

Managers' Discretionary Behavior in Segment Reporting : A Study Based on the Internal Data of Japanese Listed Companies

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Abstract

This paper verifies managers' discretionary behavior in segment reporting. Pseudo-segments were produced based on the internal data of companies and compared with their externally reported segments. As a result, it was found that before adopting the management approach (MA), the managers of Japanese companies tends to refrain from disclosing the results of non-competitive businesses that have a high present value or unprofitable businesses that have a low present value. This finding is consistent with the proprietary cost (PC) hypothesis and the agency cost (AC) hypothesis. Through the study of the situation after the adoption of the MA, it was confirmed that the ratio reporting pseudo-segments increased significantly. However, not all businesses are reported equally, and the managers still tends to refrain from disclosing the results of business segments whose PC or AC is large. Little evidence was found for indicating the restraint on the above-mentioned discretionary behavior. After the introduction of MA, I rather found some evidence implying the augmentation of this tendency. By using the internal and publicly disclosed data of Japanese listed companies, this study contributed by giving initial evidence of managers' discretionary behavior in the segmentation before the adoption of the MA and the effects of applying the MA on the behavior.

Keywords

Segment reporting, Discretionary Disclosure, Management Approach, Proprietary cost, Agency cost, Individual data

(1) Introduction

This paper empirically elucidates, based on the internal data of publicly listed

companies in Japan, the following two points: the motivation and method of segmentation by managers, and the effect of adopting the

management approach (MA) on managers' behavior towards the segmentation¹.

In the United States, where segment reporting was institutionalized ahead of any other countries, the segmentation was first virtually left to managers' full discretion under the standard called an industry approach (hereinafter referred to as the "IA") (FASB, 1976). There was a conspicuous trend suggesting that, under the IA, managers aggregated "segments for internal reporting purposes" (hereinafter referred to as "internal segments") and defined "segments for external reporting purposes" (hereinafter referred to as "external segments") for their own convenience. In the wake of criticism from the users of financial statements, the MA was adopted in the second half of the 1990s with the aim of decreasing room for managers' discretion (FASB, 1997). Following the United States, the MA was introduced to the International Financial Reporting Standards (IFRS) in 2010 and the Japanese generally accepted accounting principles (J-GAAP) in 2011 (IASB, 2006; ASBJ, 2008). Before the adoption of the MA, J-GAAP had employed the IA similar to that used in the United States.

However, regarding whether or not managers of Japanese companies actually defined external segments for their convenience, such anecdotes were told by practitioners but have not been verified in an academically reliable methodology. The effect of the introduction of

the MA on managers' behavior towards segmentation has not been examined either. As segment reporting is essential for financial statement users, this issue is worth verifying on an academic level.

Considering these issues, this study examines whether or not the managers of Japanese companies aggregates internal segments in accordance with specific motivation and defines external segments² for their own convenience. However, internal segments are confidential information, and therefore, it is difficult to verify using only publicly disclosed data. In this research, I have directly observed the type of business in which each company has engaged and established pseudo-segments based on internal data, and then compared them with external segments. This study has made contributions by exhibiting the very first evidence regarding managers' discretionary behavior towards segmentation before adoption of the MA, and the effect and issues of the MA on their behavior, with the use of both internal and publicly available data of Japanese listed companies.

This research is composed of three parts. Firstly, I develop hypotheses for verification by overviewing the previous work on managers' discretionary behavior towards segmentation. Secondly, I describe the research design and the verification results. Finally, I summarize findings and mention limitations and future issues to address.

¹ In this paper, segment reporting is used as a synonym of segment information disclosure. Furthermore, the segment information herein refers only to the "information reported for industry segments" before adoption of the MA and the "segment information" after the adoption.

² In this paper, while segments for internal reporting purposes refer to the segment used within a company for the purpose of internal management, segments for external reporting purposes mean the segment disclosed in the notes in financial statements.

(2) Previous Research and Hypotheses

1. Prior Research

In this section, I look back at prior studies related to this research. If segments were defined as they were, high-quality information was disclosed, and then the costs exceeded benefits³, managers should have the motivation to lower information quality, that is, the disclosure costs through various efforts such as aggregating internal segments, within their discretion approved by accounting standards. What has been conventionally pointed out as the aforementioned costs is proprietary costs (PC), which is the cost incurred due to leakage of confidential information to competitors through segment reporting, creating competitive disadvantages.

Hayes and Lundholm (1996) conducted an analytical research, through which they have theoretically unraveled the PC generated due to segment reporting. Their research with a company running two businesses set as a model has, in an analytical manner, led to an economic consequence that, when there is an enormous gap in the profit margin between two of the company's businesses, segment reporting conveys information that supports the competitive strategy of competitors, that is, which of the two businesses has a larger future cash flow, competitors enter into

the company's product market, and finally the corporate value is impaired.

The research by Harris (1998) is the first to have demonstrated managers' discretionary behavior regarding segmentation. Taking the aforementioned theoretical analysis into account, she made an assumption that managers had the motivation of aggregating the business with a higher profit margin whose product market was more monopolistic or less competitive, and carried out examination using the following model with U.S. companies that provided segment reporting based on an IA (1987-1991):

$$\begin{aligned} Match_{ij} = & \alpha + \beta_1(SpeedAdj_j) \\ & + \beta_2(Con4_j \text{ or } IndHi_j) \\ & + \sum Controls + \varepsilon_{ij} \end{aligned} \quad (1)$$

The objective variable $Match_{ij}$ is a binary variable⁴, which becomes 1 if business category j in which firm i engages is reported by segment or 0 if the category is not reported. The variables of interest are $SpeedAdj_j$, $Con4_j$, and $IndHi_j$ ("the rate of adjustment of excess profits," "4-company concentration ratio," and "Herfindahl-Hirschman Index by business category" for business category j), which indicate that the greater these values are, the less intense the competition is in the relevant business category. As a result of logit estimation of Equation (1), the coefficients of all of the variables of interest were significantly

³ The benefits expected through high-quality segment reporting include effects on financing, such as a reduction in the cost of capital.

