



Corporate governance, innovation investment and firm performance: evidence from Malaysian public listed companies

Guvernanța corporativă, investiția de inovație și performanța firmei: studiu asupra companiilor publice listate din Malaezia

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Abstract

Increasing attention is given in monitoring the management team by the shareholders through corporate governance mechanism. This is to ensure that every strategic business decisions maximize shareholders' wealth. Unlike previous studies which identified a direct relationship between corporate governance mechanism and performance, this study is conducted to examine the moderating impact of the corporate governance mechanism on the relationship between innovation investment proxies by R&D expenditures and firm performance. Our findings concluded that board compensation and frequency of board meeting are considered as important characteristics that would determine the effectiveness of the innovation investment. Thus, in analyzing the innovation investment incurred by the firm, investors should review the corporate governance characteristics as it would determine the effectiveness of the innovation investment in improving firm performance.

Keywords: *corporate governance; innovation; performance*

Rezumat

O atenție deosebită este acordată monitorizării echipei de management de către acționari prin mecanismul de guvernanță corporativă. Aceasta are scopul de a asigura că toate deciziile strategice de afaceri vor maximiza averea acționarilor. Spre deosebire de studiile anterioare, care au identificat o relație directă între mecanismul de guvernanță corporativă și performanță, acest studiu este realizat pentru a examina impactul moderator al mecanismului de guvernare corporativă asupra relației dintre investițiile de inovație reprezentate prin cheltuielile de Cercetare & Dezvoltare și performanțele firmei. Rezultatele noastre au identificat compensarea bordului de conducere, precum și frecvența reuniunii bordului ca fiind caracteristici importante care ar determina eficiența investiției de inovație. Astfel, în analiza investițiilor de inovație suportate de firmă, investitorii trebuie

să revizuiască caracteristicile guvernărilor corporative, deoarece astfel ar putea determina eficiența investiției de inovație în îmbunătățirea performanței firmei.

Cuvinte-cheie: *guvernarea corporativă; inovație; performanță*

JEL Classification: G34

Introduction

Agency theory explains the relationship between the principal who is the owner of the economic resources and the agent who is the controller and manager of the resources (Jensen & Meckling, 1976).

In addition, agency theory was developed based on the assumption that the agents have more information than the principals, which caused difficulty to the principals in monitoring the agents effectively (Adams, 1994). Thus, due to the advantage of having more information on the economic resources, the agents tend to maximize their self-interest rather than the owners' wealth. In this connection, corporate governance has been applied by most of organization as a set of mechanisms to influence the decisions made by agents when there is a separation of ownership and control. By having good corporate governance practices, managerial opportunism can be reduced.

One of the areas where managerial opportunism can occur is innovation investment described as research and development (R&D) expenditure. This is because the managers may manipulate R&D investment when there is a conflict of interest between the principals (shareholders) and the agents (managers) of the firms. Shareholders may be interested to see that the organization rigorously involves in R&D activities in order to ensure that the firm performance in future will be improved. However, lack of experiences and time spent in the R&D activities may cause managers to spend the financial resources inefficiently and ineffectively. Besides, R&D is one of the significant areas within any corporate entity as it could determine the future performance of the firms. Wang and Chang (2005) mention that previous studies have found that R&D expenditure is not only influence current performance and market value but also future performance.

In relation R&D expenditures in Malaysia, the survey conducted by Ministry of Science, Technology and Innovation Malaysia indicated that research and development (R&D) expenditure has been steadily and consistently growing since 1996. The expenditure by private sectors which are the major contributor toward R&D activities in Malaysia has increased by RM400.5 million, from RM1.63 billion in 2002 to RM2.03 billion in 2004. This phenomenon indicates that more and more companies put a greater emphasis on R&D activities. Relying on this trend, it is interesting to discover the impact of the R&D investment on the

firms' performance in the existence of corporate governance monitoring mechanism which has not been concluded.

Literature review

Innovation investment and firm performance

Most of the prior studies find that innovation through R&D activity is one of the factors that contribute to the firm growth particularly in the high-tech industry (Chan, Martin & Kensinger, 1990; Huang and Lin, 2006). This is because innovation could improve employee's productivity and efficiency which lead to improvement in firm performance (Dougherty & Hardy, 1996; Lawless & Anderson, 1996; Li & Deng, 1999). Most previous studies found that there is a significant and positive correlation between research and development (R&D) expenditures and business performance as well as market value. (Huang & Lin, 2006; Cockburn & Griliches, 1988; Hall, 1993). Chauvin and Hirschey (1993) conclude that R&D expenditures have consistently significant, positive influences on the market value whereby higher R&D expenditures attract higher expectation of future cash flow by the investors. Based on these findings, the following hypothesis is proposed:

H1: There is a positive relationship between innovation investments and firm performance.

