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CORPORATE GOVERNANCE AND INNOVATION IN MALAYSIA

Shamsullah Shams[1*], Aslan Amat Senin[2], Abdullah Ziarmal[3]

[1]Business Administration Department, Kandahar University, Kandahar, Afghanistan

[2]Faculty of Management, Universiti Teknologi Malaysia, Johor Bahru, Malaysia

[3]Finance and Banking Department, Kandahar University, Kandahar, Afghanistan

[*]shams.sn.dsk@gmail.com

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Abstract: Corporate governance are the internal systems or means that direct and control corporations. It specifies the rules and practices to ensure accountability, fairness, and transparency in a company's relationship with its stakeholders. Innovation considered as the development of a new idea, device or method is deemed to be affected by corporate governance mechanisms both positively and negatively around the world. For Malaysia, there wasn't any study undertaken to show how different mechanisms of corporate governance namely; ownership concentration and characteristics of the board of directors affect innovation. This study is carried out with the purpose to find out how corporate governance affects innovation for Malaysian listed companies. It is a quantitative study using a combination of convenience and systematic random sampling methods to collect data from a population of 993 companies listed in Bursa Malaysia. Probit regression analysis is used to analyze the data. It is found out that meetings frequency of the board of directors has a significant positive relationship with innovation for Malaysian listed companies implying that frequent board meeting results in patent registrations. For other corporate governance mechanisms, there weren't sufficient evidences available to conclude a significant positive or negative relationship with innovation.

Keywords: Innovation, corporate governance, ownership concentration, board of director.

Paper type: Empirical article

Introduction

The principle-agent relationship in corporations made it inevitable to draw up management control mechanisms ultimately resulting into the appearance of corporate governance. Corporate governance is set of certain mechanisms used to align the benefits and interest of finance providers and the company managers where the former tries to make itself sure that the latter would not try opportunistic behavior (Shleifer & Vishny, 1997). Corporate governance mechanisms are classified

as internal and external. Since the internal mechanisms are set by the company itself and have most often linked to innovations, therefore the focus of this particular study will be on internal corporate governance mechanisms specifically on ownership concentration and characteristics of the board of directors.

Innovation is defined as the management of all the activities pertaining to technology development, idea generation, improvement of a manufacturing process, and launching a completely new or an existing improved product (Trott, 2017). It has become a key factor determining the success and sustainability of business organizations guaranteeing its going concern (Kahn, 2018). Corporations all around the world are recently more focused on innovations compared to last few decades where business environment was relatively stable and factors affecting business success were not much versatile. Innovations could take any form including product, process, management, marketing, and production innovation (Trott, 2017). Major indicators of innovation are considered to be patents applications, research and development (R&D) expenditures, new product announcement, and others (Taques et al., 2021).

Both positive and negative relationships have been observed around the world between corporate governance mechanisms and innovation along the years. Ownership concentration as a major mechanism of the board was observed to be affecting innovation both negatively and positively. In study by Wan et al. (2021) it was found out that the ownership concentration negatively affects research and development (R&D) intensity, implying that the more an ownership of a company is cencentrated, the lowest will be the R&D activities in that particular company. It is argued that owners of highly concentrated companies are more likely to utilize resources of a particular company for their own profit rather than using it for other profitable activities like innovation that would have benefited everyone (Su et al., 2008). While on the other hand Succurro and Costanzo (2019) have found out in a study for Italy that successful patent applications are positively affected by ownership concentration, meaning that the more an ownership of a company is cencentrated, the highest will be the number of successful patent applications. Baysinger et al. (1991) have also found out that ownership concentration is more likely to affect innovation positively. The logic behind a positive relationship between the two is argued to be the fact that large owners are focusing more on the market value of a company and are inclined to invest in value generating projects rather than merely focusing on short term profits.

