The Role of Corporate Governance in the Link between Management Accounting System and Firm Performance

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Abstract

This research attempts to explore the causal relationships among corporate governance structure, the adoption of management accounting systems and firm performance by applying the directed acyclic graph model. Especially, it discusses and uses Sobel's procedure and the interaction factor to investigate the mediating and moderating roles of corporate governance structure in the association between the adoption of management accounting systems and firm performance, which have been missed in prior studies. The findings reveal statistical evidence on the mediating and moderating roles of corporate governance structure in the influence of adopting management accounting systems in business on firm performance. This research is useful to business managers in their decisions on the adoption of management accounting systems that should fit the corporate governance structure of their firm, which will help them to attain competitive advantages as well as better firm performance.

Keywords: Corporate governance, Management accounting system, Firm performance, Directed acyclic graph model

JEL Classification: C51, G34, L25, M41

1. Introduction

Agency problems related to corporate governance structure, which arise from the separation between ownership and management, have been discussed a lot in the management literature (Jensen and Meckling 1976). Much previous research refers to corporate governance structure as controlling mechanisms to alleviate the agency problems, namely the proportion of outside directors and supervisors in the boards as well as chief executive officer (CEO) duality (Brown and Caylor 2004; Edwards and Clough 2005; Kyereboah-Coleman 2007; Bhagat and Bolton 2008). Good corporate governance structure will help firms to diminish the conflicts of interests among managers and owners, which results in the reduction in agency costs. This will therefore create competitive advantages for the firms, which brings about sustainable economic development as well as improved firm performance (Cadbury 1992). Corporate governance structure is applied in this research as the composition of outside directors and outside supervisors as well as the leadership separation of chairman and CEO, which is modified from the prior research (Brown and Caylor 2004; Edwards and Clough 2005; Kyereboah-Coleman 2007; Bhagat and Bolton 2008).

A number of studies have suggested the causal relationships between and among corporate governance structure, the adoption of management accounting systems and firm performance (Kaplan and Norton 2006; Seal 2006; Nicholson and Kiel 2007; Kaymak and Bektas 2008; Salvato and Melin 2008; Christine et al. 2011). Furthermore, based on the research of Baron and Kenny (1986), the above suggestions allow us to argue that corporate governance structure may play a mediating role in the influence of adopting management accounting systems in business on firm performance. These above suggestions also enable us to expect that corporate governance structure may moderate the causal linkage from the adoption of management accounting systems to firm performance. Nonetheless, the mediating and moderating roles of corporate governance structure in the relationship between the adoption of management accounting systems and firm performance have not been statistically investigated. In this paper, we discuss the mediating and moderating roles and then examine how and whether corporate governance structure statistically mediates or/and moderates the effect of adopting management accounting systems on firm performance by applying Sobel's procedure and the interaction factor analysis. In addition, we employ both the regression analysis and the directed acyclic graph (DAG) model to study the causal relationships among corporate governance structure, the adoption of management accounting systems and firm performance. The DAG model that is often applied to tell the difference between actual cause and spurious cause in a set of data clearly differentiates direct cause from indirect cause (Wang 2010). Furthermore, Wang (2010) also contends that the difference between actual cause and spurious cause is reflected clearer with the DAG model than with the structural equation modelling procedure- SEM.

In this research, we try to make some contributions to the literature as well as to the practice. To the literature, this research is the first to provide statistical evidence on the mediating and moderating roles of corporate governance structure, which offers better understanding of the importance that corporate governance structure plays in the link between the adoption of management accounting systems and firm performance. Furthermore, it is also the first to

utilize the advanced model of DAG, which offers better understanding of the interrelationships, to discover the causal relationships. To the practice, the findings provide business managers an insight into the relationships that exist among corporate governance structure, the adoption of management accounting systems and firm performance. The results reveal that adopting management accounting systems in business affects corporate governance structure as well as firm performance. Moreover, corporate governance structure both affects firm performance and plays the mediating and moderating roles in the association between the adoption of management accounting systems and firm performance. The findings are helpful to managers in choosing suitable management accounting systems to their corporate governance structure, which yields greater firm performance.

This research will be organized as follows. The subsequent section "literature review" will develop hypotheses. Next, the research methodology will show the way to collect the data and to measure the variables in the research model as well as how the data is analyzed. Then, the empirical results will explain the findings obtained from the data analyses. Finally, the conclusions are offered.

2. Literature Review

Corporate governance structure, the adoption of management accounting systems and firm performance are three main variables mentioned in this research. The relationships between and among these variables are more complicated than simple bivariate ones. The detail of these associations will be explained in this section.