Innovation investment and board size on firm performance

Earlier studies find there is positive relationship between board size and firm performance (Kogan & Wallach, 1966; Moscovici & Zavalloni, 1969; Sah & Stiglitz, 1986; Khanchel, 2007). As explained by Khanchel (2007), the quality of corporate governance can be influenced by the size of the board. Cheng (2008) finds that the board size could manipulate the innovation investment through R&D expenditure which will have an impact on firm performance. As such, larger board size tends to be less likely involves with high-risk projects. Following from these findings, Hypotheses H2 is proposed:

H2: The positive association between innovation investments on firm performance is stronger for firms with larger board size.

Innovation investment and board independence on firm performance

Chung, Wright and Kedia (2002) find that there is significant and positive relationship between R&D investments and the firm value but only for firm with higher proportion of outside directors. Consistent with this finding, Adam and Mehran (2003) also conclude that firm performance can be improved by improving the proportion of outside directors since they are more effective in monitoring manager performance. Coles et al (2007) suggest that the existence of outside directors in the board tend to better discipline managerial behavior. As such, it can

be said that managers are likely to act to maximize shareholders' wealth rather than pursuing personal interest. Based on these findings, the following hypothesis is proposed:

H3: The positive association between innovation investments on firm performance is stronger for firms with higher fraction outside directors.

Innovation investment and number of board meeting on firm performance

The effectiveness of the board can be improved by spending more time for board meeting. Shivdasani and Zenner (2004) explain that where there is requirement for tight control and supervision, the board should be ready to increase the number of meetings frequency. Based on this findings, it can be said that board meeting is one the significant methods for the board to discuss on the relevant issues in relation to the firm. These findings also suggest that there is a positive relationship between board meeting and firm performance. As such, the following hypothesis is proposed:

H4: The positive association between innovation investments on firm performance is stronger for firms with higher frequency of board meetings.

Innovation investment and CEO duality on firm performance

Rechner and Dalton (1991) find that firms with separate roles consistently perform better than firms with combined roles. Consistent with this study, Pi and Timme (1993) also find in their study the firms that separate roles of CEO and Chairman shows higher Return on Assets and cost efficiency ratios. Yermack (1996) also states that separation of the two functions leads to higher price-to-book multiples. These finding shows there are potential positive relationship between CEO duality and firm performance. Based on these arguments, the following hypothesis is proposed:

H5: The positive association between innovation investments on firm performance is stronger for firms with no role duality.

Innovation investment and compensation on firm performance

Most previous studies find that that there is a positive relationship between board compensation and firm performance (Kakabadse & Kakabadse, 2001; Brick, Palmon & Wald, 2006; Aggarwal & Samwick, 2006). Brick, Palmon and Wald (2006) explain that this could be due to the fact that compensation is a source of directors' motivation for improving firm performance. Kakabadse and Kakabadse (2001) suggest that in order to influence board of directors to improve firm performance, firm need to offer appropriate compensation. As such, this study proposes the following hypotheses:

H6: The positive association between innovation investments on firm performance is stronger for firms with higher board compensation.

Research design

The objective of this study is to investigate the moderating impact of corporate governance characteristics on the relationship between innovation investments proxies by R&D expenditure and firm performance. The sample of the study consists of non-financial public listed firms listed on MESDAQ, Main Board and Second Board of Bursa Malaysia whose annual reports available in 2005. All the finance related firms, bank, insurance and unit trust are excluded from the sample due to their differences in the regulatory requirement and financial reporting standards and compliance. A final sample of 100 companies is selected based on disclosure of the R&D expenditures in their annual reports for 2005. The data on the ROA and ROE are collected for 2005 to 2007 in order to compute average firm performance. The descriptions of the variables used in this study are summarized in Table 1.