Major characteristics of the board as another major mechanism of the board were also found out to be affecting innovation one way or the other. Li et al. (2020) have found out in study for China that when an independent director of the board has got the relevant technical expertise in a specific operational field of the company, the company should perform way better when it comes to innovation. An independent director is a member of the board of directors of a particular company that does not have any material link with the company and is not part of the company's executive team. It's worth mentiong that this type of directors in a company play a crucial role in speeding up the knowledge transfer through their broad networks outside the organization to bring in specialized knowledge to the organization (Westphal, 1999). Fried et al. (1998) believe that external directors are beneficial in terms of attracting funds and using their specialist knowledge for innovative activities in the company. Kosnik (1987) also believe that this type of directors helps in promoting strategies that increase shareholders wealth including investment in research in development.

However, according to Yoo and Sung (2015) the supervision and advice from external or independent non-executive directors does not always positively affect research and development (R&D) expenditures of a company. These authors argue that the role of independnt non-executive

directors is not to boost research and development activities in a company but to direct the strategic decisions made by shareholders. Therefore, they usually hold back and get cautious and, as a result, may unintentionally affect long term or strategic goals and cast down certain business strategies due to the lack of available information on strategic decisions and merely making decision based on financial information.

The size of the board is cited for having both the positive and negative link with innovation in corporations. Shapiro et al. (2015) believe that sizeable board of directors facilitates access to vast number of resources outside the organization including financial and technological which are deemed essential for carrying out research and development (R&D) activities ultimately leading to innovations. However, it has also been argued that a sizeable board may restrict the board to perform better while making decisions for the long run due to the diversiness of opinions which may later result into distrust and dispute among directors of the board of a particular company (Amason & Sapienza, 1997).

Frequent board meetings are considered to be having a positive impact on a company's performance. Efficient board is deemed to be achieved through more frequent meetings (Vafeas, 1999) and better governance (Chiang & He, 2010) and are expected to play a crucial role in establishing and enhancing a network of relations between the members of the board (Gabrielsson & Winlund, 2000). Such relations among the board members may expedite access to critical resources namely; capital, information, talent, etc., later leading to the reduction of the possible risk of shortage of resources for research and development (Chen & Hsu, 2009). Sierra-Morán et al. (2021) have found out in study that meetings' frequency of the board and the proportion of independent directors and outsiders in the board show the most significant positive correlations with a company's innovative activities. However, a study by Chen (2012) does not support a positive relation between innovation and board of directors meetings' frequency.

As far as now, not a single literature has been found examining the link between corporate governance mechanism and innovation specifically for Malaysia. This study is aimed to find out the relationship between the two and to contribute empirical evidences to the literature pertaining to this particular field of research. Empirical evidences of 100 Malaysian listed companies from a population of around 993 companies listed in Bursa Malaysia are collected and then analyzed in this study to explore how corporate governance affects innovations. It is found out that among the internal corporate governance mechanism, meetings frequency of board of directors has a significant positive relationship with innovation for Malaysian listed companies meaning that, the higher the frequency of the of the board meetings, the more likely for the company to be innovative and register more patents compared to those that have a lower frequency of board meetings. However, for other mechanisms of the corporate governance, there weren't sufficient evidences available to justify either a significant positive or negative relationship between the two.

Results of the study are concluded testing six important hypothesizes developed based on the literature review. Hypothesis 1: Concentrated ownership negatively affects innovation, Hypothesis 2: More non-executive directors in the board negatively affects innovation, Hypothesis 3: Higher number of board meetings has a positive impact on innovation, Hypothesis 4: Larger board size facilitates innovation, Hypothesis 5: Big companies in terms of sales are more innovative, Hypothesis 6: Big profits recorded by a company make it innovative.

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Materials and Methods

It is an explanatory study, deductively approached using quantitative data aimed to find out the relationship between ownership concentration, major Board of Directors' characteristics, and innovation in Malaysia. The data used in the study are secondary and are retrieved from various reliable sources. Data on ownership concentration are obtained from Eikon, data on patents application from LENS.ORG and WIPO, data on major board characteristics and financial aspect of the business from annual reports of the companies. A combination of convenience and systematic random sampling methods are used to select a sample size of 100 listed companies from a population of around 993 companies listed in Bursa Malaysia.

