

THE EFFECT OF PERCEIVED ENVIRONMENTAL UNCERTAINTY ON MANAGEMENT ACCOUNTING SYSTEMS IN INDONESIAN MANUFACTURING COMPANIES: The Role of Firm's Decentralization

Kirmizi Ritonga
Faculty of Economics, University of Riau, Indonesia
Yuserrie Zainuddin
School of Management, Universiti Sains Malaysia

Abstrak

This study examines the effect of perceived environmental uncertainty (PEU) on the design of management accounting system (MAS) which is moderated by decentralization. MAS is design to provide chief executive officers information to make decision, planning, and controlling was defined in terms of the extent to which managers use the information characteristics of broad scope, timeliness, and aggregation in manufacturing firms. The study of 158 chief executive officers that have responsible for an organization, drawn from the manufacturing companies in Jakarta, Tangerang, Bogor, and Kerawang. The questionnaire survey, which was analyzed by using a regression analysis, suggests that PEU have an effect on the aggregated MAS information moderated by decentralization.

Key Word : PEU, MAS, Manufacturing Companies, Decentralization

INTRODUCTION

The adoption of a contingency approach to management accounting research has led to the identification of factors, which potentially affect the efficacy of management accounting systems. The concept of this approach is that there is no single management accounting system or design that can be applied effectively to all conditions or organizations: rather, a certain management accounting system is only effective for certain situations or organizations. This approach, in other word, argues that management accounting systems will be effective if the conditions of the organizations are consistent with the systems. This study is more emphasize on application of contingency theory where information capacity or controlling system have to fulfil the requirements or demand of users resulting from the uncertainty faced of organization (Gerloff, 1985; Tushman and Nadler, 1978). A number of studies, which applied contingency theory, have examined the relationship between contextual variables and management accounting systems (MAS) design such as studies performed by Gul (1991), Mia (1993), Gul and Chia (1994) that have provided strong empirical evidence to support the proposition that PEU affects MAS design. The samples are the manufacturing companies in developed countries such as Australia, Hongkong, and

Singapore, which have dissimilar business environment, social, and cultural conditions to that of other developing countries in South East Asia region, such as Indonesia. However, this study was conducted in Indonesia's manufacturing companies that focuses on the effect of PEU on the design of MAS, which is moderated by decentralization. Indeed, the management accounting literature is replete with studies examining effects of the degree of fit between the situation of PEU and the design of characteristics of MAS information, which depend upon the degree of decentralization.

A number of researchers have discovered that the application of MAS information in manufacturing firms was limited in a narrow scope in the sense that the system has been expected to provide information, which is generally financial, dealing with matters internal to the organization, and *ex post* or historical. Furthermore, MAS was implemented in a process of identification, measurement, accumulation, analysis, preparation, interpretation, and communication information to the executives in achieving organization objectives. While the larger scope implementation of information resulted to providing managers for planning, controlling, and decision, which covered in the organization planning system and management controlling system. Not only historical and financial data to be required but Information resulted of MAS, however, has to be more toward future orientation.

Since 1970s, perceived environmental uncertainty has received attention as a promising explanatory variable in behavioral accounting research. Specifically, accounting researcher have examined the re-

lationship between perceived environmental uncertainty and host of variables including: organizational structure (Gordon and Narayanan, 1984; Chenhall and Morris, 1986; Chia, 1995); management accounting systems design (Chenhall and Morris, 1986; Bouwens and Abernethy, 2000; Chia, 1995; Fisher, 1996), job satisfaction, employee motivation, and performance (Rebele and Michaels, 1990; Anderson and Kida, 1985), and unit business performance (Govindarajan, 1984). Since the business environment has been always in uncertainties, therefore Ferris (1982) argued that the attention of researchers on the effect of perceived environmental uncertainty in some models investigated and the theories pertaining with organization and accounting, at present, is an important field of research to investigate.