⁴ In Compustat's database at that time, while North American Standard Industry Codes (SIC) were

contained for the business categories in which companies engaged, a maximum of two SICs were given to each segment. $Match_{ij}$ was identified as 1 when the former was included in the latter on the 3-digit basis, and 0 when not included.

negative, suggesting that the managers did not report segments for less competitive businesses.

The finding by Harris (1998) has been further verified in ensuing studies by other researchers, as a PC hypothesis that “managers hold the motivation to prevent the performance of their companies’ less competitive businesses with greater excess profits from being disclosed to other enterprises through segment reporting.” Harris (1998) calculated the variable of the market concentration ratio using only the data of listed companies, from which, however, glaring errors resulted; thus, the opinion that unlisted public companies should also be included is prevailing today⁵.

In the second half of the 1990s, the MA was adopted in the United States. Comparing the data before the adoption with post-adoption data, Berger and Hann (2007) analyzed the characteristics of the newly disclosed segments, in other words, the segments concealed before the MA was introduced. The research had an important contribution by taking up not only the PC hypothesis, but also the agency cost (AC) hypothesis for discussion. The AC hypothesis proposes that managers hold the motivation to prevent stakeholders, such as shareholders, from recognizing their poorly performing businesses through segment reporting, on the assumption that opportunity costs are inflicted because the

managers do not withdraw from the stagnant business due to their moral hazard. As a result of verification with a model being based on the study by Harris (1998), several pieces of robust evidence that supports the AC hypothesis (suggesting that businesses with a lower excessive profit margin are concealed before the MA is adopted) and several pieces of weak evidence that supports the PC hypothesis (suggesting that businesses with a higher excessive profit margin are concealed before the adoption)⁶ were obtained in the research.

However, while being intended to identify how external segments were aggregated against internal segments, these empirical studies observed internal segments only indirectly. I consider Harris (1998) based on a strong assumption that the businesses managers did not want to disclose to third parties were contained in the commercial database⁷, while Berger and Hann (2007) made a potent supposition that all the segments newly disclosed after the MA was adopted were concealed by managers, therefore, their studies possibly failed to properly identify internal segments.

It is Bens et al. (2011) who overcame this point. Their study established pseudo-segments based on data by factory in the manufacturing industry and compared them with external segments, using individual data of a

⁵ As a result of an replication study for Harris (1998) by calculating the variable of the concentration ratio using the data of a U.S. census survey that included both listed and unlisted companies, Ali et al. (2009) reported that the coefficient of the variable did not become significant.

⁶ Botosan and Stanford (2005) also obtained a weak evidence consistent with the PC hypothesis arguing that

the segments newly disclosed after MA adoption are relatively less competitive and have a higher excessive profit margin.

⁷ Because the commercial database is on the premise of publication, the managers is unlikely to declare all businesses as they are.

U.S. census survey. As a result of an analysis with a model based on the research by Harris (1998), evidence that supports both the PC and AC hypotheses was acquired. Although the number of sample companies was only 1,625 firms-years in the period before the MA was adopted (1987, 1992, and 1997), the study directly observed internal segments, contributing considerably to shedding light on the managers' discretionary behavior.

These are the previous studies pertinent to this research; however, their findings are limited. That is, the only fact revealed is that, while being given ample room for discretion before adoption of the MA, managers aggregated business with the considerable PC or AC accompanying segment reporting into other segments and suppressed their business results. No study has included in the matters for discussion whether or not managers' discretionary behavior changed following the MA adoption.

2. Hypotheses

In this section, I develop hypotheses. The Accounting Standards Board of Japan (ASBJ) pointed out that there was criticism before adoption of the MA, which mentioned that segmentation was insufficient and information disclosure did not properly reflect diversified management⁸. The Japanese industrial circle had strongly opposed institutionalization of segment reporting, citing as a major reason that the PC accompanying segment reporting, such as leakage of confidential information, was enormous⁹. As the government has traditionally regulated industries and the practice of cooperative transactions through affiliates has existed in Japan, the PC becomes relatively huge when highly profitable businesses are revealed through segment reporting. Meanwhile, the reality is that Japanese companies, compared to the U.S. and European enterprises, have held less profitable businesses (Industrial Structure Council, 2017). This means that the AC, too, becomes comparatively considerable when businesses with low profit margins are articulated through segment reporting. The larger

⁸ The Theme Advisory Council of the Accounting Standards Board of Japan (November 2001) pointed out that nearly 20% of large-sized leading companies in Japan, at that time, seemingly, made financial reporting in a single segment, or had not established industry segments on the ground that the importance was minor; thus, it was necessary to consider a method of determining viable business segments, including consideration for "the management approach in the United States" (ASBJ, 2008, para. 42). Furthermore, upon establishing Statement No. 17: *Accounting*

Standard for Disclosures about Segments of an Enterprise and Related Information, the Board indicated that, regarding the conventional way of disclosing segment information, some held negative opinions that segmentation was not sufficiently and therefore the expectations of financial statement users were possibly not be satisfied, and that information disclosure did not properly reflect diversification of corporate management (ASBJ, 2008, para. 47).

⁹ Yamaji et al. (1994) analyzed the process of the institutionalization in detail.

relevant costs are, the bigger incentives managers have. In addition, the managers were given the discretion of freely segmentation before the MA was employed. Based on these points, I formulate hypotheses as follows. In this research, hypotheses are described in the form of the alternative hypothesis.

