other segments, and inconsistent with the hypothesis, defense segments have the highest. They explain that firms gain the high profitability in defense segments from factors beyond the accounting context.

In Japan, Morimitsu (2012) suggests that the current defense contract pricing structure yields little incentive for firms to reduce costs. However, he provides no empirical data collection, so his suggestion is limited. Morimitsu (2013) argues that cost transparency is the responsibility of the Cost Audit Agency in Japanese defense procurement. He demonstrates that the primary function of the Cost Audit Agency is the false check, so verification of cost manipulation is limited. Ohta (2014) argues an appropriate institutional design of cost auditing and a competitive bidding process for Japanese defense procurement contracts. Although he suggests the existence of overcharging, he uses a mathematical model analysis, and therefore also has no empirical data. This literature review illustrates that there is no consensus about cost manipulation in defense procurement contracts in Japan.

While previous studies make use of *segment* data, few prior studies attempt to assess overcharging using empirical *contract* data. To analyze overcharging in Japanese defense contracts, we focus attention on the contract itself and, in particular, on the provision requiring the return of excess profit. We hypothesize that this contract provision strongly promotes overcharging and therefore believe that this contract provision is an appropriate focus for examining cost manipulation.

We can precisely verify whether contract firms manipulate costs using contract data from Japanese defense contracts that require the return of excess profit. This data allows us to examine whether the actual costs accrued during contract fulfillment exceed the anticipated contract costs. In addition, the distribution of the actual/contract ratio will indicate the seriousness of the cost manipulation problem.

3.2. Hypothesis Development

Prior studies suggest some common views and indications. Rogerson (1992), Thomas and Tung (1992), and Lichtenberg (1992) assert the existence of opportunistic cost-padding, mainly focusing on overhead allocation (i.e., a cost-shifting hypothesis). Their assertions support the existence of cost manipulation, and we believe that cost-shifting is a method of cost manipulation.

Although McGowan and Vendrzyk (2002) disagree, we argue that they overlook cost-shifting between defense businesses. In practice, cost-shifting between defense contracts has occurred in Japan (Board of Audit of Japan, 2012). Thus, we predict that cost-shifting behaviors exist in defense contract firms as a cost manipulation method.

Morimitsu (2012, 2013) and Ohta (2014) suggest that current defense contract structures provide contract firms with a disincentive to reduce costs. Although they do not identify the manipulation method specifically, they indicate the existence of cost manipulation implicitly. Therefore, we propose that defense contract firms manipulate their costs.

H1: Defense contract firms manipulate their costs to maximize their own gain.

In addition, we believe there are several cost manipulation methods and factors with positive effects on the probability of cost manipulation.

3.2.1. Contract Scale

Based on the cost-shifting hypothesis, the contract value is a simple but important factor. The higher the value of the contract is, the greater the manufacturing overhead tends to become. Consequently, a higher manufacturing overhead makes it easier for firms to shift costs. Furthermore, with a larger contract value, the price will become larger even with the same ratio. Thus, firms have a stronger incentive to manipulate costs in larger contracts than in smaller ones. Accordingly, we predict that a higher contract value has a positive effect on cost manipulation.

H2: As the contract value increases, the probability of cost manipulation increases.

3.2.2 Defense Contract Firms

Rogerson (1992) concludes that defense contract firms purposely overuse direct labor to shift more overhead costs to defense contracts. Thus, he indicates that defense contract firms tend to be labor-intensive (i.e., the more firms employ labor in the defense business, the higher the opportunity to manipulate costs is). Thus, we propose the same prediction under the Japanese defense contract structure.

H3a: The ratio of the firm's employees to total assets at the end of the fiscal year (i.e., labor-intensity) has a positive effect on the probability of cost manipulation.

Based on this hypothesis, the number of contracts may also be an important factor. In simple terms, as the number of a firm's defense contracts in the fiscal year increases, manufacturing overhead increases. Thus, the scope for cost manipulation increases.

H3b: As the number of contracts increase, the probability of cost manipulation increases.

Additionally, we predict that a firm's total sales under defense contracts has a positive effect because higher sales will tend to increase a firm's manufacturing overhead, which makes it easier for firms to shift costs from other defense contracts. Consequently, the higher defense contract sales become, the greater the opportunities for cost manipulation become.

H3c: As a firm's total sales under defense contracts increases, the probability that it will manipulate costs increases.

4. Research Design

To test our hypotheses, we use three approaches: (1) profit distribution, (2) cost manipulation ratio, and (3) logistic regression.