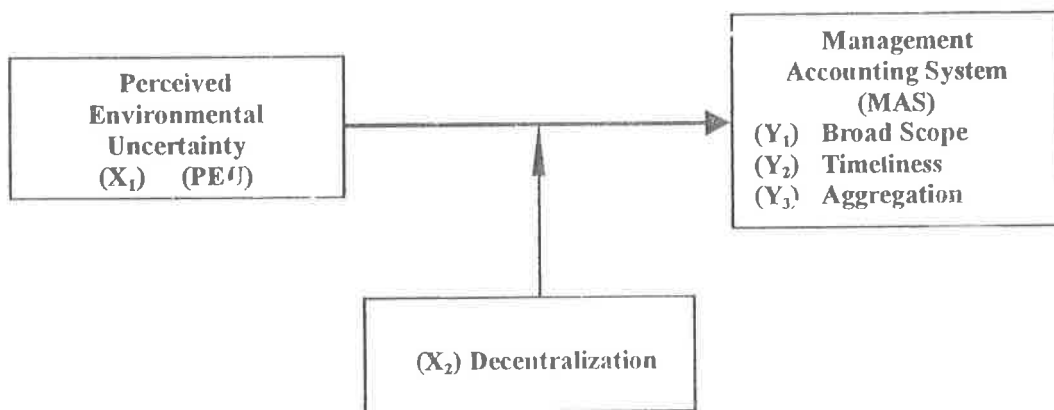
Management accounting system is one of organizational control mechanism, which facilitates control by reporting and creating visibility in the action and performance (Chia, 1995). Implementation of management accounting systems on manufacturing firms, according to Abernethy and Guthrie, 1994, has been affected by perceived environmental uncertainty. MAS information is highly required in decentralized rather than centralized organizations. As decision-makers attempt to cope with uncertainty, they collect more information but this will lead to increase in information processing capability within the structure. Decentralized structures generally tend to have higher information processing capability. In more certain environments, information-processing requirements would be lower, and hence organizations will rely more on es-

established rules and procedures and would require less sophisticated MAS information. If these arguments hold, then the need for MAS information should be related to decentralized organizational structures. This study attempts to improve our understanding on perceived environmental uncertainty (PEU), which influence managers' usage of management accounting information, thereby moderated by decentralization. Interaction be-

namely broad scope, timeliness, and aggregation. The framework of the study is as shown on figure 1.

The term of moderating variable in this study is in the sense that the variable can affect the relationship between perceived environmental uncertainty and management accounting systems. In the condition of high level perceived environmental uncertainty, decision makers require broad scope and timeliness informa-

Figure 1: Research Framework



tween PEU and decentralization on the characteristics of MAS resulting effective information provided managers to make decision and controlling. The agenda of this study, however, is to investigate implication of management accounting systems (MAS) design on environmental uncertainty of firms moderated by decentralization. MAS design was defined, in this study, as a perception of users for the application of three-information characteristics management accounting systems

tion, particularly information pertaining to future events or events that potentially occurred in future in terms of the activities of business organization. However, the information will more useful if authorities delegated broadly to lower level of management in making decision. Furthermore, information provided to managers should have characteristics as accurate, sources and focused, quantified, high frequencies of usage, future orientation, relevance, complete, more aggre-

gated and timeliness (Anthony, 1985; Dermer, 1973; Senn, 1982).