***H1-1 (H1-2):** Businesses with the higher PC (AC) accompanying segment reporting are aggregated into other segments before adoption of the MA.*

The MA was adopted in the fiscal year ended March 2011. Since the adoption, managers have not been granted, in principle, liberty to aggregate segments and been forced to define external segments in faithful conformity to internal segments. I expect that the situation in which external segments are too few compared with internal segments will be ameliorated, given that other conditions are fixed. Thus, I formulate the following hypothesis:

***H2:** The degree to which each business is reported by segment becomes greater after adoption of the MA.*

It is difficult, however, to offer an across-the-board prediction about how H1 changes after MA is adopted. Firstly, on the premise that a business with the larger PC (AC) is

independent as an internal segment, is identified as an operating segment, and serves as a reportable segment as it is, I infer that H1 is mitigated according to the trend of H2 after adoption of the MA.

Meanwhile, there are two factors based on which I presume that H1 is not ameliorated. The first factor is associated with the room for the managers' discretion. In determining reportable segments based on the MA, it is allowed to apply the aggregation criteria after "operating segments" are identified (ASBJ, 2008, para. 6-11). Here, as operating segments are identified based on the unit of actual internal performance evaluation, room for managers' discretion is fundamentally eliminated; however, there is room for discretion for applying the criteria¹⁰, therefore, there is a possibility that the managers intentionally aggregate a specific business into another segment by applying the criteria. In fact, the Financial Accounting Foundation (FAF) pointed out that, as a result of a review after the segment accounting standard (FASB, 1997) was applied, investors recognized that determination on reportable segments involved managers' judgment, and, in particular, that managers avoided disclosing competitive confidential information and poorly performing businesses by applying the aggregation criteria (FAF, 2012, pp. 7-8). The U.S. Securities and Exchange Commission (SEC) has also seen this point as a problem. Wang (2016)

¹⁰ Managers were given discretion for freely segmentation under an IA; however, under the MA, application of the "aggregation criteria" has been approved for determining reportable segments only after business segments have been identified according to the units of internal business performance evaluation.

Managers' arbitrariness is highly likely to intervene in segmentation under an IA, and in application of the "aggregation criteria" under the MA. Please refer to Asano (2018, pp. 101-104) for details of the differences between an IA and the MA, including room for the managers' discretion.

has revealed, through analysis of 1,392 comment letters (from August 2004 to July 2007) concerning cases where segment reporting was improved after the review¹¹ by the SEC for legal disclosure documents, that half of the letters were related to “segment identification and aggregation” and that the greater companies’ PC accompanying segment reporting was, the more the companies were subjected to the letters. Based on the aforementioned facts, specific businesses are possibly aggregated into other segments in an arbitrary manner through application of the aggregation criteria” even after the MA has been adopted, and H1 is facilitated in aspects different from that before the adoption.

The second factor is relevant to the characteristics intrinsic to the MA. The MA only requires identifying operating segments existing in an enterprise and does not ask whether or not business with different profit margins are intermingled there. I presume that the person in charge of a department often assumes responsibility for business with different profit margins particularly when the department is highly independent and higher authority is given to the person in charge. In such cases, H1 is likely to be actually facilitated when the managers strictly apply the MA.

As the above-mentioned factors affect each other in a complex manner and it is impossible to identify beforehand the direction of a change which will eventually develop to H1, I will set the following hypotheses:

H3-1a (H3-2a): *The trend that businesses with the higher PC (AC) accompanying segment reporting are aggregated into other segments (H1) is ameliorated after adoption of the MA.*

H3-1b (H3-2b): *The trend that businesses with the higher PC (AC) accompanying segment reporting are aggregated into other segments (H1) is facilitated after adoption of the MA.*

(3) Research Design

1. Data

In this section, I describe the data used in verification. To begin with, I establish pseudo-segments for each listed company based on the internal data of the companies. Internal data are the individual data of the “Basic Survey of Business Structure and Activities” by the Ministry of Economy, Trade and Industry of Japan (METI) (hereinafter referred to as “the Basic Survey”). The Basic Survey is a fundamental statistical survey in accordance with the Statistics Act, which covers about 37,000 companies all over Japan, excluding some business categories, and collects information, such as “financial statement accounts” and “sales breakdown.”

¹¹ The review was executed in accordance with Article 408 of the Sarbanes–Oxley Act (officially referred to as the Public Company Accounting Reform and Investor Protection Act of 2002, or SOX Act for short), and the

comment letters have been disclosed in the Electronic Data-Gathering, Analysis, and Retrieval system (EDGAR).

Table 1 Definition of Variables

Variable Name	Variable Definition
(1) $Match_{ij}$	Binary variable, which is 1 when the industrial code for the pseudo-segment j of Company i accords with the industrial code of the segment file of Company i based on Nikkei NEEDS, and 0 when the codes do not match each other.
(2) (3) ROA_High_j (Low_j)	[High (low) ROA dummy] Binary variable, which will be 1 when the median of Return on Asset (ROA) in Business Category j is in the 5th quintile of all the companies (the first quintile), and 0 otherwise.
(4) (5) PBR_High_j (Low_j)	[High (low) ROA dummy] Binary variable, which will be 1 when the median of the Price Book-value Ratio (PBR) in Business Category j is in the 5th quintile of all the companies (the 1st quintile), and 0 otherwise.
(6) $Con4_j$	[4 company concentration ratio] Total sales of the leading 4 companies in Business Category j ÷ Total sales of all the companies in Business Category j .
(7) $IndHi_j$	[Herfindahl-Hirschman Index by business category] Σ (Sales of each company in Business Category j ÷ Total sales of all the companies in Business Category j) ² .
(8) $Post_MA_i$	[Dummy after MA adoption] Binary variable, which will be 1 when Company i is in the period after the MA has been adopted, or 0 when in the period before the adoption.
Control variables:	
(9) $Private_j$	[Proportion of unlisted companies] (Total sales of unlisted public companies ÷ Total sales of all the companies) in Business Category j .
(10) $Barrier_j$	[Barrier to entry] Median of (Fixed assets ÷ Total assets) in Business Category j .
(11) $Fsize_i$	[Corporate scale] Natural logarithm of the total assets of Company i .
(12) $IntSegN_i$	[Number of pseudo-segments] The number of pseudo-segments of Company i based on the Basic Survey.
(13) $IntSegSize_{ij}$	[Scale of pseudo-segment] (Sales in Business Category j ÷ Total sales) of Company i based on the Basic Survey.