Variables

Corporate governance mechanisms are deemed the inputs to the innovation process resulting into the registration of patents by a company while patents registered are considered the outcomes of the process (Tylecote & Visintin, 2008). Patents registered as a measure of innovation is used as the dependent variable in the study. Companies will be classified as innovative if they have registered at least one patent during our assumed period of observation (5 years) and as non-innovative if they have not registered any patents. We assign the value of 1 when a company is innovative and 0 when it is non-innovative. However, such a classification is admittedly based on a strict criterion but it is assumed to be one of the best available criteria for classifying companies as innovative and non-innovative for cases like Malaysia due to the unavailability of sufficient data. It is worth noting that patent registered are considered as one of the most important indicators of innovation (Taques et al., 2021). However, usage of patent registered has its shortcoming. It is argued that not all innovation outcomes will result in registering patents.

Ownership concentration as an independent variable in the study is one of the major corporate governance mechanism. It is characterized by measuring equity shares concentration. The Herfindahl-Equity Index is used to measure ownership concentration of a specific company. This particular index is also used by Valencia (2018) in her study to find out the relationship between corporate governance and CEO innovation. The value of the index is in an interval of 0 to 1 calculated using the following formula using data obtained from WIPO (World Intellectual Property Organization) and Eikon (Previously known as DataStream). In the formula S_i = 5 highest equity holding of shareholder i, and $T_N = \sum_{i=1}^{N} S_i$ ($Total\ Equity$). A value close to one would indicate concentrated ownership whereas a value close to zero would imply dispersed ownership. Major characteristics of the board; size of the board, composition of the board and meetings frequency are our other three independent variables of the study.

$$H_N = \sum_{i=1}^{N} \left(\frac{S_i}{T_N} \right)^2 \quad (1)$$

For a company to register patents, it needs to spend on research and development (R&D). Profits as one of the many available financial resources for R&D will be the control variable in the study. We will also see if profits of the companies have any effect on company's ability to register patents. In addition to the profit of the company, size of the company in terms of sales or employment will be the second control variable in the study. It is deemed another driver of the companies' ability to apply for a patent. Big-sized companies are deemed to be having more R&D activities which result in more patents applications compared to small-sized companies.

Model

Keeping in mind of classifying companies in two groups; innovative and non-innovative. It is reasonable to analyze the relationship between corporate governance and innovation using Probit regression as shown below; one of the best econometrics specifications. It is quite well suited for analyzing data reflecting two alternatives or binary outcomes, which in our study is the classification of firms as innovative and non-innovative. The model used in the study is also used by (Tajoli & di Milano, 1999). They tried to find out if weak performance in high-tech sectors in Italy depends upon ownership concentration.

(2)

$$\Pr(Y = 1|X) = \phi\,(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 LogX_5 + \beta_6 LogX_6)$$

Y = Dependent Variable

ϕ = The Cumulative Normal Distribution Function

β_0 = Y-Intercept

β_{1-6} = Coefficients

X_1 = Ownership Concentration

X_2 = Board Size

X_3 = Board Composition

X_4 = Meetings Frequency

$LogX_5$ = Profit

$LogX_6$ = Sales

Results

Our sample fairly represent the population, it includes companies of all sectors and sizes. The biggest company in our chosen sample of the study has got a market cap of RM 104,740,000,000 and the smallest company in the sample has got a market cap of RM 26,890,000. Among the sample, 42%

of the companies are from manufacturing sector, 11% are from services sector, 10% are from technology sector, 11% are from engineering sector, 4% are from financial sector and the last 17% are investment holding companies.

Dependent Variable Information

The dependent variable in the study is innovation represented by patent registration by a particular company. Among our 100 sampled listed companies; 23 of these have registered at least one patent in the last five years whereas 77 of these haven't registered any as shown in table 1. It is worth noting that among the 77 companies that haven't registered any patents, there was 9 companies that have registered patents beyond our five years period but since the registration wasn't in the study's specified period of time, we have excluded them from the analysis.