4.1. Profit Distribution Approach

To verify cost manipulation, we apply the profit distribution approach [2] (Burgstahler & Chuk, 2015; Burgstahler & Dichev, 1997; Degeorge et al., 1999) to analyze the data. Prior studies used the profit distribution approach to detect earnings management that exceeds thresholds.

We anticipate that if firms manipulate costs to maximize profit, the frequency of the ratio of actual prices to contract prices on a histogram will be extraordinarily weighted to the right of 100%. Because firms know the actual costs, if they are below the contract costs, they may try to manipulate the actual costs to obtain the full profit. If this occurs, then the frequency of data points to the left of 100% on a histogram should decrease and the frequency to the right of 100% should increase. Thus, if firms manipulate costs, the histogram of the ratios will show discontinuation around 100%. By using significance tests of standardized differences in the interval (Burgstahler & Dichev, 1997), we can confirm whether this discontinuation is statistically significant.

In creating the histogram, the width of the bin determines the shape of the distribution and the result of the statistical tests. To avoid arbitrarily deciding the width, we use Degeorge et al.'s (1999) proposed method, in which the width of the bin should be positively related to data variability and negatively related to sample size. They recommend using a bin width of 2 (IQR) $n^{-1/3}$, where IQR is the interquartile range of the interest variable and n is the sample size.

4.2. Cost Manipulation Ratio Approach

To test for differences in cost manipulation between smaller and larger contracts (H2), we report the cost manipulation ratio (CM ratios). The CM ratio is the ratio of the number of observations in the interval to the immediate right of (and including) 100% to the numbers to the immediate left of 100%. Some studies report similar ratios

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[2] Some researchers criticize the profit distribution approach (Durtschi & Easton 2005; Durtschi & Easton 2009, hereafter DE). DE assert that scaling and sample selection explain discontinuities. However, in a recent study, Burgstahler and Chuk (2015) assert that DE's studies provide no evidence that this is the case. In addition, they show the presence of discontinuities using the same data that DE use in their studies. Based on Burgstahler and Chuk (2015), we use a profit distribution approach to show evidence of cost manipulation.

as evidence of earnings management (Brown & Caylor, 2005; Dechow et al., 2003; Shuto, 2009). We split our sample into larger and smaller contracts based on the median of the initial contract prices and compare their CM ratios. Per H2, firms with large contracts can manipulate defense contract costs easier than firms with smaller contracts can. Therefore, the CM ratio based on larger contracts is larger than that of smaller contracts is.

4.3. Logistic Regression Approach

To test H2 and H3, we estimate the following logistic regression model[3]:

$$OVER100\% = \alpha + \beta_1 AMMOUNT + \beta_2 LINTENS + \beta_3 CNUMBER + \beta_4 DSALES + year\ dummy + \varepsilon$$

where:

$OVER100\% =$ indicator variable that takes a value of one if the firm scaled the ratio of the actual price to contract price in the interval between 100% (inclusive) and 102.8% (exclusive), and 0 otherwise;
$AMMOUNT =$ natural logarithm of the initial contract value;
$LINTENS =$ ratio of the firm's employees to total assets at the end of the fiscal year;
$CNUMBER =$ the number of the firm's defense contracts at the end of the fiscal year;
$DSALES =$ ratio of the firm's sales from defense contracts to total sales;
$year\ dummy =$ indicator variable for the fiscal year.

The larger the contract cost is, the more the opportunities for cost manipulation increase and the stronger the motivation to manipulate costs ($AMMOUNT$). We also expect that firms with labor-intensive production processes can manipulate costs more easily than capital-intensive firms ($LINTENS$) can. Firms with more defense contracts can shift actual costs among contracts more easily than other firms ($CNUMBER$) can. Finally, our hypotheses predict that the larger the firms' total contract values are, the more the opportunities for cost manipulation will increase ($DSALES$).

Following McGowan and Vendrzyk (2002), we introduce a year effect ($year\ dummy$) dummy in our model to control for the effect of annual changes in the prices of raw materials and other environmental effects.

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[3] We considered a multilevel logistic regression because our contract data is nested in firms. However, the interclass correlation coefficient is close to 0. Thus, we do not use this method.