Note: Although the variables of ROA_High (Low), $Private$, and $Barrier$ are based on listed and unlisted companies contained in the Basic Survey, companies with advanced diversification (which means that the major product accounts for less than 70%) are excluded in order to accurately measure the situation of the business category. PBR_High (Low) was calculated based on the sample of this research (in accordance with the industrial classification based on Nikkei's middle classification). $Con4$ and $IndHi$ were calculated based on the sales included in the Basic Survey Segment File.

Two processes, however, are required in order to use the data for analyzing listed companies. Firstly, as either a flag that indicates whether or not a company is listed or a common ID to link to the commercial database, such as a securities number, has not been given to the data, in this research, I identified

listed companies and gave common IDs in accordance with the procedure described in Appendix A "Procedure for Linking Nikkei NEEDS with Data from Basic Survey of Business Structure and Activities." Secondly, it is necessary to aggregate data on a consolidated basis because the data from the Basic Survey

are on an individual company basis while segment information is on a consolidated basis. Regarding this point, I also followed the procedure contained in Appendix A for building a consolidated-based database.

I use the data of “sales breakdown” from the Basic Survey for setting up pseudo-segments. The “corporate group-based sales breakdown” created through the aforementioned processes (hereinafter referred to as “the Basic Survey Segment File”) contains sales by business category, and the name and code of the business categories. The industrial classification of the Basic Survey is revised relatively frequently and is not consistent with either the Japanese Standard Industrial Classification codes or the Nikkei industrial classification codes. In accordance with the procedure stated in Appendix B “Business Category Arrangement,” I unified the industrial code of the Basic Survey in chronological order and created a conversion table for linking the codes with other business category codes.

I use the data from the Basic Survey for purposes other than establishment of pseudo-segments. I use the data of “financial statement accounts” for setting up variables by business category, such as product market concentration rate. As the opinion that major errors arise if product market variables are based only on the data of listed companies is prevailing, I make calculation based on the individual data from the Basic Survey that covers about 37,000 companies each year, including unlisted companies.

In addition to the aforementioned Basic Survey data, I obtained financial data, including the publicly available segment data of

listed companies, from Nikkei NEEDS FinancialQUEST2.0 (hereinafter referred to as “Nikkei NEEDS”).

2. Regression Model

This research verifies the above-mentioned hypotheses through logit estimation with the following equation set as a basic model. Based on the study by Harris (1998) as the previous study did as discussed in Section 2.1, I have derived the equation below, intending to examine whether or not the probability that businesses with the greater PC (AC) accompanying segment reporting are aggregated into other segments is strong. The definition of each variable is as described in Table 1.

$$\begin{aligned}
 Match_{ij} &= \alpha + \beta_1(ROA_High_j) \\
 &+ \beta_2(ROA_Low_j) + \beta_3(PBR_High_j) \\
 &+ \beta_4(PBR_Low_j) + \beta_5(Con4[IndHi]_j) \\
 &+ \sum Controls + \varepsilon_{ij}
 \end{aligned} \tag{2}$$

First of all, I describe the method of establishing the objective variable, *Match*. As mentioned above, while an industrial code is given for each pseudo-segment in the Basic Survey Segment File, a maximum of three industrial codes are given by external segment in the segment file of Nikkei NEEDS. *Match* is a binary variable that, after being matched against the code of Nikkei NEEDS for each pseudo-segment, becomes 1 when the pseudo-segment accords with the Nikkei code, or 0

when they are not congruent with each other. The variable indicates that, when it is 1, the pseudo-segment is reported, and in contrast, that the pseudo-segment is aggregated into another segment and is not reported as an independent external segment when it is 0.

The independent variable includes the following as proxy variables for the PC (AC): (1) *ROA_High (Low)* [high (low) ROA dummy] and (2) *PBR_High (Low)* [high (low) PBR dummy]. I deem both to be the proxy variables for the PC (AC), considering that competitors, shareholders, and other stakeholders have interest in not only (1) the current profit margin but also (2) the future cash flow of each business. The actual values of (1) Return on Asset (ROA) and (2) Price Book-value Ratio (PBR) are not available even from the Basic Survey Segment File, thus, I use the median of each business category as each expectation¹². Although (1) profit margin also includes Return on Sales (ROS), the ROS correlates negatively with an asset turnover ratio, which means that it contains errors, and

¹² Because the Basic Survey Segment File includes only sales for each business category, and the name and code of the industries, it is impossible to calculate the profit margin by pseudo-segment, and thus, I have to rely on the expected value by business category.