Cadbury (1992) considers corporate governance structure as a monitoring mechanism to lessen the extent of agency problems owing to the separation between ownership and management as well as the greater composition of outside directors in the board, which thus enhances firm performance, while Mayer (1997) regards corporate governance structure as "ways of bringing the interests of shareholders and managers into line and ensuring that firms are run for the benefit of shareholders. Corporate governance structure is often concerned with composition and function of firm boards. Following the previous studies (Brown and Caylor 2004; Edwards and Clough 2005; Kyereboah-Coleman 2007; Bhagat and Bolton 2008), we refer to corporate governance structure as compositions of boards of directors and supervisors as well as chief executive officer (CEO) duality that is known as the situation that the posts of chairman and CEO are taken by one person. Another variable discussed in this research is the adoption of management accounting systems in business. Management accounting system is a management means applied to offer necessary financial or nonfinancial information for making business decisions. It is regarded by Kaplan (1983) as a part of management techniques and its role is to provide important information for management planning so as to improve firm performance. Kaplan (1983) and Lucas (1997) suggest that traditional management accounting systems, such as traditional budgeting, cost volume profit analysis, and variance analysis, which focus on concerns internal to the firm and are financially oriented, are no more considered as a supportive means to provide sufficient information for planning and management in the current ever-changing business environment. Lucas (1997) stresses that, other than these traditional management accounting

systems, firms should also relate their management tools to more advanced management systems- for example activity based costing, total quality management and balanced scorecard- that meet the requirements of customers as well as other stakeholders, so will achieve competitive advantages.

Grounded on these above perspectives, we define the adoption level of management accounting systems for this study as the degree to which a firm chooses and implements the management accounting systems, composed of both the above-mentioned traditional and advanced techniques for managing business. In regard to firm performance, this variable is evaluated on a firm's overall outcomes over a given period of time. The assessment of firm performance is often based on both financial performance and nonfinancial performance. Financial performance is measured using traditional indices such as return on asset and return on equity (Droge et al. 2003); whereas nonfinancial performance is evaluated on the indices of innovativeness, quality, and customer satisfaction (Hudson et al. 2001; Kaplan and Norton 2007). Furthermore, these indices of financial performance and nonfinancial performance have also been applied in the research of Wang and Huynh (2013) and Huynh and Lin (2013). In this research, we measure both financial performance and nonfinancial performance as the proxy for firm performance.

Management accounting systems are suggested by Kaplan and Nagel (2004) to enhance the effectiveness of corporate governance structure, because it provides the directory board with necessary information for business management, the treatment of which needs better corporate governance structure. In other words, the adoption of management accounting systems in business will shape the corporate governance structure of firms, in which higher adoption levels of management accounting systems may lead to better corporate governance structure. Furthermore, information from management accounting systems helps corporate boards in offering useful suggestion to the CEO, so that the CEO can better fulfill their managerial job (Kaplan and Norton 2006). Therefore, it is supposed that management accounting systems generate effective corporate governance, because a higher adoption level of management accounting systems requires better corporate governance structure existing a better mechanism for dealing with inportant information obtained from management accounting systems. Moreover, the research on management accounting systems and corporate governance structure by Seal (2006) implicates that techniques derived from management accounting can be adapted to embed better corporate governance structure, since good corporate governance structure is formed by supportive information from management accounting systems. Additionally, Sam et al. (2012), in the study on managers' decision in adopting management accounting systems in business and the characteristics of CEOs, propose a relationship between the adoption of management accounting systems and CEOs characteristic. Consequently, we can infer the suggestion that management accounting tools can shape and enhance corporate governance structure. Based on the above arguments, we can formulate the following hypothesis.

H1: Corporate governance structure may be enhanced by the adoption of management accounting systems in business

White and Ingrassia (1992) argue that when the positions of both chairperson and CEO fall into a person, the firm can suffer an agency cost if this manager pursues his own interest at a cost of other shareholders. In addition, the studies of Nicholson and Kiel (2007) and Kaymak and Bektas (2008) highlight the boards, which include independent directors, will counter an agency problem, as these boards can supervise any self-interested actions by managers. This may lessen agency costs, and as a result bring about improved firm performance. Moreover, independent directors are taken on by their outstanding qualifications, expertise and experience; hence they may effectively affect business decisions, which eventually results in benefits to the firm. Independent directors are also argued by Beasley (1996) and Bebenroth and Donghao (2007) to play a unique monitoring role in the firm, which will diminish agency costs, and so enhance firm performance. A firm will suffer worse performance, if its board cannot monitor and dismiss an underperforming CEO. Accordingly, the chairperson and CEO positions should be occupied by different individuals, so that the power of control is decentralized and thus agency costs are mitigated. The above discussions allow us to posit that a good structure of corporate governance may be a driving force of improved firm performance as stated by the hypothesis below.

H2: Good corporate governance structure likely improves firm performance

Management accounting systems are aimed to facilitate decision-making by collecting, processing and communicating information that helps managers to plan, organize, manage and assess business processes as well as firm strategy and performance. Mia and Clarke (1999) suggest a positive relationship between the adoption of management accounting systems and business performance. They claim that the higher use of management accounting information will help managers to enhance their business performance. Moreover, Williams and Seaman (2002) provide evidence on the role of management accounting systems in enhancing business performance. In a research on management accounting by Ajibolade et al. (2010), a positive relationship between the adoption of management accounting systems and firm performance is determined. Additionally, Wan (2011) provides evidence that the use of e-accounting positively impacts on business performance. A number of studies have confirmed the influence of e-commerce, information system, accounting information system as well as information technology on firm performance (Chong 1996; Choe 2003; Ismail 2007; Yulius 2010; Schulz et al. 2010). These tools are similar to management accounting systems, in which they are all expected to augment firm performance. Overall, these previous findings lead us to suggest the hypothesis below for the management accounting context.