CONCEPT AND DEFINITION

Environmental uncertainty, according to Gordon and Narayanan (1976) has been identified as an important contextual variable in accounting information system and management information system design. Duncan (1972) defines the environment as the totality of physical and social factors that are taken directly into consideration in the decision-making behavior of individual in the organization. Furthermore, Duncan identified that perceived environmental uncertainty is defined as; (1) the lack of information regarding the environmental factors associated with a given decision-making situation; (2) not knowing the outcome of a specific decision in terms of how much the organization would lose if the decision were incorrect; and (3) inability to assign probabilities with any degree of confidence with regard to how environmental factors are going to affect the success or failure of the decision unit in performing its function

A literature review indicates that the amount of MAS information that managers use for decision making is a function of their PEU. Mia (1993) had found that the greater a manager's PEU in a particular situation, the greater is the amount of MAS information that the manager uses to deal with the situation. Dill (1958), Thompson (1967), Lawrence and Lorsch (1967), and Waterhouse and Tiessen (1978) suggested that environment uncertainty represented a key variable affecting the structure of

organizations. Gordon and Narayanan (1984) and Chenhall and Morris (1986) showed that not only does environment affect structure, but also information requirements. Particular finding of Chenhall and Morris (1986) identified a positive relationship between environmental uncertainty and perceived usefulness of information that has wider (broad) scope and is timely. This research will propose that PEU will influence the perceived usefulness of aggregated information.

Broad scope of an information system refers to the dimensions of focus, quantification, and time horizon (Gory and Scott Morton, 1971; Larcker, 1981, Gordon and Narayanan, 1984). A traditional MAS provides information, which focuses on events within the organization, is quantified in monetary terms, and relates to historical data. The scope of information can be defined, as information that is related to the external environment, is non-financial and future oriented. This study will propose that under condition of high PEU, decentralization is needed to be implemented in an organization and the consequence of the situation the availability of MAS broad scope should be used. Therefore, the greater the degree of PEU, the greater the degree decentralization in an organization, the greater the need for a more broad scope of MAS information. Decentralization, which refers to the level of autonomy delegated to the managers, and MAS design constitutes a significant part of the control package in an organization. PEU will be interacted with decentralization on availability of broad scope MAS information. Since managers faced with high PEU condition will require sophisticated MAS

which is moderated by decentralization, the study proposes the following hypothesis:

H₁: Decentralisation significantly moderates the relationship between perceived environmental uncertainty and the usefulness of broadscope of MAS information.

The second characteristic of MAS information is timeliness. This kind of characteristic of information might be defined as a manager's ability to respond quickly to events is likely to be occurred regarding to provision of information on request and the frequency of reporting systematically collected information (Chenhall and Morris, 1986). Timely information enhances the facility of MAS to report upon the most recent events and to provide rapid feedback on decisions. In uncertain situations, managers are likely to find that they need to respond rapidly to unpredictable change and, consequently, they would find timely information particularly useful. Therefore, in the situation of high uncertainty, then structure decentralization complemented with broad scope information (Gul and Chia, 1994). This study, therefore, examines the interaction between PEU and decentralization on the useful of timeliness MAS information. Then, the study propose the hypothesis is as follows:

H₂: Decentralisation significantly moderates the relationship between perceived environmental uncertainty and the timeliness of MAS information.

The third characteristic of MAS information is aggregation. MAS may provide information in various forms of aggregation ranging from provision of basic raw, unprocessed data to a variety of aggregations around periods or areas of interest such as responsibility center, functional areas or division unit. The type of aggregation information is referring to summation of in formats consistent with formal decision models such as discounted cash flow analysis, linear programming in budgetary applications, cost-volume profit analysis, and inventory control models. This study proposes that the relationship between PEU and characteristic aggregation MAS information will be affected by decentralization. It is mean that decentralized managers are required in high degree of environmental uncertainty, then, the consequence is aggregated information should be used to provide formal decision models. Many decision models have been designed to assist management of uncertainty especially in various management accounting books that provide numerous examples of formal models to assist planning and statistical planning. Thus far, the argumentation, which stresses on a fit between decentralization and high degree of PEU, will be required aggregated of MAS information to utilize greater application of forecast and decision models. Therefore, this study will propose the hypothesis:

H₃: Decentralisation significantly moderates the relationship between perceived environmental uncertainty and the aggregation of MAS information.