Description of variables

Table 1

Variables	Acronym	Description
Dependent		
Return of Equity	ROE	Net income/ common stockholders' equity
Return on Asset	ROA	Net income/ total assets
Independent		
R&D Expenditure	RnDAsset	R&D expenditure/ total assets
Moderator		
Size of board of directors	Size	Number of directors in the board
Board independence	Indept_R	Total outside directors / total board
No. of board meeting	Meet	Number of board meetings held
CEO Duality	Duality	Indicator of 1 if duality, 0 for separate roles
CEO Compensation	Compen	Logarithm of compensation for director in 2005
Control		
Firm size	LogAsset	Logarithm of firms total asset

Model specification

The following regression equations have been used as the primary model to test the hypotheses. Each model will contain the interaction term of R&D expenditures (RnDAsset) as a proxy for innovation investment and corporate governance mechanisms. The general model of this study can be described as follows:

$$Perf = \beta_0 + \beta_1 RnDAsset + \beta_2 LogAsset + \beta_3 Size + \beta_4 Indept_R + \beta_5 Meet + \beta_6 Duality + \beta_7 Compen + \beta_8 Interaction\ term + \epsilon$$

The specific models for each interaction term of R&D expenditures (RnDAsset) and corporate governance mechanisms are the following:

$$\text{Perf} = \beta_0 + \beta_1 \text{RnDAsset} + \beta_2 \text{LogAsset} + \beta_3 \text{Size} + \beta_4 \text{Indept_R} + \beta_5 \text{Meet} + \beta_6 \text{Duality} + \beta_7 \text{Compen} + \beta_8 \text{RndxSize} + \epsilon$$

$$\text{Perf} = \beta_0 + \beta_1 \text{RnDAsset} + \beta_2 \text{LogAsset} + \beta_3 \text{Size} + \beta_4 \text{Indept_R} + \beta_5 \text{Meet} + \beta_6 \text{Duality} + \beta_7 \text{Compen} + \beta_8 \text{RndAssetxIndept_R} + \epsilon$$

$$\text{Perf} = \beta_0 + \beta_1 \text{RnDAsset} + \beta_2 \text{LogAsset} + \beta_3 \text{Size} + \beta_4 \text{Indept_R} + \beta_5 \text{Meet} + \beta_6 \text{Duality} + \beta_7 \text{Compen} + \beta_8 \text{RndAssetxMeet} + \epsilon$$

$$\text{Perf} = \beta_0 + \beta_1 \text{RnDAsset} + \beta_2 \text{LogAsset} + \beta_3 \text{Size} + \beta_4 \text{Indept_R} + \beta_5 \text{Meet} + \beta_6 \text{Duality} + \beta_7 \text{Compen} + \beta_8 \text{RndAssetxDual} + \epsilon$$

$$\text{Perf} = \beta_0 + \beta_1 \text{RnDAsset} + \beta_2 \text{LogAsset} + \beta_3 \text{Size} + \beta_4 \text{Indept_R} + \beta_5 \text{Meet} + \beta_6 \text{Duality} + \beta_7 \text{Compen} + \beta_8 \text{RndAssetxCompen} + \epsilon$$

where

β_0	= Intercept
Perf	= Operating Performance measured by Return on Equity (ROE) = Operating Performance measured by Return on Assets (ROA)
RnDAsset	= R&D Expenditures / Total Assets
LogAsset	= Logarithm of Total assets
Size	= Board Size
Indept_R	= Board Independence
Meet	= Board Meeting
Duality	= CEO Duality
Compen	= Board Compensation
ϵ	= Error term

The data is analyzed by using SPSS (Statistical Package of Social Science). According to Hartmann and Moers (1999:293), moderated regression analysis is the appropriate statistical technique when the hypotheses involve testing of interaction term. The interaction effect is due to the interaction of moderator variables with the independent variable to change the relationship between independent and dependent variables (Hair et al, 2006). In order to test the interaction effect, the hierarchical regression technique is used whereby interaction term is regressed one by one in order to examine the added value to the explanation of the relationship. In this study, the general model is regressed first in order to assess the “direct effect” of the independent, moderating and control variables on the relationship between innovation investment (R&D expenditure) and firm performance (ROA and ROE). Next, separate regressions are conducted in order to determine the effect of the interaction terms on the relationship between R&D expenditure and ROA/ROE.

Data analysis and empirical results

Descriptive Analysis

The descriptive statistics summarize the data in relation to dependent variables, independent variables, moderator and control variables. The descriptive analysis is presented in Table 2.