H3: The adoption of management accounting systems may improve firm performance

Baron and Kenny (1986) suggest that the causal relationships between and among variables in a research model are often not as simple as a simple bivariate association between a predicting variable and a predicted variable. Rather, the connection between two variables in a research model is sometimes mediated by a third element. Baron and Kenny (1986) introduce a procedure to examine the third variable intervening role in the influence of the explanatory variable on the explained variable. This procedure requires three conditions to determine whether the interfering impact occurs. First, an explanatory variable significantly

affect an explained variable. Second, it also simultaneously imposes a statistically significant impact on a third variable. Third, the third variable, in turn, is the predictor of the explained variable. The third variable can be suggested to mediate the relationship between the independent variable and the dependent variable, if the three above conditions are met. As earlier discussed, hypothesis 1 (H1) indicates that the adoption of management accounting systems enhances corporate governance structure, which in turn leads to improved firm performance as stated by hypothesis 2 (H2); whereas hypothesis 3 (H3) suggests the effect of adopting management accounting systems in business on firm performance. In agreement with Baron and Kenny (1986), these hypotheses let us come to the hypothesis below.

H4: Corporate governance structure may intervene in the relationship between the adoption of management accounting systems and firm performance.

Furthermore, on the one hand, good corporate governance structure may result in improved firm performance (as stated in hypothesis 2), on the other hand it is also given to affect the adoption of management accounting systems in business. A study by Salvato and Melin (2008) points out that the empowerment of firm management to outside independent directors with their outstanding qualifications, expertise and experience will lead to a high degree of formalization. The outside independent directors have to report their jobs to their shareholders; hence they need formal management tools to effectively control business activities (Cromie et al. 1995). In addition, Christine et al. (2011), in their research on "corporate governance and management accounting in family firms", find it essential to establish a separate unit in charge of management accounting, where formal management accounting tools should be employed for formalized management systems. They also imply that professionalization possessed by outside independent directors is related with the adoption of more sophisticated management systems. Agrawal and Chadha (2005) find that the probability of restatement is significantly lower in firms whose boards or supervisory committees include outside independent financial experts, but higher in firms where CEOs hold the firm's major shares. Their findings are consistent with the argument that outside independent directors adopt formalized management systems which create more faithful earnings reports. Accordingly, we can suggest that corporate governance structure impacts on the adoption of management accounting systems. The above discussions allow us to argue that the relationship between the adoption of management accounting systems and firm performance can be influenced by corporate governance structure. As such, *corporate governance structure may moderate the effect of adopting management accounting systems in business on firm performance (Proposition1 or P1)*. However, there is a lack of evidence on this moderating relationship in the existing management literature; hence we would like to undertake a tentative investigation on *the moderating role of corporate governance structure in the relationship between the adoption of management accounting systems in business and firm performance*.

In addition to the three main variables "corporate governance structure", "the adoption of management accounting systems" and "firm performance" mentioned above, we also consider two other variables that are deemed by previous research to affect "corporate governance structure" and "the adoption of management accounting systems", namely environmental uncertainty and firm characteristics. We treat these two variables as

controlling variables; hence our results are more reliable. The effects of environmental uncertainty and firm characteristics on "corporate governance structure" and "the adoption of management accounting systems" are discussed below.

Haldma and Lääts (2002) indicate that environmental factors affect managers' decision on the adoption of management accounting system. In addition, Masrek (2009) finds out the relationship between environmental uncertainty and the utilization of information systems. Environmental uncertainty is also reported by Ashill and Jobber (2010) to influence the use of marketing information systems, while Ibadin and Imoisili (2010) provide evidence on the relationship between environmental uncertainty and the design of management accounting system. In addition, a study of Jusoh (2010) reveals that the level of environmental uncertainty is considerably related to the use of financial and internal performance measures. Grounded on the above arguments we suggest that *environmental uncertainty determines the adoption of management accounting system (Proposition2 or P2).*

Soltani (2005) in his research of "Factors Affecting Corporate Governance and Audit Committees in Selected Countries" discusses the effects of factors on the effectiveness of corporate governance and the audit committee. He proposes that environmental factors have relationship with the current corporate governance. Heinrich et al. (2007) suggest four environmental variables namely (1) pressure from majority shareholders, (2) pressure from outside minority shareholders, (3) pressure from internationalization/ globalization and (4) pressure from the state legal regulation are likely to influence corporate governance. Furthermore, a study of Altunoglu (2012) reveals that environmental variables put influence on corporate governance practices. When business environments considerably fluctuate, firms' boards try to build good corporate governance to cope with environmental uncertainty. Hence, we offer a suggestion that *environmental uncertainty affects corporate governance (Proposition3 or P3).*

Firm characteristics are asserted by Haldma and Lääts (2002) as the determinants of the use of the control system. Al-Omiri and Drury (2007) determine that the level of accounting system sophistication will differ significantly across firm characteristics. Following them, Abdel-Kader and Luther (2008) reveal that firm characteristics impact on the use of management accounting practices. Furthermore, firm attributes are suggested by Masrek (2009) as variables explaining the utilization of information systems in business. These arguments are consistent with the contingency theory of management accounting which implies that companies with different characteristics may choose and use the most appropriate management accounting systems to their firm characteristics. Therefore, it is supposed that *firm characteristics have an impact on the adoption of management accounting system (Proposition4 or P4).*