METHODOLOGY

Data collection and sampling

A questionnaire survey was used to collect the data and information on relevant aspects of usefulness the characteristic information management accounting systems in Indonesian manufacturing firms and the effect of perceived environmental uncertainty. Strategic business unit managers were approached to participated in the study, as they were the most appropriate personnel experience, and were incharged to the strategic business unit of their organization. Four hundred fifty questionnaires, together with a covering letter and self-addressed prepaid envelope, were distributed to managers in companies randomly selected from Indonesia; Jakarta, Tangerang, Bogor, and Bekasi. Recognizing the sensitive nature of some of the information requested, the covering letter provided a statement ensuring the respondents of anonymity. 125 questionnaires were returned, of which 13 questionnaires were not usable and 159 questionnaires were use in the final analysis. The strategic business unit organizations, at the level of chiefs executive officers as respondents, have to fulfill the criteria for inclusion in the sample were as follows: (1) the company must has at least 200 employees in the organizations; (2) the sales of the company must exceed fifty billions rupiah in a year; and (3) the capital must exceed ten billions rupiah.

Variable measurement

Perceived environmental uncertainty.

Perceived environmental uncertainty is regarding with the ability to predict the condition the environment of organization. It was measured using an eight-item, seven-point Likert-type scale instrument developed by Gul (1991). The eight-item were designed to measure the respondent's perceptions about the predictability and stability in various aspects if their organization's competitors' actions, manufacturing technology, product attributes/design, market demand, raw material availability, raw material price, government regulation and labor union action.

Management accounting system

Management accounting system is conceptualized as a formal system, which is designed to provide managers with information. Each of the three-characteristic of management accounting system information was measured using a self-scoring instrument which involved rating the extent to which a series of information items would be useful to them in carrying out the overall task of the organization (Bouwens and Abernethy, 2000). The seven-point scale ranged from "not at all useful" to "most useful". A set of questions was developed for each of three information dimensions taken from several research, which have been conducted by previous management accounting researchers.

Decentralization

Decentralization was measured by using the instrument developed by Chow et al (1999) and Gul and Chia (1994). The

measure contains nine questions regarding the extent to which authority is delegated to the chief executive officers for nine classes of decisions namely, development of new product, firing and hiring of personnel, purchase of capital equipment, selection of large investment, pricing decision, sourcing of input, operating proce-

ables for regression analysis, which are subject to factor analysis to confirm their theoretical groupings (construct validity) (Kerlinger, 1964; and Chenhall and Morris, 1986). Varimax rotation is applied to arrive at the final selection. The Kaiser's MSA values of the variables are all above acceptable level of 0.50 required for the test

Table 1. Summary of Result of Factors Analysis and Cronbach Alfa Coefficients for PEU, Decentralization and MAS Information Characteristics.

Variables	Cronbach Alpha	Kaiser MSA	Factor Loading
Perceived Environmental Uncertainty (PEU)	0.90	0.852	0.492 - 0.870
Decentralization	0.89	0.906	-0.929 - 0.901
Broad Scope of MAS	0.79	0.719	0.431 - 0.837
Timeliness of MAS	0.74	0.686	0.699 - 0.807
Aggregation of MAS	0.86	0.831	0.537 - 0.888

dures and schedules, distribution of product, and making tradeoff within unit.

Reliability and Validity

To examine reliability and validity, the researcher used Statistical Package for Social Science (SPSSPC) package. Reliability of the scale was estimated using Cronbach's alpha for internal consistency of the items. Construct validity for measures was assessed by factor analysis (using varimax rotation). Factor analysis yielded one factor each for perceived environmental uncertainty, management accounting information, and decentralization with Eigen values greater than one. Single scales were constructed by averaging a respondent's scores over the questions pertaining to PEU, decentralization, and each of characteristic of management accounting system. On the Table 1 the result of measurements of the various vari-

ables for regression analysis, which are subject to factor analysis to confirm their theoretical groupings (construct validity) (Kerlinger, 1964; and Chenhall and Morris, 1986). Varimax rotation is applied to arrive at the final selection. The Kaiser's MSA values of the variables are all above acceptable level of 0.50 required for the test