Summary of descriptive statistics

Table 2

	Min	Max	Mean	Standard Deviation	Skewness	Kurtosis
Return on Equity	-46.43	44.53	3.85	17.73	-0.49	0.14
Return on Asset	-0.43	0.70	0.02	0.15	0.16	4.91
R&D per Total Asset	0.00	0.89	0.11	0.16	2.83	9.66
Log Asset	3.54	7.61	4.82	0.64	1.50	3.84
Board Size	4.00	13.00	6.96	1.94	0.81	0.44
Board Independence Ratio	0.20	0.80	0.37	0.09	1.43	4.07
Board Meeting Compensation	1.00	12.00	4.09	2.31	0.99	2.76
	5.00	7.00	5.88	0.48	-0.35	1.09

N = 100

In respect of the dependent variables, the minimum ROE is -46.43. This indicates that some of the companies within the sample experiencing financial loss during the financial year 2005, 2006 and 2007. Similarly, ROA also is showing a negative figure for the minimum ROA. As such, this could be due to the similar explanation on the ROE.

In connection with dependent variables, Table 2 shows that some of the companies incurred very minimal expenditures on R&D activities. Meanwhile, some companies spent very huge amount approximately 90% of total assets on R&D activities. This could be the companies which highly focus on technological advancement. In addition, another explanation is that it could be due the companies which at preliminary stage of setting up R&D facilities whereby huge investment is required.

Descriptive statistics for moderating variables are also shown in Table 2. First, the average board size is seven members with minimum of four and maximum of 14. Even though Malaysian Code of Corporate Governance (MCCG) does not mention the requirement for board size, the board with seven members could be considered optimal for most of the firms since it will be more effective on the basis of less communication problem as compared to 14 members (Yermack, 1996). Second, for board independence ratio, the minimum and maximum outside directors are 20% and 80% respectively. On average most of the firms have approximately 40% of outside directors. This shows that most of firms prefer internal directors even though outside directors are considered better monitors. This could be due to the fact that Malaysian business owners prefer internal directors because of coordination and communication easiness apart from the fact

that family ownership is a prominent in the Malaysian corporate sector. Third, as shown in Table 2, the highest number of board meetings conducted was 12. However, on average most of the companies were having four meetings during 2005.

Frequency of CEO Duality

Table 3

	Frequency	Percent	Valid Percent	Cumulative Percent
Other	73	73	73	73
Duality	27	27	27	100
Total	100	100	100	

Based on Table 3, 27% of the companies prefer CEO duality and 73% of the companies separate the CEO and board roles. This could be due to the fact that most of the companies in Malaysia follow MCCG recommendation that the roles should be separated. In addition, it also could be due the effectiveness of board of directors when there is a separation of CEO and board of directors (Vafeas & Theodorou, 1998).

Hypothesis Testing

The regression analysis is firstly conducted to examine the direct effect of the independent variables on the dependent variable. As indicated in Table 4, the explanatory power, R^2 is 0.23 when using ROE as the dependent variable. Further analysis indicates that RnD per Total Asset has a significant negative relationship with ROE ($p < 0.01$). Using ROA as a dependent variable, it shows that the R^2 increased to 0.37. Similar to earlier test, the regression analysis shows that RnD per Total Asset has significant negative relationship ($p < 0.05$) with ROA.

The main objective of the study is to investigate the interaction effect of innovation investment proxies by R&D expenditure and corporate governance characteristics on firm performance. Based on Table 4 and 5, it shows that the interaction of board size is not significant. As such, it can be concluded that board size does not have moderating impact on the relationship between R&D expenditures and; ROA and ROE. Thus, this result does not support hypothesis H2.

Analysis was also carried to evaluate the interaction effect of board independence on the relationship between R&D expenditures and ROE and ROA. Consistent with the earlier results, Table 4 and 5 again show that there is insignificant effect. As such, board independence does not moderate the relationship between R&D expenditures and ROE and ROA. This means that H3 is not supported. This implies that board independence does not have moderating effect on the relationship between innovation investment and firm performance.