Table 1. Dependent Variable Information

Year 2017 - 2021			N	Percent
Dependent Variable	Patent Registration	No	77	77%
		Yes	23	21%
		Total	100	100%

Independent Variables Information

The independent variables or predictors in our study model as shown in table 2 are ownership concentration, board of directors' meetings frequency, composition of the board of directors or to simply say the percentage amount of independent non-executive directors in the board, size of the board of directors, sales and profit.

Table 2. Independent Variables Information

Year 2021		N	Min	Max	Mean	Standard Deviation
	Ownership Concentration	100	.09	.870	.51004	.196769
	Board of Directors' Meetings' Frequency	100	3	23	6.17	3.124
Covariate	Size of the Board of Directors	100	4	14	7.64	2.125
	Composition of					

the Board of Directors	100	.29	1.00	.5429	.13264
Log10Sales	100	5.60	10.66	8.5373	.96997
Log10Profit	100	.00	1.04	6.2003	3.32328

Ownership concentration of the company is measured using Herfindahl-Equity Index as explained in the material and methods section of the article. We have got companies both of concentrated and dispersed ownership in the sample. The company in the sampled data having most concentrated ownership has an index value of 0.87 and the company having most dispersed ownership has an equity index value of 0.09 as shown in table 2.

Board of directors' meetings frequency is the number of times the members of the board have met in one year period. In our sampled data, the average number of meetings a company had in one year was around 6 meeting as shown in table 2. The highest number of meetings were 24 per year and the lowest was was 3.

Size of the board is the number of directors a company has in its board of directors. It includes both executive and non-executive directors. Our 100 sampled companies have had around 7 members of the board on average as shown in table 2. Among our sampled companies, the highest number of members of the board for a company was 14 and the lowest was 4.

Board composition is defined as the number of independent non-executive directors in the board of directors of a company. In our study, we have measured it as the percentage amount of non-executive directors in the board of directors of the company using the formula: $Y = N / A$, where Y is the percentage amount of independent non-executive directors, N is the number of independent non-executive directors and A is the size of the board or all the directors in the board. It take the value between 0 to 1, a value next to 0 implies the lower number of independent non-executive directors in board while a value close to 1 implies higher number of independent non-executive directors in the board. In our sampled data as shown in table 2, the smallest percentage amount of independent non-executive directors in a company's board is 0.29 or 29% and the largest percentage amount of independent non-executive directors in a company's board is 1.0 or 100%.

Sales is the amount of revenue a company has earned during a particular period. Companies in our sample have had sales in hundreds of million. To make sales data consistent with the model we converted it to logarithm to the base of 10 as shown in table 2. Our sampled companies was of various sizes, the highest sales observed for a company was RM 45,959,000,000 and lowest sales was RM 394,100.

Profit in our analysis is the profit earned before taxation during the year. The values for profit was also in hundreds of millions. To make profit data consistent with the model, we have converted it to logarithm to the base of 10 as shown in table 2. The lowest profit observed by a company was RM -14,000,000,000 and highest profit was RM 10,886,600,000. However, since the logarithm for a negative number is undefined, we have put the value 0 for companies having a loss during the year.

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Test of Goodness of Fit

In order to see if our independent variables or predictors are fit into the model. We did the Omnibus Test; this is basically the likelihood ratio chi-square test and what this is doing is testing whether the model that contains our set of independent variables or predictors represents a significant improvement and fit over an unconditional model with no predictors. Based on the test results as shown in table 3, p-value of the test is lower than the significance level of 0.05 which indicates that our model containing the predictors represents a significant improvement and fit over the unconditional model.

Table 3. Omnibus Test a'

Likelihood Ratio Chi-Square	df	Sig.
26.295	6	.000

Dependent Variable: Patent Registration

Model: (Intercept), Ownership Concentration, Board of Directors' Meetings' Frequency, Size of the Board of Directors, Composition of the Board of Directors, Log10Sales, Log10Profit

a. Compares the fitted model against the intercept-only model.