The examination techniques for hypothesis

The examination of hypothesis could be done after collecting the data. Regression model that would be used to examine the hypothesis, the approach which was adopted by Chia (1995) and Govindarajan and Gupta (1985), the results are mathematically reflected as in the equation (1) and (2):

$$Y_i = a + b_1X_1 + b_2X_2 + e \quad (1)$$

$$Y_i = a + b_1X_1 + b_2X_2 + b_3X_1X_2 + e \quad (2)$$

- Y_i = Management accounting systems; broad scope ($i = 1$), timeliness ($i = 2$), aggregation ($i = 3$).
- a = Constant
- b_1, b_2, b_3 = Regression coefficient
- X_1 = Perceived environmental uncertainty
- X_2 = Decentralization
- X_1X_2 = Interaction between X_1 and X_2
- e = Error term

information. Otherwise, if b_3 is not significant, then interaction between the variables would not affect the characteristics of MAS information. Therefore, if b_3 is significant and positive (i.e. $b_3 > 0$) the corresponding incremental R^2 will so be statistically significant at the same probability level. This means that the introduction of the term X_1X_2 in equation (2) adds significantly to the variance explained.

According to Schoonhoven (1981), testing for the existence of contingency versus universalistic interaction effect, of the two independent variables (X_1 and X_2) on the dependent variable (Y), can be per-

The inclusion of product term in a multiple regression is an acceptable way of testing for interaction (Schoonhoven,

Table 2 Descriptive Statistic and Matrix Correlation (n = 159)

NO	VARIABLES	MEAN	STD.DEV.	Theoretical Range	Actual Range	1	2	3	4
1	Broad Scope Information (Y_1)	5.96	0.386	1 - 7	4.83 - 7				
2	Timeliness Information (Y_2)	6.06	0.621	1 - 7	3 - 7	0.244**			
3	Aggregated Information (Y_3)	5.79	0.811	1 - 7	2.50 - 7	0.202*	0.457**		
4	PEU (X_1)	2.59	0.735	1 - 7	1.46 - 5.50	0.184*	-0.075	-0.171*	
5	Decentralization (X_2)	4.05	1.469	1 - 7	1.33 - 6.89	0.335**	0.129	-0.079	0.047

1981). For this study, the interaction approach aims at explaining the variations in management accounting system from the interaction of the two independent variables in the empirical model. The focus is on the significance and nature of the impact of interaction between the independent variables on the dependent variable, in the equation (2), on the coefficient index of b_3 . If b_3 is significant, then interaction between PEU and decentralization would affect the characteristics of MAS

formed by examining the partial derivative from the larger regression equation, that is, equation (2). This will determine if a nonmonotonic effect or symmetrical effect is present. The partial derivative of equation effect is present. The partial derivative of equation (2) is shown as equation (3) below:

$$\frac{\partial Y}{\partial X_1} = b_1 + b_3 X_2 \quad (3)$$

This existence of nonmonotonic ef-

facts could provide information on where in the range of the contingent variable a change in the direction of slope occurs. The point of inflection for equation (3) will be: $X_2 = -b_1 / b_3$.

ANALYSIS AND RESULT

Descriptive Statistics of the Variables

To identify the data that acceptable in this study could be shown on Table 2, which present descriptive statistics for the various variables that have been examined.

Table 2 shows that perceived environmental uncertainty (PEU) has a significant relationship with broad scope of MAS information ($r = 184, p < 0.01$) and with aggregation of MAS information ($r = -1.171, p < 0.01$). However, PEU does not has a relationship with timeliness of MAS information.