¹³ The reason why ROS is not suited to measuring the profit margin variance among industries is that ROS is susceptible to asset turnover ratio. According to our examination utilizing the data by business category which are used in this research, it happens not infrequently, compared to other business categories, that “ROA is high, ROS is low, and asset turnover ratio is high” in categories which handle characteristic products among wholesalers and retailers and that “ROA is low, ROS is high, and asset turnover ratio is low”

therefore, I use *ROA_High (Low)* as a scale for profit margin variances among industries¹³. However, I report the results of estimation using *ROS_High (Low)* for checking the robustness.

Although the variables of *ROA_High (Low)*, *Private*, and *Barrier* are based on listed and unlisted companies contained in the Basic Survey, companies with advanced diversification (which means that the major product accounts for less than 70%) are excluded in order to accurately measure the situation of the business category. *PBR_High (Low)* was calculated based on the sample of this research (in accordance with the industrial classification based on Nikkei’s middle classification). *Con4* and *IndHi* were calculated based on the sales included in the Basic Survey Segment File.

Furthermore, I include (3) *Con4* [4 company concentration ratio] and *IndHi* [Herfindahl-Hirschman Index by business category] as the proxy variables for the PC¹⁴.

in the categories being on the decline in the manufacturing industry. This means that application of ROS as a profit margin scale will contribute to underestimation of the former while resulting in overestimation of the latter.

¹⁴ In the prior research such as Harris (1998), *SpeedAdj* (Adjustment Speed Adjustment Speed) is used as a variable of the competitive situation of the product market, but this variable takes the same sign not only for PC but also for AC hypothesis (Bens et al. 2011). In the framework of this study, which covers both PC and AC hypothesis, it is difficult to clearly rationalize this variable, so it is not included in the verification. I would like to set as future challenges to be left.

In addition to the aforementioned noteworthy variables, in reference to the previous work, I include variables that control factors affecting the objective variable *Match*. With respect to the plus and minus signs of the coefficient of each variable, I deduce the following: the variable *Private* becomes negative as the greater the number of private companies a business category has, the higher the cost related to segment reporting is in the category; *Barrier* becomes positive because the higher the barriers to entry are, the lower the cost associated with segment reporting is; *Fsize* becomes positive since the larger the scale of a company is, the more positive stance the company takes towards financial reporting; *IntSegN* becomes negative because the larger the number of pseudo-segments is, the greater the possibility of aggregation of the pseudo-segments is; and *IntSegSize* becomes positive as the more considerable the scale of pseudo-segments is, the higher the chance that companies submit reports is.

I estimate Equation (2) with the sample before adoption of the MA regarding H1. H1-1 is supported when the coefficients of the proxy variables for the PC (*ROA_High*, *PBR_High*, *Con4*, and *IndHi*) become significantly negative, and H1-2 is confirmed when the coefficients of the proxy variables for the AC (*ROA_Low* and *PBR_Low*) are significantly negative.

Meanwhile, concerning H2 and H3, I estimate an equation, which is obtained by adding *Post_MA* [dummy after adoption of the MA], and the cross term of its variable and the aforementioned proxy variables for the PC and AC, to Equation (2), based on all the samples. In the estimation, when the coefficient of

Post_MA becomes significantly positive, H2 is proven. Furthermore, H3-1a (H3-1b) is supported when the coefficient of the cross term of the proxy variables for the PC and *Post_MA* becomes significantly positive (negative), and H3-2a (H3-2b) is confirmed when the coefficient of the cross term of the proxy variables for the AC and *Post_MA* becomes significantly positive (negative).

3. Sample

The samples used in this research are pseudo-segments of listed companies. I classified sample selection into the following as shown in Table 2: (1) selection of listed companies based on Nikkei NEEDS and (2) selection of pseudo-segments based on the Basic Survey.

In (1), I selected 14,710 firms-years, which satisfy the following conditions: they are not in industries other than construction, finance, and real estate, they are listed on the first or second section of the Tokyo, Osaka, or Nagoya Stock Exchange in the period between 2000 and 2015, the fiscal year ends in March and an accounting period is for 12 months, the J-GAAP are applied, and consolidated financial statements and segment information are disclosed. I excluded the aforementioned business categories in order to avoid the possibility that the Basic Survey data have not been collected in the long term or that the level of accuracy of variables drops due to broad industry classification.

Then, in (2), I linked the Basic Survey Segment File to the companies selected above.

The percentage of companies that I failed to link here is only 16% (2,370 firms-years / 14,710 firms-years), indicating how high the response rate and data management standard of the Basic Survey is. Finally, I selected firms-pseudo-segments-years, excluding

business categories whose Basic Survey data were not collected in the long term based on the industrial codes given to the pseudo-segments or whose industrial classification was not accurate enough.

Table 2 Sample Selection

	firms-pseudo-segments-years	firms-years
<u>(1) Selection of listed companies based on Nikkei NEEDS</u>		
Firms listed on 1st or 2nd sections of Tokyo, Osaka, or Nagoya Stock Exchanges (2000 – 2015)		40,424
Less firms that are in construction, finance, real estate, and transport industries, whose fiscal year ends in other than March or accounting period is not for 12 months, and that do not disclose consolidated financial statements		(18,658)
Less firms that apply the accounting standards other than the J-GAAP		(560)
Less firms that do not disclose segment information		(6,496)
Sub total		14,710
<u>(2) Selection of pseudo-segments based on Basic Survey</u>		
Less linkage with Basic Survey: firms that do not have, in Basic Survey, industrial codes, sales by industry, and other data necessary for linking to Nikkei NEEDS	91,844	(2,370)
Less firms whose pseudo-segment falls under any of the following business categories: Construction, transport and postal activities, finance/insurance, real estate/goods rental and leasing, medical services/social welfare, compound services, and other	(13,062)	(139)
Final sample (firms-pseudo-segments-years)	78,782	12,201

(4) Results

1. Descriptive Statistics

Table 3 shows descriptive statistics of the number of pseudo-segments, the number of external segments, and the variables used in

verification of the hypotheses. I present the statistical values of the samples before adoption of the MA separately from those after the adoption in an attempt to observe the changes before and after the MA was introduced.