Regression Analysis

Our model in formula 3 derived from table 4, shows a combination of positive and negative relationship of corporate governance mechanisms and innovation. The regression coefficients in our model is symbolled as B in table 4. A negative coefficient imply negative relationship between the predictor and the dependent variable whereas a positive coefficient imply a positive relationship between the two. In our model, ownership concentration and composition of the board of directors has a negative relationship with innovation whereas board's meetings' frequency, size of the board, sales and profit has a positive relationship with innovation.

$$F(-\mathbf{5.266} - \mathbf{0.226}x\mathit{Ownership\ Concentration} + \mathbf{0.178}x\text{Board's Meetings' Frequency} + \mathbf{0.076}\text{xSize of the Board} - \mathbf{0.058}\text{xComposition of the Board} + \mathbf{0.262}\text{xLog10Sales} + \mathbf{0.132}\text{xLog10Profit}) \quad (3)$$

In table 4, B is the regression coefficient for the predictors or independents variables in our study, Standard Error of the regression also known as standard error of the estimate is the average distance that the observed values fall from the regression line. Wald Chi-Square test values in the table is used to see the significance of the regression coefficients using a 95% Waild Confidence Interval.

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Table 4. Parameter Estimates

Parameter	B	Std. Error	95% Walid Confidence Interval		Hypothesis Test		
			Lower	Upper	Walid Chi-Square	df	Sig.
(intercept)	-5.266	1.6772	-8.553	-1.979	9.858	1	.002
Ownership Concentration	-.226	.8523	-1.896	1.445	.070	1	.791
Board of Directors' Meetings' Frequency	.178	.0697	.041	.315	6.516	1	.011
Size of the Board of Directors	.076	.1050	-.130	.282	.525	1	.469
Composition of the Board of Directors	-.058	.1473	-.347	.230	.157	1	.692
Log10Sales	.262	.2091	-.148	.672	1.570	1	.210
Log10Profit	.132	.0736	-.013	.276	3.194	1	.074
(Scale)	1[a]						

Dependent Variable: Patent Registration

Model: (Intercept), Ownership Concentration, Board of Directors' Meetings' Frequency, Size of the Board of Directors, Composition of the Board of Directors, Log10Sales, Log10Profit

a. Fixed at the displayed value.

In formula 3, F is the cumulative distribution function of the standard normal, $\mathbf{-5.266}$ is the Y-intercept or constant and the rest are the coefficients of the predictors or independent variables of the study. The interpretation of the coefficients in Probit regression is not the same as in linear regression and logit regression.

A negative $\mathbf{-0.226}$ coefficient for Ownership Concentration imply that the more concentrated ownership a company has, the less likely for it to be innovative but this coefficient isn't statistically significant as shown in table 4. The p-value for the coefficient is 0.791 which is higher than 0.05. Although the relationship between the two is negative but since the coefficient is insignificant due to insufficient evidences available, we could not accept our 1st Hypothesis that concentrated ownership negatively affects innovation.

A negative $\mathbf{-0.58}$ coefficient for Composition of the Board of Directors imply that the higher percentage amount of independent non-executive directors a company has in its board of directors, the less likely for the company to be innovative but this coefficient is also not statistically significant as shown in table 4. The p-value for the coefficient is 0.692 which is higher than 0.05. Although the relationship between the two is negative but since the coefficient is insignificant due to insufficient evidences available, we could not accept our 2nd Hypothesis that more non-executive directors in the board negatively affects innovation.

While on the other hand, a positive $\mathbf{+0.178}$ coefficient for Board of Directors' Meetings' Frequency imply that the more meeting a board has during the year, the more likely for the company to be innovative and this coefficient is statistically significant as shown in table 4. The p-value for the coefficient is 0.011 which is lower than 0.5. This significant coefficient let us to the accept our 3rd Hypothesis that higher board meeting has a positive impact on innovation.

A positive $\mathbf{+0.076}$ coefficient for Size of the Board of Directors imply that the higher the number of directors in the board of a company, the more likely for it to be innovative but this coefficient isn't statistically significant as shown in table 4. The p-value for the coefficient is 0.469 which is higher than 0.05.. Although the relationship between the two is positive but since the coefficient is insignificant due to insufficient evidences available, we could not accept our 4th Hypothesis that larger board size facilitates innovation.