Discussion of results

Support for hypothesis 3 is shown in Table 3. This is indicated by the statistically significant ($p < 0.05$). F-ratio of regression model for usefulness of aggregation MAS information. There is a significant interaction effect between decentralization and perceived environmental uncertainty on aggregation of MAS information as indicated by the interaction coefficient which is statistically significant ($p < 0.05$) as shown in Table 3. Therefore, the result indicated that decentralization significantly interacts with PEU and positively effect the usage aggregation of MAS information.

To test for the presence of nonmonotonic relationship on the interaction effect between decentralization and PEU on aggregation of MAS information, partial derivative of equation 3 (for hypothesis 3).

Table 3 Interaction between Perceived Environmental Uncertainty and Decentralization on Management Accounting System.

Variable		Coefficient	Value	Std.Error	t-stat	P
Broad Scope						
Equation (1a): $Y = a + b_1X_1 + b_2X_2$						
X_1	PEU	b_1	0.089	0.039	2.268	n.s
	X_2 Decentralization	b_2	0.086	0.020	4.408	<0.001
R ² =0.141; Adj.R ² =0.130; n=159			F _(2,156) =4.61;		p<0.001	
H_1 : Equation (2a): $Y_1 = a + b_1X_1 + b_2X_2 + b_3X_1X_2 + e$						
X_1	PEU	b_1	0.151	0.152	0.993	n.s
	X_2 Decentralization	b_2	0.118	0.078	1.518	n.s

The Effect of Perceived Environmental Uncertainty on Management Accounting Systems in Indonesian Manufacturing Companies

X_1X_2	Interaction	b_3	-0.013	0.031	-0.423	n.s
$R^2=0.142$;	Adj. $R^2=0.125$; n=159		$F_{(1,155)}=6.63$;		$p<0.001$	

R^2 explained by interaction term is 0.001 (R^2 change)

Variable	Coefficient	Value	Std.Error	t-stat.	P
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Timeliness

Equation (1b): $Y = a + b_1X_1 + b_2X_2$

X_1	PEU	b_1	-0.069	0.067	-1.027	n.s
X_2	Decentralization	b_2	0.056	0.033	1.680	n.s
$R^2=0.023$;	Adj. $R^2=0.011$; n=159		$F_{(2,156)}=4.61$;		$P>0.10$ n.s	

H_2 : Equation (2b): $Y_2 = a + b_1X_1 + b_2X_2 + b_3X_1X_2 + e$

X_1	PEU	b_1	-0.455	0.258	-1.759	n.s
X_2	Decentralization	b_2	0.141	0.132	-1.069	n.s
X_1X_2	Interaction	b_3	0.082	0.052	1.545	n.s
$R^2=0.038$;	Adj. $R^2=0.020$; n=159		$F_{(1,155)}=2.048$;		$P>0.10$ n.s	

R^2 explained by interaction term 0.015 (R^2 change)

Variable	Coefficient	Value	Std.Error	t-stat.	p
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Aggregation

Equation (1c): $Y = a + b_1X_1 + b_2X_2$

X_1	PEU	b_1	-0.191	0.087	-2.190	0.030
X_2	Decentralization	b_2	0.026	0.044	0.591	n.s
$R^2=0.031$;	Adj. $R^2=0.019$; n=159		$F_{(2,156)}=4.61$;		$P<0.10$ Sig.	

H_3 : Equation (2c): $Y_3 = a + b_1X_1 + b_2X_2 + b_3X_1X_2 + e$

X_1	PEU	b_1	-1.187	0.328	-3.614	0.000
X_2	Decentralization	b_2	-0.485	0.168	-2.885	0.004
X_1X_2	Interaction	b_3	0.208	0.066	3.140	0.002
$R^2=0.089$;	Adj. $R^2=0.072$; n=159		$F_{(1,155)}=3.84$;		$P<0.05$ Sig.	