Demsetz and Lehn (1985) find evidence that firm characteristics significantly explain the variation in ownership structure as a corporate governance variable. Similarly, firm-specific factors are indicated by Soltani (2005) to affect firms' current corporate governance. Further, the research on effects of factors on corporate governance practices by Altunoglu (2012)

implicates that organizational factors are drivers of corporate governance practices. Hence we hypothesize that *firm characteristics determines corporate governance (Proposition5 or P5).*
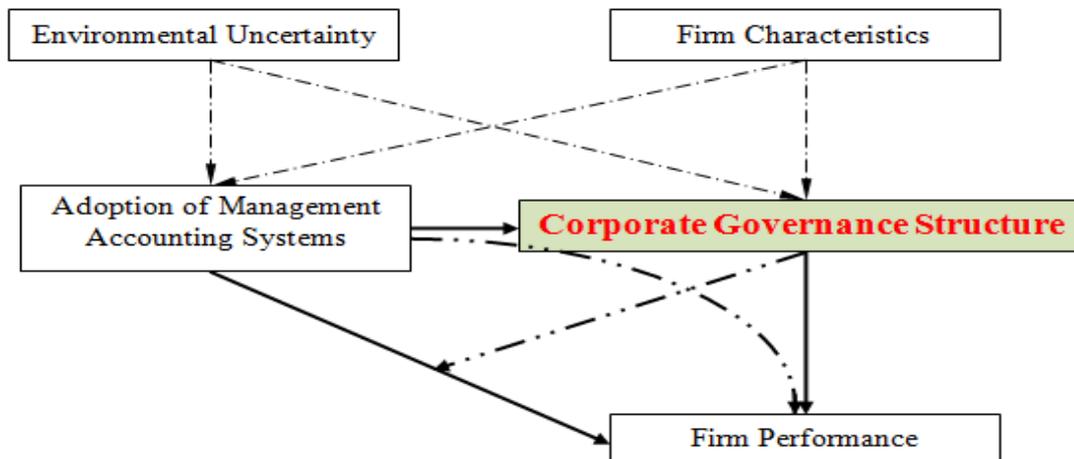

Figure 1. Research Model

The above-discussed hypotheses and propositions enable us to build a research model given in Figure 1 stating that while corporate governance structure is related to firm performance, it is affected by the adoption level of management accounting systems in business, which in turn also leads to better firm performance. Furthermore, corporate governance structure is stated to play both the mediating and moderating roles in the link between the adoption level of management accounting systems in business and firm performance. In addition, environmental uncertainty and firm characteristics also affect corporate governance structure as well as the adoption level of management accounting systems.

3. Research Methodology

This research used a population of the publicly listed firms in the two Vietnamese Stock Exchanges, which was totally consisted of 705 firms (397 in Ha Noi Stock Exchange and 308 in Ho Chi Minh Stock Exchange). Before collecting the data for the research analyses, we conducted a pilot test for variable measurements with 20 managers involved in management accounting to ensure that our variable measurements are valid and appropriate for the study (Donna et al. 2011). In addition to information available in their statements and reports, we sent the initial emails to solicit responses from main informants with experience in management accounting. Then, we conducted the questionnaire with a relevant manager for each targeted firm. The questionnaires were delivered to 475 firms by email and face-to-face interviewed with managers in the 230 others. Having gathered the responses, we removed those without necessarily sufficient information. Our final sample consists of the 331 responses with adequately required information. The data was collected, based on the measurements of the variables as described as follows. *Corporate Governance Structure (CGS)* is referred to as the majority of outside directors (CGS1) and outside supervisors (CGS2) that are coded as 1 if the proportion of outside directors/supervisors is more than 50% and otherwise as 0, as well as the leadership separation of chairman and CEO (CGS3) that is coded as 0.combined leadership or 1.separate leadership (Brown and Caylor 2004;

Edwards and Clough 2005; Kyereboah-Coleman 2007; Bhagat and Bolton 2008). *Adoption of Management Accounting Systems (MAS)* is evaluated by using a five-point scale. The measurement ranges from 1.never considering, 2.decided not to introduce, 3.favored to introduce, 4.intended to introduce, to 5.under implementation of MAS, adapted from Cinquini et al. (2008). The six dimensions that are traditional budgeting (MAS1), cost volume profit analysis (MAS2), variance analysis (MAS3), activity based costing (MAS4), total quality management (MAS5) and balanced scorecard (MAS6), are employed for the factor "MAS". These six dimensions are suggested by the prior studies (Lucas 1997; Hyvonen 2005; Al-Omiri and Drury 2007). *Firm Performance (FPF)* is based on both financial performance and non-financial performance. For the financial performance proxy, we use the two items that are return on asset- FPF1 and return on equity- FPF2, which are modified from Droge et al. (2003). For the non-financial performance proxy, we employ the three items, namely innovativeness- FPF3, quality in products or services- FPF4, and customer satisfaction- FPF5, which are adapted from Hudson et al. (2001), and Kaplan and Norton (2007). The items are assessed by using a five-point scale from no growth, a little growth, average growth, fast growth to very fast growth. The items of our sample firms' performance were compared to the industry average over the last year. Furthermore, we also offer the measurements for the other two variables environmental uncertainty and firm characteristics. *Environmental Uncertainty (EUN)* encompasses the five items; namely Government policies (EUN1), Economy (EUN2), Resources and services used by the company (EUN3), Product market and demand (EUN4) and Competition (EUN5); accepted from Miller (1993), Werner et al. (1996), and Brouthers et al. (2002). These items are measured with a five-point scale ranging from 1.always predicted; 2.easily predicted; 3.a little difficult to be predicted; 4.quite difficult to be predicted; and 5.very difficult to be predicted, adapted from Chenhall and Morris (1986) and Jusoh (2010). *Firm Characteristics (CHF)* is constituted by the three variables which are firm size, firm type and firm interdependence. Firm size (CHF1) is measured with three states: 1.small if the total capital is less than VND 10 billion for service sector or less than VND 20 billion for other sectors, 2.medium if it is from VND 10 billion to under VND 50 billion for service sector or from VND 20 billion to under VND 100 billion for other sectors, and 3.large for the others, modified from Nguyen (2009). Firm type (CHF2) is measured with a three-point scale that includes three levels with 1.manufacturing sector, 2.manufacturing-service sector and 3.service sector, modified from Taha et al. (2011) and Brouthers et al. (2002). Firm interdependence or the relationship between sub-units within the company (CHF3) is measured with a three-point scale that includes three descriptions of intra-unit work flow integration: 1.pooled interdependence, 2.sequential interdependence, and 3.reciprocal interdependence, adapted from Chenhall and Morris (1986), and Ibadin and Imoisili (2010).