Panel A shows statistics of the numbers of pseudo-segments and external segments

per company. Before adoption of the MA, the average proportion of the number of external segments to the number of pseudo-segments was 44.7% (3.39 / 7.58), which is slightly less than 50%. Furthermore, while the standard deviation of the number of pseudo-segments was considerable (7.12) and the status of diversification in reality varied substantially from company to company, the standard deviation of the number of external segments was slight (1.25) and I observed that the number of external segments tended strongly to be around 3 regardless of the progress with diversification. This trend remained almost unchanged after the MA was adopted¹⁵.

Panel B shows the basic statistics and correlation of the variables used in verification of the hypotheses. To begin with, I focus on the samples before adoption of the MA. The mean value of *Match* is 0.295, indicating that the ratio of pseudo-segments reported as an independent external segment is 29.5%. The means of *ROA_High (PBR_High)* and *ROA_Low (PBR_Low)* are 0.193 (0.241) and 0.141 (0.145), respectively, which suggests that sample companies have engaged more in business categories with greater profit margins and future cash flows than less profitable industries with smaller future cash flows. Secondly, regarding correlation coefficients, the proxy variables for the PC (AC), excluding *Con4* and *IndHi*, relate negatively to *Match* and therefore consistent with H1-1 (H1-2).

The correlation coefficients of *ROA_High (PBR_High)* and *ROA_Low (PBR_Low)* are 0.41 at the maximum, meaning that both of them grasp different factors as inferred in Section (3) 2. The correlation coefficients of *Con4* and *IndHi* have reached 0.99 (Spearman's rank correlation coefficient), and I deem both of them, as the product market concentration rate, to be almost the same as each other in terms of scale.

Next, I cast a spotlight on the samples after the adoption. The mean value of *Match* stands at 0.320, which increased by 0.025 from the mean before the MA adoption. This proposes that the percentage of the pseudo-segment reported as independent external segments has risen by 2.5%, which is consistent with H2. Other mean values than that of *Match* remain nearly unchanged; however, *PBR_Low* has grown about 10%, suggesting that the proportion of companies that have recently devoted to businesses with less future cash flows, that is, the larger AC accompanying segment reporting, is rising. There is a high possibility that Japanese companies have not rearranged their business portfolios appropriately against the modern-day changes in the industrial structure.

The proxy variables for the PC (AC) and *Match* correlated negatively with each other, excluding *ROA_Low* and *Con4*, and the correlation, compared to that before the MA was adopted, tended to expand in the negative

¹⁵ Nakano (2016) studied the change in the number of external segments before and after adoption of the MA. The research presented evidence demonstrating that the number of external segments increased both before and after the adoption, including single-segment companies; however, the number of external segments

slightly decreased when it came solely to multiple-segment companies. As the samples of this research were limited to multiple-segment companies, the results concerning the number of external segments (Panel A, Table 3) conforms to the evidence.

direction. The trend is consistent with H3-1b (H3-2b). On the other hand, as far as correlation coefficients are concerned, I do not detect

almost no trend that is in conformance with H3-1a (H3-2a).

Table 3 Descriptive Statistics

Panel A Pseudo-Segment vs. External Segment

	Before MA (n = 54,149)			After MA (n = 24,633)		
	mean	median	standard deviation	mean	median	standard deviation
No. of pseudo-segments	7.58	5	7.12	7.39	5	7.35
No. of external segments	3.39	3	1.25	3.29	3	1.27

Panel B Basic Statistics and Correlation of Variables

	Before MA (n = 54,149)									After MA (n = 24,633)								
	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) <i>Match</i>	0.295	0.456								0.320	0.466							
(2) <i>ROA_High</i>	0.193	0.394	-0.02							0.212	0.409	-0.09						
(3) <i>ROA_Low</i>	0.141	0.348	-0.04	-0.20						0.119	0.324	0.00	-0.19					
(4) <i>PBR_High</i>	0.241	0.428	-0.06	0.41	-0.05					0.242	0.429	-0.10	0.26	-0.02				
(5) <i>PBR_Low</i>	0.145	0.352	-0.03	-0.16	0.06	-0.23				0.253	0.435	-0.11	-0.27	0.06	-0.33			
(6) <i>Con4</i>	0.274	0.132	0.03	0.08	-0.02	0.16	-0.03			0.276	0.139	0.00	0.06	0.09	0.22	-0.19		0.99
(7) <i>IndHi</i>	0.037	0.040	0.02	0.08	-0.02	0.19	-0.06	0.89		0.038	0.043	-0.02	0.05	0.07	0.23	-0.17	0.89	

Note: In this table, the control variable is omitted. Regarding correlation, values in the lower part of the diagonal are the Pearson's correlation coefficient and those in the upper part are the Spearman's rank correlation coefficient, and the bold-faced values indicate they are significant at the level of 10% (two-sided test).

2. Verification Results of Hypotheses

The results of the verification of the hypotheses are as shown in Table 4. Although the control variable is omitted due to the paper size limitation, the signs of all the variables, excluding *Fsize*, are as presumed in all the estimations.