**Hierarchical Regression Examining R&D Expenditure,
Corporate Governance Mechanisms and ROE**

Table 4

Model 1: Return on Equity (ROE)

Variables	Direct Effect		Interaction Effect			
	Set 1	Set 2	Set 3	Set 4	Set 5	Set 6
	B	B	B	B	B	B
R&D per Total Asset	(0.41) ***	(0.21)	(0.58)	(0.83) **	(0.45) ***	(3.21) **
Log Asset	0.01	(0.01)	0.01	0.03	0.01	0.01
Board size	(0.02)	0.00	(0.02)	(0.01)	(0.01)	0.02
Board independent ratio	0.06	0.06	0.04	0.08	0.07	0.09
Board meeting	(0.24) **	(0.23) **	(0.23) **	(0.33) **	(0.24) **	(0.23) **
CEO duality	0.09	0.09	0.09	0.10	(0.00)	0.09
Compensation	(0.00)	(0.01)	0.00	(0.02)	(0.01)	(0.16)
RnDAssetxSize		(0.20)				
RnDAssetxIndept_R			0.18			
RnDAssetxMeet				0.45		
RnDAssetxDuality					0.16	
RnDAssetxCompen						2.80 **
F-Statistic	3.89 ***	3.40 **	0.34 **	3.58 ***	3.63 ***	4.07 ***
R2	0.23	0.23	0.23	0.24	0.24	0.26
Adjusted R2	0.17	0.16	0.16	0.17	0.18	0.20

Note: *p<0.10, **p<0.05 and ***p<0.01 indicate the significance at the 0.10, 0.05 and 0.01 levels, respectively.

The interaction term of board meeting is also included in the regression analysis. Using ROA as a proxy for performance indicates that there is insignificant effect. However, the result in Table 5 shows that there is a significant positive effect ($p < 0.1$) between R&D expenditures and ROE. Therefore, board meeting moderates the relationship between innovation investments and ROE. As such, H4 is partially supported.

Hierarchical Regression Examining R&D Expenditure, Corporate Governance Mechanisms and ROA

Table 5

Variables	Model 2: Return on Asset (ROA)					
	Direct Effect		Interaction Effect			
	Set 1	Set 2	Set 3	Set 4	Set 5	Set 6
R&D per Total Asset	B (0.48) ***	B (0.11)	B (0.73)	B (1.18) **	B (0.51) ***	B (4.06) **
Log Asset	(0.10)	(0.12)	(0.10)	(0.05)	(0.10)	(0.09)
Board size	(0.05)	(0.02)	(0.06)	(0.04)	(0.05)	0.00
Board independent ratio	(0.02)	(0.04)	(0.06)	0.00	(0.02)	0.01
Board meeting	0.02	0.02	0.02	(0.13)	0.02	0.03
CEO duality	0.06	0.06	0.06	0.09	(0.00)	0.06
Compensation	0.10	0.10	0.11	0.08	0.10	(0.10)
RnDAssetsxSize		(0.38)				
RnDAssetsxIndept_R			0.25			
RnDAssetsxMeet				0.75 *		
RnDAssetsxDuality					0.11	
RnDAssetsxCompen						3.58 **
F-Statistic	0.37 **	3.30 **	3.22 **	3.77 ***	3.32 **	4.34 ***
R2	0.22	0.23	0.22	0.25	0.23	0.28
Adjusted R2	0.16	0.16	0.15	0.18	0.16	0.21

Note: * p<0.10, **p<0.05 and *** p<0.01 indicate the significance at the 0.10, 0.05 and 0.01 levels, respectively.

The interaction effect of CEO duality is also assessed and the results are shown in Table 4 and 5. It proves that the relationship is not significant which means that CEO duality does not have moderating impact on the relationship between innovation investment and firm performance. As such, H5 (a) and H5 (b) is not supported.

Finally, the analysis investigates the interaction effect of board compensation on the relationship between R&D expenditures and; ROA and ROE. Based on table 4 and 5, there is a significant positive ($p < 0.05$) effect which means that board compensation moderate the relationship between R&D expenditures and both ROA and ROE. Therefore, H6 which stated that a positive association between innovation investments on firm performance is stronger for firms with higher board compensation is supported.

Discussion of findings

This study examines the moderating effect of corporate governance characteristics on the relationship between innovation investments and firm performance. The result of direct effect has indicated that there is negative significant relationship between R&D expenditures and ROE and also with ROA. The inverse relationship could be due to the fact that huge R&D expenditure reduces the firm's net return for the year that may lead to inferior financial performance. This finding consistent with the earlier study conducted by Chen, (Cheng & Hwang, 2005). In addition, this finding may also suggest that performance period in which the benefits of R&D expenditures should be reflected is too short. It may be necessary to look at the performance period which extends for more than three years after the R&D expenditures have incurred. This may require another study for further investigation.