A $\mathbf{+0.262}$ coefficient for Sales imply that the higher sales a company record in a given period, the more likely for the company to be innovative but this coefficient isn't statistically significant as shown in table 4. The p-value for the coefficient is 0.21 which is higher than 0.05. Although the relationship between the two is positive but since the coefficient is insignificant due to insufficient evidences available, we could not accept our 5th Hypothesis that big companies in terms of sales are more innovative

Lastly, a $\mathbf{+0.132}$ coefficient for profit imply that the more profitable a company is, the more likely for it to be innovative but this coefficient isn't statistically significant as shown in table 4. The p-value for the coefficient is 0.074 which is higher than 0.05. Although the relationship between the two is positive but since the coefficient is insignificant due to insufficient evidences available, we could not accept our 6th Hypothesis that big profit recorded by a company make it innovative.

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Discussion and conclusion

Corporate governance is defined as the processes and structures aiming to control and provide directions for companies (IFC, 2010). It is deemed to be affecting innovation in a particular company. Rogers (1998) defines innovation as the creation of value through introducing a new product or process or significantly improving it. While in some parts of the world the impact of cooperate governance mechanisms on innovation is positive (Baysinger et al., 1991; Black, 1992; Kosnik, 1987; Yoo & Sung, 2015), but it is found out to be negative in other parts of world (George et al., 2005; Hill & Snell, 1988; Jensen & Meckling, 1976; Su et al., 2008). However, for some cases there weren't sufficient evidences to decide upon whether the impact of corporate governance on innovation is negative or positive (Driver & Guedes, 2012).

Although, there are numerous studies around the world on this particular topic but for Malaysia, not a single study has been carried out so far to see how corporate governance affect innovation for Malaysian listed companies. It is believed that the success of a businesses is dependent on innovation (Tohidi & Jabbari, 2012). For a business to be competitive and successful, it needs to consistently improve or provide new products or services. Tylecote and Visintin (2008) also believe that corporate governance is one of the major causal factor of innovation and technological change.

This study is carried out with the purpose to find out the link between corporate governance and innovation for Malaysian listed companies testing six important hypotheses. Based on the analysis of the study, it is found out that although ownership concentration negatively affects innovation in Malaysian listed companies but due to insufficient evidences available, the relationship turned out to insignificant. However, the negative impact of ownership concentration on innovation around the world is considered to be due to the greater risk aversion behaviors of the owners. According to Jensen and Meckling (1976) and Fama and Jensen (1983), whenever is a large portion of the company owned by a few owners, the owners become more risk averse which ultimately results in a few R&D activities being carried out.

The relationship between composition of the board of directors and innovation is also found out to be negative for Malaysian listed companies but due to insufficient evidences available, the relationship turned out to insignificant as well. However, it is believed thatthe negative relationship between the two is most likely because of the kind of role the independent non-executive directors play in a particular company. According to Yoo and Sung (2015), the role of such directors is not to foster research and development activities but to supervise the management and instruct the strategic decisions taken by the shareholders of the company. Therefore, higher percentage amount of independent non-executive directors in a board make it less likely for the company to be innovative. Lorsch and Young (1990) also believe that independent non-executive directors unintentionaly affect the long-term goals and cast down certain business strategies specifically that of research and development (R&D) expenditures in company for being too cautious. The authors further add that such type of directors do not have sufficient information on long term decisions, therefore merely make decisions based on financial information.

The relationship between meetings' frequency of the board of directors and innovation is found out to be positive for Malaysian listed companies and in this case we have found sufficient evidences to conclude that this particular relationship is significant implying that the higher the board meeting take place, the more innovative the company. The positive relationship between the two is more likely

to be there due to the fact that frequent board meetings let the directors focus and allocate enough time and effort to the company strategy and operation, sharing their knowledge, expertise, experience, and judgment ultimately resulting in innovation (Forbes & Milliken, 1999).