5. Sample Selection and Descriptive Statistics

5.1. Sample Selection

The ATLA provided us with Defense Department procurement contract data for 2009–2014. This data consists of contact year, false names of firms, contract prices, actual prices, and contracts terms. These data do not include cost data, but do include price data (costs plus profits). We cannot compare actual costs to contract costs, though we can use this data to calculate the ratio of actual prices to contract prices to verify the existence of cost manipulation in defense procurement contracts. The ATLA recently showed that some firms paid penalties for disguising costs.[4] The ATLA data eliminates observations of firms that engaged in disguising costs. The sample size of the ATLA dataset is 361 contracts (n = 361). In addition to this data, ATLA provides processed financial data and contract related data. Both types of data are connected to contract data so we cannot identify the real names of the contract firms.

5.2. Descriptive Statistics

Table 1 reports the descriptive statistics of the ATLA contract data. The mean of the actual/contract ratio is 110.1% and the median is 104.8%, which indicate that the average actual contract costs are larger than the projected contract costs.

Table 1 Descriptive statistics: ATLA contract data

variables	*n*	mean	std. dev.	median	mini	max
contract price (thousand yen)	361	1,715,339	4,238,073	572,000	1,156	43,837,600
actual price (thousand yen)	361	1,807,455	4,354,023	649,989	858	46,917,320
actual/contract ratio (%)	361	110.1	22.38	104.8	45.8	286.8

Table 2 reports the descriptive statistics and correlations for the variables used in the logistic regression. Panel B shows a high correlation between *LINTENS* and *DSALES*. When we introduce both variables in the logistic equation, the variance inflation factors (VIF) of these variables are higher than 5.0. Thus, we introduce these two variables in the logistic regression models separately.

[4] We define cost disguise as illegally manipulating costs (e.g., inflating the man-hours spent on a project).

Table 2 Descriptive statistics and correlations among the variables in the logistic regression

Panel A: Descriptive statistics for the variables used in the logistic regression approach

variables	*n*	mean	std. dev.	median	mini	max
OVER100%	96	0.72	0.45	1.00	0.00	1.00
AMMOUNT	96	20.72	1.50	20.73	15.85	24.25
LINTENS	96	0.03	0.01	0.02	0.01	0.06
CNUMBER	96	184.52	79.80	214.00	1.00	301.00
DSALES	96	11.52	1.43	12.21	5.30	12.67

Panel B: Correlations ofr the variables used in the logistic regression approach

	OVER100%	*AMMOUNT*	*LINTENS*	*CNUMBER*	*DSALES*
OVER100%	1.00				
AMMOUNT	0.07	1.00			
LINTENS	−0.11	−0.13	1.00		
CNUMBER	−0.06	0.06	−0.27	1.00	
DSALES	0.09	0.09	−0.72	0.71	1.00

6. Results

6.1. Profit Distribution

Figure 2 shows the histogram of the ratios of actual costs to projected contract costs, revealing a discontinuation and skew to the right of 100%. The frequency of the ratios to the right of 100% is very high, the frequency to the left is relatively low, and the frequency of values in the 2nd interval to the left of 100% shows a dramatic decrease. In addition, if we assume a distribution peak to the right of 100%, the frequency of values in the right half of the distribution is relatively higher than that in the left half of the distribution. These results indicate that a certain amount of cost manipulation occurred.

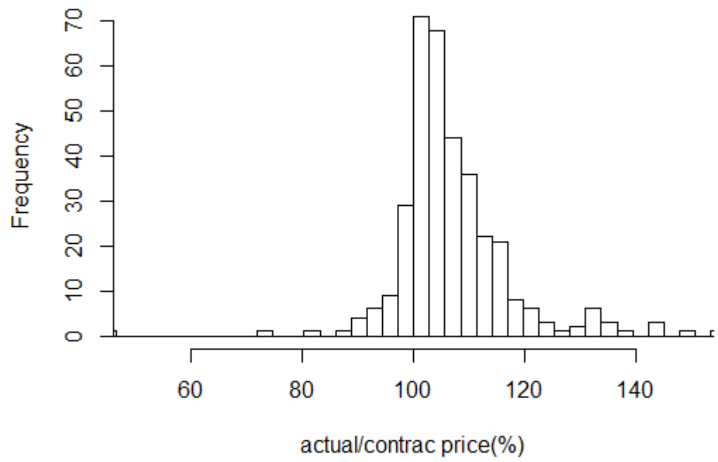

Figure 2:　S Histogram of actual/contract price ratio

Table3 shows the results of the standardized differences tests. In the interval to the left[5] of 100%, the standardized difference is significant (p < 0.05). Thus, the frequency of observations in the intervals to the left of 100% is extraordinarily low. These results again suggest that firms manipulated costs in their contracts.