The main objective of the study is to investigate the moderating effect of corporate governance characteristics on the relationship between innovation investment proxies by R&D expenditures and firm performance represented by ROE and ROA. Based on the hierarchical regression analysis, interaction effect of board compensation has significant positive effect on the relationship between R&D expenditure and ROE as well as ROA. This implies that board compensation is one of the effective methods to ensure that the R&D projects undertaken by the firms would improve firm performance. This is consistent with previous studies which also find that firm performance can be improved by providing appropriate level of incentives to the directors (Kakabadse & Kakabadse, 2001). This is because compensation is a major source of motivation and encouragement for the directors to improve firm performance (Brick, Palmon & Wald, 2002).

In addition, the study also finds that board meeting also moderates the relationship between R&D expenditure and ROA. This means that by increasing the frequency of meetings, the firm performance can be improved through R&D projects. Basically, this finding is consistent with previous studies i.e. Shivdasani & Zenner, 2004. The reasonable explanation is that by increasing the frequency of board meeting, the evaluation of R&D projects may be carried out more thoroughly and comprehensively. As a result, only projects that could have positive return to the firm will only be selected. Consequently, this would result in better firm performance. In addition, by meeting more frequently, board would be able to monitor and supervise the progress of any R&D projects. As such, necessary actions can be taken on the R&D projects that are not progressing successfully and this will help to improve firm performance.

On the other hand, the interaction effect of other corporate governance characteristic such as board size, board independence and CEO duality do not show any significant interaction on the relationship between R&D expenditures and firm performance. In relation to the interaction effect of board size, the result is not supported could be due to the fact that the quality of board members that determine

the effectiveness of the R&D expenditures rather the board size. This is consistent with previous study by Khanchel (2007) who concludes size of the board has significant impact on the quality of corporate governance. In addition, Cheng (2008) finds that the board size may affect the performance variability through its effect on R&D spending. This is due to the facts that high-risk projects such R&D activities are less attractive to the firm with larger board size.

The result for the interaction effect of board independence ratio on the relationship between R&D expenditures and firm performance is also not significant. This result is consistent with the prior study conducted by Le et al (2006). The reasonable explanation could be due to the fact the outside directors may not be truly independent since they may be under managerial influences (Le et al, 2006). Managerial influences may be due to the existence of consulting relationships or other business connections with the firm, such as attorneys, investment bankers, business partners, and consultants (Ryan & Wiggins, 2004).

The interaction effect CEO duality on the relationship between R&D expenditures and ROE is also not significant. This could be explained on the basis that the CEO who is also a chairman of the board will have a concentrated power base that will permit the CEO to make decisions in their own-self interest and at the expense of shareholders. This is consistent with the previous study that concludes that the combined structure is inappropriate for the most critical power relationships in the firm (Jensen, 1983). In conclusion, in analyzing the R&D expenditures incurred by the firm, investors should review the corporate governance characteristics as it would determine the effectiveness of the R&D investment in improving firm performance. Board compensation and frequency of board meeting are considered as important characteristics that would determine the effectiveness of the R&D investment.

Conclusion

Basically, this study is one of few studies that explicitly investigate the moderating impact effect of corporate governance characteristics on the relationship between R&D expenditures and firm performances. The findings have contributed significantly to the investors particularly in Malaysia in relation to R&D investment made by the Malaysian listed firms. In general, the finding suggests that investor should consider the nature of corporate governance characteristics in analyzing the R&D investment made by the firms. As this study found, some of the corporate governance mechanism may not be an effective way to ensure that the R&D investment undertaken by the firm would improve future performance. This study suggests that board compensation packages and frequency of board meeting may be able to ensure that R&D investment undertaken by the firm would generate positive return in the future.

Conclusion drawn from this study may be subjected to several limitations which could be the potential opportunities for future investigation. First, other

variables that could significantly affect the result may have been excluded from the study. Second, the sample size may be too small which produces difference results. Third, the study was based on three-year performance period which resulted in negative relationship between R&D expenditures and firm performance. As such, longer performance period should be used as it may produce a different result. Fourth, the multiple regression analysis has been used in the study. Other methods such as simultaneous equation techniques or appropriate more robust techniques should be used in order to test the interaction effect on the relationship.

It can be suggested that future studies should consider some modification to the above study. The modifications can be in term of the length performance period as well as the R&D expenditures. In addition, future research should investigate the interaction effect of other corporate governance mechanism such as external mechanism on the relationship between R&D spending and market performance as this may provide different perspective to the investors in analyzing their investment strategies.

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