Frequent board meeting are also considered to be giving its members enhanced understanding of the research and development (R&D) activities by working on developing alternative strategies in the meetings ultimately reducing the uncertainty and resulting in a greater probability of innovations to happen (Wincent et al., 2010). Vafeas (1999) also believe that frequent board meetings in a particular company let the board to be more efficient in developing networks among its members ultimately leading to the reduction of risk in case of resources shortage for R&D (Chen & Hsu, 2009).

The relationship between size of the board of directors and innovation is also found out to be positive but an insignificant one due to the unavailability of sufficient evidences. However, it is believed that a positive relationship between the two is due to the fact that large number of directors in the board facilitates access to vast amount of external resources including financial and technological which are deemed essential for carrying out R&D activities ultimately leading to innovations (Shapiro et al., 2015). It is also assumed that sizeable number of directors in the board can increase a company's links with its other partners on the one hand and enhance its capacity to deal with variability in the environment on the other (Pfeffer & Salancik, 2003).

Sales and profit of the company are also found out having a positive relationship with innovation but for these two control variables as well, the relationship is found out to be insignificant due to the unavailability of sufficient evidences. However, it is believed that size of the company in terms of sales or employment is one of the drivers of the companies' ability to apply for a patent. Big-sized companies are deemed to be having more R&D activities which result in more patents applications compared to small-sized companies. Profit is also deemed to be affecting innovation for a company positively as it is considered one of the many available financial resources for R&D projects.

To sum up, among the corporate governance mechanisms studies in the study, we have only managed to find out that meeting frequency of the board of directors has a significant positive relationship with innovation in Malaysian listed companies which mean, the more meeting of the board taking place, the more innovation the company. However, for other mechanism of the corporate governance, there wasn't sufficient evidences available for a significant positive or negative relationship with innovation. More research is needed on this particular topic to get reliable results. For future studies, researchers may us R&D expenditures as a measure of innovation and try to add up more independent variables.

In conclusion, for Malaysian listed companies to be innovative, it is important for them to have a reasonable number of meetings of the board of directors along the year. A higher number of meetings facilitates innovation in these particular companies. Having frequent meetings is to foster research and development. Therefore, Malaysian listed companies are recommended to always have a close look on the meetings frequency of the board of directors and try to have a reasonable number of meetings of the board of directors.

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Conflict of interest

The authors declare that they have no competing interests in relation to this study and its publication.

Data availability

The datasets generated and analysed during this study are available from the corresponding author upon reasonable request.

Ethics declaration

As this study was based entirely on publicly available secondary data and did not involve human participants directly, ethics committee approval was not required.

References

Amason, A. C., & Sapienza, H. J. (1997). The effects of top management team size and interaction norms on cognitive and affective conflict. *Journal of Management*, *23*(4), 495–516. https://doi.org/10.1177/014920639702300401

Baysinger, B. D., Kosnik, R. D., & Turk, T. A. (1991). Effects of board and ownership structure on corporate R&D strategy. *Academy of Management Journal*, *34*(1), 205–214. https://doi.org/10.5465/256308

Black, B. S. (1992). Agents watching agents: The promise of institutional investor voice. *UCLA Law Review*, *39*, 811–893.

Chen, H.-L. (2012). Board characteristics and R&D investment: Evidence from Taiwan's electronics industry. *Advances in Management & Applied Economics*, *2*(4), 161–170.

Chen, H.-L., & Hsu, W.-T. (2009). Family ownership, board independence, and R&D investment. *Family Business Review*, *22*(4), 347–362. https://doi.org/10.1177/0894486509341062

Chiang, H.-T., & He, L.-J. (2010). Board supervision capability and information transparency. *Corporate Governance: An International Review*, *18*(1), 18–31. https://doi.org/10.1111/j.1467-8683.2009.00779.x

Driver, C., & Guedes, M. J. C. (2012). Research and development, cash flow, agency and governance: UK large companies. *Research Policy*, *41*(9), 1565–1577. https://doi.org/10.1016/j.respol.2012.04.003

Fama, E. F., & Jensen, M. C. (1983). Separation of ownership and control. *The Journal of Law & Economics*, *26*(2), 301–325. https://doi.org/10.1086/467037