Firstly, I pay attention to columns (1) of Table 4 based on the samples before adoption of the MA. As the coefficients of *PBR_High*, *Con4*, and *IndHi*, all of which serve as a proxy for the PC, were significantly negative, H1-1

(Businesses with the higher PC accompanying segment reporting are aggregated into other segments before adoption of the MA) was supported. The coefficient of *ROA_High* was significantly positive, which was not consistent with H1-1. Meanwhile, the coefficients of *ROA_Low* and *PBR_Low* as the proxy for the AC were significantly negative, and therefore, H1-2 (businesses with the higher AC accompanying segment reporting are aggregated into other segments before adoption of the MA) was supported. These results have indicated a significantly strong probability

that, before adopting the MA, the managers aggregated less competitive businesses with more enormous present value, or less

profitable businesses with lower present value into other segments and did not report them as independent segments.

Table 4 Verification Results of Hypotheses

Independent Variable	Expected Sign	(1) Samples before MA		(2) All Samples	
		(1.1)	(1.2)	(2.1)	(2.2)
<i>Post_MA</i>	+			0.728*** (7.83)	0.744*** (10.44)
<i>ROA_High</i>	-	0.347*** (6.05)	0.356*** (6.20)	0.325*** (5.67)	0.333*** (5.82)
<i>ROA_High</i> × <i>Post_MA</i>	±			-0.400*** (-4.92)	-0.404*** (-4.96)
<i>ROA_Low</i>	-	-0.260*** (-4.60)	-0.265*** (-4.69)	-0.262*** (-4.62)	-0.267*** (-4.70)
<i>ROA_Low</i> × <i>Post_MA</i>	±			0.122 (1.43)	0.126 (1.48)
<i>PBR_High</i>	-	-0.268*** (-4.71)	-0.265*** (-4.66)	-0.242*** (-4.25)	-0.240*** (-4.22)
<i>PBR_High</i> × <i>Post_MA</i>	±			-0.358*** (-4.37)	-0.344*** (-4.22)
<i>PBR_Low</i>	-	-0.151** (-2.15)	-0.161** (-2.31)	-0.182** (-2.52)	-0.191*** (-2.65)
<i>PBR_Low</i> × <i>Post_MA</i>	±			-0.333*** (-3.35)	-0.319*** (-3.21)
<i>Con4</i>	-	-1.149*** (-5.19)		-1.033*** (-4.80)	
<i>Con4</i> × <i>Post_MA</i>	±			-0.0635 (-0.25)	
<i>IndHi</i>	-		-4.027*** (-5.51)		-3.538*** (-5.03)
<i>IndHi</i> × <i>Post_MA</i>	±				-1.001 (-1.11)
Year effect		included	included	included	included
Observations		54,149	54,149	78,782	78,782
Pseudo-R ²		0.211	0.211	0.226	0.227

Note: *, **, and *** represent statistical significance at the levels of 10%, 5% and 1%, respectively (two-sided test). Equation (2) was estimated through logit regression. The numerical values shown in parentheses are the Z value based on the robust standard deviation with the corporate cluster adjusted. The intercept and control variable are omitted here.

Secondly, I give our attention to columns (2) of Table 4 based on all the samples. The coefficient of *Post_MA* was 0.728 in (2.1) and 0.744 in (2.2), both of which were significantly positive; thus, H2 (The degree to which each business is reported by segment becomes greater after adoption of the MA) was supported. With the scale of the coefficient being

brought into shape, when other variables were fixed, in both estimations, the extent to which the pseudo-segments are reported became 2.1 times higher, or up 11%, from that before the adoption¹⁶, which is a powerful piece of evidence that indicates the actual development of positive effects of the MA adoption.

¹⁶ Based on the odds ratio and the mean value of the marginal utility.

Then, regarding H3, I focus on the cross terms of the proxy variables for the PC [*ROA_High*, *PBR_High*, *Con4*, and *IndHi*] and those for the AC [*ROA_Low* and *PBR_Low*], and *Post_MA*. Among the cross terms, as no cross term had a significantly positive coefficient, H3-1a (H3-2a) (The trend that businesses with the higher PC (AC) accompanying segment reporting are aggregated into other segments (H1) is ameliorated after adoption of the MA) was not supported at all. On the other hand, the coefficients of the respective cross terms between *Post_MA* and *ROA_High*, *PBR_High*, and *PBR_Low* were all significantly negative in both estimations, thus, concerning these variables, H3-1b (H3-2b) (The trend that businesses with the higher PC (AC) accompanying segment reporting are aggregated into other segments (H1) is facilitated after adoption of the MA) was supported; however, as the cross terms of *Post_MA* respectively with *ROA_Low*, *Con4*, and *IndHi* were not significant in either of the estimations, neither H3-1a (H3-2a) nor H3-1b (H3-2b) was supported for these variables.

According to the above-mentioned results in relation to H3, the trend that businesses with the greater PC (AC) accompanying segment reporting are aggregated into other segments remain strong, and any evidence on mitigation of the trend has not been obtained at all. In addition, some evidence indicating that the trend has been facilitated rather than mitigated after the adoption of the MA has been found.

In columns (2) of Table 4, I estimated only samples in 2006 and later because the MA had not been adopted for 11 years (2000-2010), which was long enough for the economic

environment to change in the post-adoption period; however, the estimation results shown in Table 4 are basically robust. Furthermore, according to the estimation I conducted by replacing *ROA_High (Low)* with *ROS_High (Low)*, I confirmed that the sign of the coefficient of the variable was consistent with all the signs of the coefficients of the variables related to *ROA_High (Low)* in Table 3. Through a significance test, however, I found results different in that the coefficient of *ROS_High×Post_MA* was not significant and that the coefficient of *ROS_Low×Post_MA* was significant, both in columns (2.1) and (2.2) of Table 4. Although the fact that the coefficient of *ROS_Low×Post_MA* was significantly positive supports H3-2a, I believe that, even when I take the aforementioned additional pieces of evidence into account, there is little evidence proving that the trend of aggregation of businesses with the greater PC (AC) accompanying segment reporting into other segments is ameliorated after adoption of the MA, because the ROS contains errors as a profit margin scale variance among industries as mentioned above.