After obtaining the data, we employ the reliability and confirmatory factor analyses to determine the validity and reliability of the scales. The correlations among the variables are then calculated to test whether the problem of multicollinearity exists in our data. Next, we carry out regression analyses and the directed acyclic graph model to investigate the causal relationships. Then, we apply the procedure suggested by Sobel (1982) to test the statistical significance for the intermediate role of corporate governance structure in the effects of

adopting management accounting systems in business on firm performance. Finally, we will employ the interaction variable analysis to examine the moderating role of corporate governance structure in the relationship between the adoption of management accounting systems and firm performance.

4. Empirical Results

To examine the properties of measurement scales and the items making up the scales, we carry out the reliability analysis, which is a technique calculating a number of commonly used measures of scale reliability and offering information on the correlations between separate items in the scale. The item-total correlation of 'MAS6- balanced scorecard' is 0.336 (untabulated) smaller than 0.5, the preferable level suggested by Nunnally (1978), hence this item is taken away from our data. Eventually, the 21 other items (of the 3 main variables: 3 items for CGS, 5 items for MAS, 5 items for FPF, 5 items for EUN and 3 items for CHF) obtain the good outcomes for the reliability, which is shown in Table 1.

Table 1. Outcomes from Reliability Analysis

Item	Item-total Correlations	Cronbach's Alpha	N of Items
CGS1	0.583		
CGS2	0.583	0.785	3
CGS3	0.710		
MAS1	0.737		
MAS2	0.708		
MAS3	0.672	0.882	5
MAS4	0.771		
MAS5	0.718		
FPF1	0.713		
FPF2	0.612		
FPF3	0.628	0.838	5
FPF4	0.632		
FPF5	0.626		
EUN1	0.681		
EUN2	0.633		
EUN3	0.642	0.834	5
EUN4	0.618		
EUN5	0.617		
CHF1	0.698		
CHF2	0.637	0.821	3
CHF3	0.694		

Table 1 reveals that all the 21 remaining items take their own item-total correlations larger than 0.5. The variable "the majority of outside directors- CGS1" and "the majority of outside supervisors- CGS2" receive the lowest item-total correlation of 0.583; whereas the variable "activity based costing- MAS4" achieves the highest value of 0.771. All of them pass the 0.5 limit suggested by Nunnally (1978). In addition, all the cronbach's alphas exceed the smallest level of 0.7, stipulated by Nunnally (1978). Accordingly, they are reasonably retained for next analyses. Next, we would like to test whether the measures of a factor are consistent with the theoretical notions implied from previous analytic research by performing the confirmatory

factor analysis. The purpose of confirmatory factor analysis is to test if the data fits a hypothesized measurement model. If the fit is poor, it can be because of some items measuring multiple factors or/and some items within a factor are more correlated to each other than to others; as a result, the model will be rejected or/and necessarily reconsidered. The confirmatory factor analysis yields the results exhibited in Tables 2, 3 and 4.

Table 2. Indicators for Goodness of Fit

Fit Index	X^2/df	IFI	TLI	CFI	RMSEA
Value	2.443	0.922	0.907	0.921	0.066
Results	Good	Good	Good	Good	Good

The first criterion to assess the hypothesized measurement model is the goodness of fit to the model. The indicators for evaluating the goodness of fit are provided in Table 2. X^2/df of 2.443 belongs to the range of 2 – 3, the preferable limit proposed by Koufaris and Hampton-sosa (2002). All the indicators IFI, TLI, and CFI exceed 0.9, passing the smallest level suggested by Hair et al. (2009). RMSEA (Root Mean Square Error of Approximation) obtains the value of 0.066 smaller than the 0.08 level offered by Hair et al. (2009). Overall, those indices imply that our hypothesized measurement model satisfies the goodness of fit to the data.

Factor loadings, average variance extracted (AVE) and construct reliability (CR) are specifically considered in order to evaluate convergent validity, in which $AVE = \frac{\sum_{i=1}^{n} L_i^2}{n}$ and

$CR = \frac{\left(\sum_{i=1}^{n} L_i\right)^2}{\left(\sum_{i=1}^{n} L_i\right)^2 + \left(\sum_{i=1}^{n} e_i\right)}$; where: L_i denotes the standardized factor loading of item i, n represents the number of items, and e is the error variance.