Table 3 Standardized differences test results

standardized differences around 100%		standardized differences in other intervals			
in left of 100%	in right of 100%	mean	median	mini	max
−1.69 *	2.60 **	−0.30	−0.54	−2.08	1.74

* p < 0.05 (2-sided), ** p < 0.01(2-sided)

6.2. Cost Manipulation Ratio

To test H2, we calculate the CM ratios for smaller and larger contracts according to the median value. Figure 3 shows the histograms of actual/contract ratios for smaller

[5] According to Shuto (2010, p. 89), when the interval to the right of 100% is the modal class of the histogram, we cannot properly estimate the expected number of observations in the interval. In this case, Shuto (2010) recommends that we interpret the result of the standardized difference test based on only the left side of the result.

and larger contracts in Panels A and B, respectively. Panel A resembles the histogram of the full sample. On the other hand, the peak in Panel B is not between 100% and 102.8%, but between 102.8% and 105.6%.

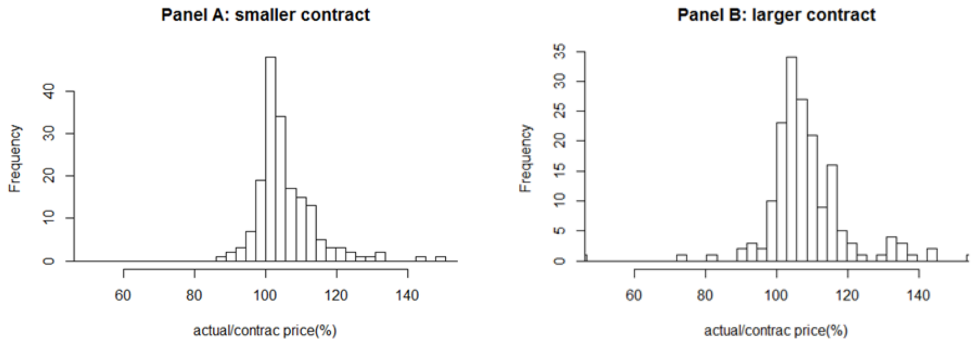

Figure 3: Comparison histograms of actual/contract price ratios

Table 4 shows the CM ratios of Panel A and Panel B and the result of the χ^2 test. H2 predicted that Panel B would have a larger CM ratio than Panel A. However, the CM ratio of Panel A is not so different from that of Panel B (2.53 vs. 2.30). Thus, we fail to disprove our null hypothesis (χ^2 = 0.00, df = 1, p = 1).

Table 4 The CM ratio and results of the χ^2 test

	CM ratio	*χ^2 -value*[a]	
Figure 3. Panel A	2.53 (48/19)		
Figure 3. Panel B	2.30 (23/10)	0.00	(Figure 3. Panel A vs. Figure 3. Panel B)

Notes:

[a]The chis-square statistics for the CM ratio differencese are caliculated using the 2 by 2 table.

6.3. Logistic Regression

Table 5 Logistic model of cost manipulation for firms with small earnings changes

$$OVER100\% = \alpha + \beta_1 AMMOUNT + \beta_2 LINTENS + \beta_3 CNUMBER + \beta_4 DSALES + year\ dummy + \varepsilon$$

Variable		Coeff.	Std. Err.	*z*	*p*
Panel A: LINTENS					
Constant		16.39	1384.00	0.01	0.99
AMMOUNT		0.06	0.16	0.39	0.70
LINTENS		−26.08	20.88	−1.25	0.21
CNUMBER		0.00	0.00	−1.03	0.30
DSALES					
Log-likelihood	−53.47				
McFadem R^2	0.06				
N	96				
Panel B: DSALES					
Constant		11.27	1374.00	0.01	0.99
AMMOUNT		0.06	0.16	0.40	0.69
LINTENS					
CNUMBER		−0.01	0.00	−1.83	0.07
DSALES		0.45	0.24	1.87	0.06
Log-likelihood	−52.49				
McFadem R^2	0.08				
N	96				

Note: The estimations sample includes the contracts data with only the absolute value of actual/contract ratio between 97.19 to 102.81.