(5) Conclusion

As described above, this paper has verified managers' discretionary behavior toward segmentation by matching pseudo-segments I established using internal data of listed companies against external segments. The evidence discovered through this paper is as follows:

Firstly, I obtained a robust piece of evidence that conforms to the PC and AC hypotheses that suggest a strong trend that,

before adopting the MA, the managers of Japanese companies did not report by segment the performance of less competitive businesses with higher present value or less profitable businesses with lower present value. Secondly, examining the situations after the adoption, I found a piece of evidence revealing that, given that other conditions were fixed, the degree to which the pseudo-segments were reported increased 2.1 times, or 11%, compared to the period before the MA was introduced; however, not all businesses were started to be reported equally. The trend that businesses with the greater PC or AC were not reported for each segment remained strong, and I obtained little evidence that supports mitigation of the trend. I uncovered some evidence, if anything, which demonstrates that the trend was facilitated after the MA adoption.

However, it is necessary to be careful about interpreting the evidence relating to the effects of the MA toward the trend that businesses with the greater PC or AC were not reported by segment. As stated in Section (2) 2, the following are two factors that facilitated the trend when managers determined reportable segments: a possibility that the managers intentionally aggregated specific businesses into other segments by applying “the aggregation criteria” and a possibility that the managers facilitated rather than mitigated aggregation of business groups with different profit margins by stringently applying the MA through which the business were mixed. These are the issues coherent the MA, eventually the segment accounting standards. Especially the former raises an extremely important problem for setting up

accounting standards in that it suggests that there is room for intervention of the managers’ arbitrariness in decisions on reportable segments. Based on the samples used in this research, although some evidence has shown that factors that facilitated the aforementioned trend are greater than factors mitigating it, I did not contain in the scope of the analysis what kind of effect was brought about by each factor, particularly each of the two facilitating factors, and therefore I have not elucidated the question. In addition, interaction effects between these factors and other factors, such as the effectiveness of the governance system and characteristics of corporate organizations, possibly have developed. As Accounting standards setters such as FASB have been focusing on the issues surrounding decisions on reportable segments under the MA and seeking methods for improvement (FAF, 2012; FASB, 2013; FASB, 2018), it is important to reveal these points, which has been left as a challenge for this research.

Although the above issues remain unsolved, this research has successfully revealed unsettled facts regarding the managers’ discretionary behavior in segment reporting. This research has made contributions by using internal data and publicly available data of Japanese listed companies in combination and presenting the very first evidence concerning the managers’ discretionary behavior toward segmentation before adoption of the MA, and the effects and issues of the adoption against the behavior.

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Appendix A Procedure for Linking Nikkei NEEDS with Data from Basic Survey of Business Structure and Activities

(1) Linkage of Listed Companies Contained in Nikkei NEEDS with Basic Survey Data

I linked them in accordance with the following procedure:

- Using only the data of specific numerical accounting figures and corporate names that do not overlap with those of other companies, I matched listed companies contained in Nikkei NEEDS against ones included in the Basic Survey under the condition that the accounting figures and the corporate names of Nikkei NEEDS

are congruent completely with those of the Basic Survey. Adopting the following account titles in descending order, including (a) assets, sales, cost of sales, and selling and general administrative expenses (in the unit of 10 million yen), and for companies that did not match, (b) the aforementioned titles in the unit of 100 million yen, (c) assets and sales (in the unit of 10 million yen), and (d) assets and sales (in the unit of 100 million yen), I moved ahead with the procedure step by step.

- Concerning the companies contained in Nikkei NEEDS that do not match any companies in the Basic Survey in Step 1 above, I divided the data by rank of assets

and sales (in increments of 10 billion yen, with the number of ranks being 1,501) and compared the data of NEEDS against the data of the Basic Survey based on the corporate names by utilizing only data of corporate names that do not overlap with other companies' names.

3. I listed companies included in Nikkei NEEDS, which did not match companies in the Basic Survey in the steps above, and visually checked them according to the address of their respective headquarters, phone numbers, and other information for matching them against their counterparts.

I referred to the research by Matsuura et al. (2007) when establishing the aforementioned procedure as the studies clearly describe procedures for linking individual data of the government statistics, such as the Basic Survey, with each other.

(2) Identification of Parent Company and Subsidiaries in Companies Included in Basic Survey

Covering companies other than the listed companies contained in the Basic Survey, which were identified in the above process (1), firstly, I identified the parent-subsidiary relationship based on the data of "securities codes of the parent company." Then, within the scope in which the "parent company name" does not overlap, covering companies other than the aforementioned ones, I identified the relationship between the parent company and subsidiaries, including indirectly owned subsidiaries.

Appendix B Business Category Arrangement

The Basic Survey has employed its unique industrial codes which are based on the three-digit codes of the Japanese Standard Industrial Classification (hereinafter referred to as the "JSIC") and have been revised seven times since 2000. Meanwhile, the JSIC given to the segment file of Nikkei NEEDS was based on the standard of 2002 (11th revision) for settlement of the accounts in or before May 2014 and has been based on the standard of 2013 (13th revision) since June 2014. Furthermore, I calculated the PBR by business category in accordance with Nikkei's middle classification. In order to link the JSIC and Nikkei's middle classification with the Basic Survey industrial classification, I conducted the following procedure; Firstly, I unified the Basic Survey industrial codes chronologically in accordance with the standard of 2004. Then, I established respective conversion tables for linking the JSIC and Nikkei's middle classification to the unified codes

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