As can seen in Table 3, all the factor loadings directly obtained from the confirmatory factor analysis are above 0.5 as the acceptable limit recommended by Hair et al. (2009), in which the correlation of FPF2 to FPF is the lowest at 0.651, while the factor loading of MAS4 to MAS is the highest at 0.834. Additionally, except for the correlations (FPF1 to FPF, MAS1 to MAS, CGS1 to CGS, EUN1 to EUN and CHF1 to CHF) having not obtained P_{value}, because they are constrained to 1, all the other factor loadings are statistically significant at the 0.01 level. In addition, having AVEs bigger than 0.507 and CRs more than 0.791 (as shown in Table 4) has statistically satisfied the smallest levels of 0.5 and 0.6 suggested by Hair et al. (2009). These results suggest adequate convergent validity for our measurement model. Table 4 also indicates that all the average variance extracted estimates (AVE) are larger than the corresponding squared inter-construct correlation estimates (SIC), which implies that our measurement model satisfies discriminant validity (Hair et al. 2009). Furthermore, the interconstruct correlations (IC) are all below 0.8, the largest level stipulated by Kennedy (1992), which suggests that the problem of multicollinearity does not occur for our model. The above findings reveal that the retained variables in our model are adequately reliable for further analyses.

Table 3. Factor Loadings

Relationships			Estimate	Standardized Estimates	P_{value}
FPF1	<---	FPF	1.000	0.809	
FPF2	<---	FPF	0.881	0.651	0.000
FPF3	<---	FPF	0.977	0.708	0.000
FPF4	<---	FPF	1.000	0.727	
FPF5	<---	FPF	0.895	0.680	0.000
MAS1	<---	MAS	1.000	0.808	0.000
MAS2	<---	MAS	1.026	0.776	0.000
MAS3	<---	MAS	1.015	0.714	0.000
MAS4	<---	MAS	1.035	0.834	
MAS5	<---	MAS	1.131	0.762	0.000
CGS1	<---	CGS	1.000	0.720	0.000
CGS2	<---	CGS	0.998	0.719	0.000
CGS3	<---	CGS	1.112	0.801	0.000
EUN1	<---	EUN	1.000	0.772	
EUN2	<---	EUN	0.834	0.713	0.000
EUN3	<---	EUN	1.044	0.714	0.000
EUN4	<---	EUN	0.737	0.672	0.000
EUN5	<---	EUN	0.768	0.684	0.000
CHF1	<---	CHF	1.000	0.806	
CHF2	<---	CHF	0.877	0.745	0.000
CHF3	<---	CHF	0.901	0.789	0.000

Table 4. Matrix of AVE, CR, IC and SIS

	CGS	MAS	FPF	EUN	CHF
CGS		0.263	0.386	0.124	0.197
MAS	0.513		0.399	0.189	0.247
FPF	0.621	0.632		0.118	0.102
EUN	0.352	0.435	0.343		0.006
CHF	0.444	0.497	0.320	0.079	
AVE	0.559	0.608	0.514	0.507	0.609
CR	0.791	0.886	0.840	0.837	0.824

Values below the diagonal are AVE, CR and interconstruct correlations (IC)
Values above the diagonal are squared interconstruct correlations (SIC)

The causal relationships in our research are explored with regression analyses that generate the results presented in Table 5. It is shown that the adoption of management accounting systems will support corporate governance structure at the 0.01 significance level. The variable the adoption of management accounting systems accounts for 19.6% of the variation in corporate governance structure. The results also indicate that good corporate governance structure will result in improved performance for the firm. The statistical evidence on the relationship between the adoption of management accounting systems and firm performance is statistically supported by our findings at the 0.01 significance level. In addition, adopting management accounting systems in business is also found out to improve firm performance at the significance level of 0.01, in which the adoption of management accounting systems by itself explains 29.9% of variance in firm performance. However, the explanation increases to

39.3%, when corporate governance structure is entered into the model together with the adoption of management accounting systems to consider firm performance. The inclusion of corporate governance structure will reduce the effect of adopting management accounting systems on firm performance from 0.455 down to 0.329. Furthermore, environmental uncertainty and firm characteristics statistically affect corporate governance structure at the 0.01 significance level. They together with the adoption of management accounting systems in business jointly explain 26.7% of variation in corporate governance structure. Overall, our hypotheses H1, H2 and H3 as well as propositions P3 and P5 are statistically supported, which is consistent with previous research that adopting management accounting systems in business will improve firm performance as well as lead to better corporate governance structure, which in turn also brings about improved performance for the firm. Corporate governance structure is also driven by external and internal factors such as environmental uncertainty and firm characteristics.