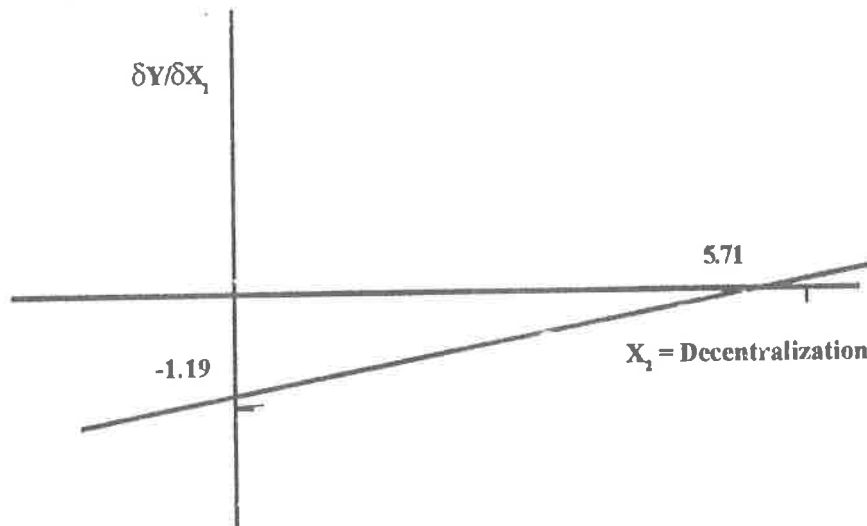
R^2 explained by interaction term is 0.058 (R^2 change)

Figure 1 shows the graph for equation 3 (for hypothesis 3). In the graph, vertical axis represents the relationship between the degree of the perceived environmental uncertainty and aggregated information of management accounting system. The hori-

zontal axis indicates the degree of decentralization. The plotted line of the graph represents the change in aggregated information of MAS, given a change in the degree of PEU over the degree decentralization.

below that inflection point of the PEU decreases aggregated information of MAS as can be seen from negative slope. The inflection points are well within the observed range of values (i.e. 1.00 to 7.00) and close to the mean value for the

Figure 2. The effect of Decentralization (X_2) on the relationship between Perceived Environment Uncertainty and Aggregated information of MAS



zontal axis indicates the degree of decentralization. The plotted line of the graph represents the change in aggregated information of MAS, given a change in the degree of PEU over the degree decentralization.

The equation 3 is positive (negative) when X_1 has a value above (below) the point of inflection. This means that PEU contributes positively to aggregated information of MAS in the range of the X_2 values above the point of inflection, since the slope for equation is positive. However,

degree of decentralization (X_2) in the sample. Hence, it is concluded that the degree of PEU has a contingent (nonmonotonic) effect on aggregated information of MAS (Y_3) over the range of the degree of decentralization (X_2) values.

For the hypothesis 3, the equation would be:

$$Y_3 = a + b_1X_1 + b_2X_2 + b_3X_1X_2 + e$$

$$Y_3 = 8.638 - 1.187X_1 - 0.485X_2 + 0.208X_1X_2 + e$$

If $\delta Y/\delta X_1 = b_2 + b_1 X_2$, then $\delta Y/\delta X_1 = -1.187 X_1 + 0.208 X_2$

If $X_2 = 0$, then $\delta Y/\delta X_1 = -1.187$ (or -1.19), and when $\delta Y/\delta X_1 = 0$, then $X_2 = 1.187/0.208 = 5.71$

CONCLUSION

The result of the study provides support for hypothesis 3. The main finding of this study is that decentralization significantly moderates the perceived environmental uncertainty to affect aggregation of MAS information. This finding also in-

dicates that the greater the level of decentralization, the greater the effect of PEU has on aggregated information of MAS. This study adds to the limited knowledge of management accounting research, in particular with reference to the design of MAS, in organizations operating in Indonesia. With respect to business organizations in developing countries, this study is of practical significance because the empirical results provide information about the appropriate design of control subsystems, which these organizations can adopt to enhance the use of management accounting systems in business unit strategy.

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