OVER100%	=	indicator variable that takes the value of one if the firm has scaled the ratio of actual price to contract price in the interval between 100% (inclusive) and 102.8% (exclusive), and 0 otherwise;
AMMOUNT	=	natural logarithm of the initial contract amount;
LINTENS	=	ratio of the firm's employees to total asset at the end of the fiscal year;
CNUMBER	=	the number of defense contracts of the firm at the fiscal year;
DSALES	=	ratio of the firm's sales amounts of defense contract to
year dummy	=	indicator variable for the fiscal year.

Indicator variables for year (*year dummy*) are inculuded but not reported.

Table 5 shows the results of the logistic regressions. Due to the high correlation between *LINTENS* and *DSALES*, we conduct two logistic regressions (Panel A with *LINTENS*; Panel B with *DSALES*). The results in Panel A do not support our hypothesis. On the other hand, Panel B indicates that *DSALES* has a significant positive effect on *OVER100%*, and is consistent with H3c. *CNUMBER* also has a significant relationship with *OVER100%*, but its sign is contrary to our hypothesis (H3b).

Overall, the profit distribution results strongly suggest that firms manipulated contract costs to obtain full profit in contracts that require that they return excess profit. However, the results of our CM ratio test do not support our hypothesis about the effect of contract values on cost manipulation (H2). Our logistic regression approach supports one of our hypotheses, that firms with large total contract values have more opportunities for cost manipulation (H3c), but does not support the other hypotheses (H2, H3a, and H3b).

7. Discussion and Conclusion

In this study, we focused on defense procurement contracts that require firms to return excess profit using a profit distribution approach to verify whether firms manipulate costs, and CM ratio and logistic regression approaches to test our hypothesis about the factors that contribute to cost manipulation. Previous research results on the subject are mixed. Some note that firms manipulate costs by shifting overhead costs from commercial projects to defense contracts (Lichtenberg, 1992; Rogerson, 1992), while others suggest that the high profitability in defense segments is not due to cost manipulation (McGowan & Vendryzk, 2002). However, prior studies rely on firms' profitability rather than using specific contract data. We argue that the mixed results are due to both insufficient data and poor research methods. In this study, we use contract data to obtain more accurate results, and our results strongly suggest that many firms inflate costs to maximize profit.

Some previous studies suggest that several factors encourage defense contractors to manipulate actual costs (Lichtenberg, 1992; Rogerson, 1992; Thomas & Tung, 1992). Firms with high-value contracts have incentives and opportunities to manipulate their actual costs, such as by manipulating man-hours. Thus, firms with labor-intensive production processes may easily manipulate their actual costs, as might firms with many contracts with the Japanese MoD and high total contract values. The CM cost and logistic regression approaches partially support our hypotheses.

Our result suggests that the larger the total value of a defense contract is, the greater the opportunities to control actual costs are. Controlling single contract values and contract numbers means that firms with larger average defense contract values can shift costs from other defense contracts or commercial products to contracts requiring that the firm return excess profits. On the other hand, our result suggests that firms with many contracts cannot shift their costs to such contracts. Firms with many contracts may face difficulty attaining an over 100% actual/contract ratio in each contract by shifting costs because as the number of contracts increases, the complexities of the interdependencies of cost allocation among contracts increases. Furthermore, the costs that firms can shift to defense contracts are not infinite. Therefore, we predicted that firms can shift limited costs, as those firms having many contracts cannot shift enough costs to all contracts.

The primary contribution of this study to the literature is on cost manipulation in the defense segment. Using a profit distribution approach, our study yields highly accurate analysis results about firms' costs manipulation. In addition, our logistic regression results could partly support the hypotheses about the factors that encourage firms to manipulate those costs. These results give new insights and strong evidence for the existence of cost manipulation in defense contracts and its exacerbating factors.

Our research has important implications for policymakers. Our results suggest that contract provisions requiring that firms return excess profit will encourage them to manipulate costs. Thus, it is important for policymakers to consider the side effects of this kind of contract provision and a revision of the incentive mechanism of the contract system.

Our study has some limitations. Our results only partly support our hypotheses, in part due to data limitations. We use firms' consolidated financial information; however, the Board of Audit of Japan reports some cases in which divisional managers disguised their actual costs (Board of Audit of Japan, 2012). If we can specify a division of a firm that makes contracts with Japan's MoD, we can use segment financial information (e.g., the labor intensiveness of the division, total divisional sales, or number of defense contracts).

Notwithstanding this limitation, our research is the first to use defense procurement contract data and provides strong evidence for the existence of cost manipulation. Future research using contracting firms' segment data will advance our understanding of cost manipulation in defense contracts.

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