Table 5. Regression Results

Explained Variable	Explanatory Variable	Coefficients	Standard Error	t-statistics	P_{value}	R^2	Supported
CGS	MAS	0.231	0.026	8.948	0.000	0.196	H1
CGS	MAS	0.140	0.030	4.732	0.000	0.267	H1
	EUN	0.107	0.030	3.510	0.001		P3
	CHF	0.155	0.033	4.753	0.000		P5
FPF	MAS	0.455	0.038	11.487	0.000	0.299	H3
FPF	MAS	0.329	0.040	8.243	0.000	0.393	H3
	CGS	0.546	0.076	7.145	0.000		H2

Furthermore, to assess the robustness of the results obtained from the regression analyses, we carry out the directed acyclic graph (DAG) model to explore the causal relationships among corporate governance structure, the adoption of management accounting systems and firm performance with the control variables "environmental uncertainty" and "firm characteristics". The software TETRAD IV, which is one of the remarkable programs for evaluating causal models, is applied to undertake the DAG analysis. The DAG model, which can be employed to differentiate actual cause from spurious cause in a set of data, clearly distinguishes direct cause from indirect cause (Wang 2010). The results obtained from the DAG analysis are presented in Figure 2 and Table 6. The outcomes of Figure 2 and Table 6 reveal that adopting management accounting systems in business will enhance corporate governance structure as well as improve firm performance with the coefficients of 0.140 and 0.329 at the 0.01 significance level respectively; whereas good corporate governance structure results in better firm performance with the coefficient of 0.544 at the 0.01 significance level. In addition, environmental uncertainty and firm characteristics are discovered to influence both the adoption of management accounting systems and corporate governance structure at the 0.01 significance level. The findings from the DAG analysis are consistent with those from the regression analyses, in which our hypotheses H1, H2 and H3 as well as propositions P3 and P5 are statistically supported at the significance level of 0.01. Consequently, the results- which statistically support our hypotheses H1, H2 and H3 that corporate governance structure is a determinant of firm performance, but is boosted by the adoption of management accounting

systems in business, which is in turn also a causality of firm performance- are robust across both the procedures (Regression and DAG analyses). Additionally, propositions P2 and P4 are also statistically supported at the 0.01 level of significance, in which environmental uncertainty and firm characteristics are the drivers leading to the adoption of management accounting systems.
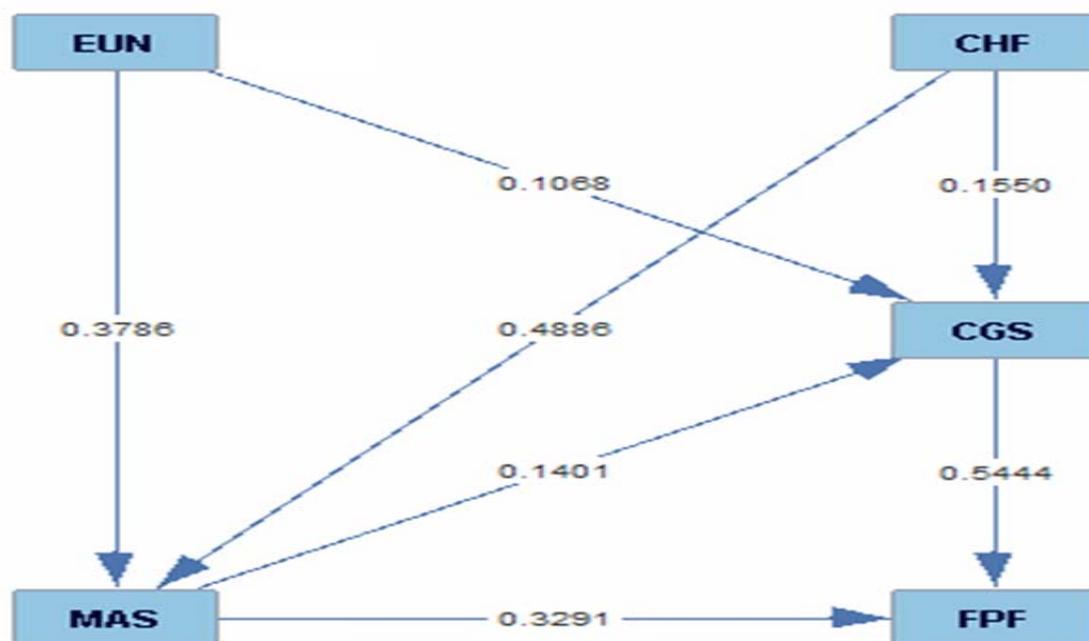

Figure 2. Research Model

Table 6. Results from the DAG analysis

Explained Variable	Explanatory Variable	Coefficients	Standard Error	t-statistics	P_{value}	Supported
MAS	EUN	0.379	0.053	7.203	0.000	P2
	CHF	0.489	0.054	8.978	0.000	P4
CGS	MAS	0.140	0.030	4.750	0.000	H1
	EUN	0.107	0.030	3.528	0.005	P3
	CHF	0.155	0.033	4.767	0.000	P5
FPF	CGS	0.544	0.076	7.158	0.000	H2
	MAS	0.329	0.039	8.274	0.000	H3

Next, the mediating role of corporate governance structure in the effect of adopting management accounting systems on firm performance is examined with a method produced by Sobel (1982), which utilizes a t-test to investigate the statistical significance for the indirect effect of the mediating variable by testing the null hypothesis that there is no the indirect impact of the mediating variable on the relationship between the independent variable and the dependent variable, in which t-statistics is a ratio of the indirect coefficient to its standard error $(t_{indirect} = \frac{b_{indirect}}{s_{b_{indirect}}})$. Table 5 implies that the addition of corporate governance structure in the relationship between the adoption of management accounting systems and firm performance

will lessen the effect of adopting management accounting systems on firm performance from 0.455 to 0.329 at the 0.01 significance level; hence we can suggest that corporate governance structure may play a mediating role in the influence of adopting management accounting systems on firm performance. Also based on Table 5, Sobel's procedure yields the results given in Table 7. The finding offers statistical evidence on the mediating effect of corporate governance structure. The association between the adoption of management accounting systems and firm performance is intervened in by corporate governance structure at the 0.01 significance level with t-statistics of 5.587. Accordingly, our hypothesis H4 is statistically supported. When included in the linkage between the adoption of management accounting systems and firm performance, corporate governance structure will diminish this relationship.

Table 7. Results for testing the mediating effect

Mediating Variable	Causal Relationship	$t_{indirect}$	P_{value}	Supported
CGS	MAS on FPF	5.587	0.000	H4

To explore "our Proposition1" that *corporate governance structure may moderate the effect of adopting management accounting systems in business on firm performance*, we use the interactive component "CGS*MAS" and test whether it affects firm performance (FPF). The results are provided in Table 8. The results illustrate that the factor "CGS*MAS" statistically impacts on firm performance at the 0.01 significance level with the coefficient of 0.125. The component "CGS*MAS" and the variable "the adoption of management accounting systems-MAS" explain 38.4% of the variation in firm performance. The findings implies that an improvement in corporate governance structure by 1 unit will increase the influence of adopting management accounting systems in business against firm performance by 0.125 unit. Consequently, corporate governance structure is statistically evidenced to moderate the linkage between the adoption of management accounting systems in business and firm performance. Rather, better corporate governance structure in a firm will boost the relationship between the adoption of management accounting systems and firm performance.

Table 8. Results for testing the moderating effect

Explained Variable	Explanatory Variable	Coefficients	Standard Error	t-statistics	P_{value}	R^2	Supported
FPF	MAS	0.285	0.044	6.445	0.000	0.383	P1
	CGS*MAS	0.125	0.019	6.675	0.000		

In summary, the findings reveal that the adoption of management accounting systems in business will enhance corporate governance structure that in turn leads to improved firm performance. A higher adoption level of management accounting systems also results in more improved firm performance. More importantly, corporate governance structure is statistcially evidenced as both a mediator and a moderator in the relationship between the adoption of management accounting systems and firm performance. These findings are consistent with the previous research as above discussed.

5. Conclusions

Prior studies have investigated the causal relationships among corporate governance structure, the adoption of management accounting systems and firm performance. However, none of them have discussed and explored the mediating and moderating roles of corporate governance structure in the association between the adoption of management accounting systems and firm performance, although corporate governance structure plays an important role in the linkage between the adoption of management accounting systems and firm performance by mediating and moderating mechanisms. This study discusses and examines the mediating and moderating role that corporate governance structure takes in affecting the relationship between the adoption of management accounting systems in business and firm performance. It also re-specifies the causal links among corporate governance structure, the adoption of management accounting systems and firm performance. Furthermore, this research takes into account the two controlling variables "environmental uncertainty" and "firm characteristics" when investigating the causal relationships among corporate governance structure, the adoption of management accounting systems and firm performance, and consequently our findings are more reliable.

The regression analyses offer statistical evidence on the causal relationships. While the adoption of management accounting systems determines corporate governance structure as well as firm performance, good corporate governance structure leads to improved firm performance. This research also performs the robustness test for the results obtained from the regression analyses by undertaking the DAG analysis, which produces the similar results to those of the regression analyses, in which corporate governance structure is statistically evidenced as a causation of firm performance, but is affected by the adoption of management accounting systems that is also a cause of firm performance. The findings for the causal relationships are consistent and robust across both the regression analyses and the DAG analysis. More importantly, this paper employs Sobel's procedure to investigate the mediating effect of corporate governance structure and the interaction factor "CGS*MAS" to examine the moderating influence of corporate governance structure. The findings from these analyses reveal that corporate governance structure both mediates and moderates the causal relationship between the adoption of management accounting systems in business and firm performance. This paper makes some contributions to the literature by providing new statistical evidence on the mediating and moderating roles of corporate governance structure in the influence of adopting management accounting systems in business on firm performance. When investigating the factors related to firm performance including corporate governance structure and the adoption of management accounting systems, researchers should take the mediating and moderating role of corporate governance structure in the relationship between the adoption of management accounting systems and firm performance into account. This paper also offers business managers with better understanding of the complicated associations among corporate governance structure, the adoption of management accounting systems and firm performance. Hence, they can make better decisions on the choice of management accounting systems that match with the corporate governance structure of their firm, which will help them to achieve competitive advantages as well as better firm performance.

Although, we make some valuable contributions to the literature as well as to the practice, this research still suffers some limitations. The first limitation is that our data is based on one single informant from each firm; consequently there may be a problem of response bias. Future research should employ a multi-informant research design to overcome this potential selection bias. Another limitation is that this research is conducted in Vietnam as a Southeast Asian country, but our findings are expected for use in other countries. Business environments among economies may be different, therefore one should generalize our findings with care. Moreover, in addition to the two factors affecting Corporate Governance Structure and Adoption of Management Accounting Systems that are Environmental Uncertainty and Firm Characteristics, which has been above mentioned; Corporate Governance Structure and Adoption of Management Accounting Systems may be driven by other factors such as Firm Structure or Firm Culture. Future studies can include these factors into the research model in order to examine the relationships discussed in this research. Hence, the resulting findings may reflect a more overall picture.

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