Forbes, D. P., & Milliken, F. J. (1999). Cognition and corporate governance: Understanding boards of directors as strategic decision-making groups. *Academy of Management Review*, *24*(3), 489–505. https://doi.org/10.5465/amr.1999.2202133

Fried, V. H., Bruton, G. D., & Hisrich, R. D. (1998). Strategy and the board of directors in venture capital-backed firms. *Journal of Business Venturing*, *13*(6), 493–503. https://doi.org/10.1016/S0883-9026(97)00062-1

Gabrielsson, J., & Winlund, H. (2000). Boards of directors in small and medium-sized industrial firms: Examining the effects of the board's working style on board task performance. *Entrepreneurship & Regional Development*, *12*(4), 311–330. https://doi.org/10.1080/08985620050177930

George, G., Wiklund, J., & Zahra, S. A. (2005). Ownership and the internationalization of small firms. *Journal of Management*, *31*(2), 210–233. https://doi.org/10.1177/0149206304271760

Hill, C. W. L., & Snell, S. A. (1988). External control, corporate strategy, and firm performance in research-intensive industries. *Strategic Management Journal*, *9*(6), 577–590. https://doi.org/10.1002/smj.4250090605

Hoskisson, R. E., Hill, C. W. L., & Kim, H. (1993). The multidivisional structure: Organizational fossil or source of value? *Journal of Management*, *19*(2), 269–298. https://doi.org/10.1177/014920639301900205

International Finance Corporation. (2010). *Corporate governance manual*.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, *3*(4), 305–360. https://doi.org/10.1016/0304-405X(76)90026-X

Kahn, K. B. (2018). Understanding innovation. *Business Horizons*, *61*(3), 453–460. https://doi.org/10.1016/j.bushor.2018.01.011

Kosnik, R. D. (1987). Greenmail: A study of board performance in corporate governance. *Administrative Science Quarterly*, *32*(2), 163–185. https://doi.org/10.2307/2393124

Li, Z., Li, X., & Xie, A. (2020). Independent technical directors and their effect on corporate innovation in China. *China Journal of Accounting Research*, *13*(2), 175–199. https://doi.org/10.1016/j.cjar.2020.06.001

Lorsch, J. W., & Young, J. P. (1990). Pawns or potentates: The reality of America's corporate boards. *The Executive*, *4*(4), 85–87. https://doi.org/10.5465/ame.1990.4277214

Pfeffer, J., & Salancik, G. R. (2003). *The external control of organizations: A resource dependence perspective*. Stanford University Press.

Rogers, M. (1998). *The definition and measurement of innovation* (Melbourne Institute Working Paper No. 10/98). Melbourne Institute of Applied Economic and Social Research.

Shapiro, D., Tang, Y., Wang, M., & Zhang, W. (2015). The effects of corporate governance and ownership on the innovation performance of Chinese SMEs. *Journal of Chinese Economic and Business Studies*, *13*(4), 311–335. https://doi.org/10.1080/14765284.2015.1090267

Shleifer, A., & Vishny, R. W. (1997). A survey of corporate governance. *The Journal of Finance*, *52*(2), 737–783. https://doi.org/10.1111/j.1540-6261.1997.tb04820.x

Sierra-Morán, J., Cabeza-García, L., González-Álvarez, N., & Botella, J. (2024). The board of directors and firm innovation: A meta-analytical review. *Business Research Quarterly*, *27*(2), 182–207. https://doi.org/10.1177/23409444211039856

Su, Y., Xu, D., & Phan, P. H. (2008). Principal–principal conflict in the governance of the Chinese public corporation. *Management and Organization Review*, *4*(1), 17–38. https://doi.org/10.1111/j.1740-8784.2007.00090.x

Succurro, M., & Costanzo, G. D. (2019). Ownership structure and firm patenting activity in Italy. *Eurasian Economic Review*, *9*(2), 239–266. https://doi.org/10.1007/s40822-018-0109-1

Taques, F. H., González-López, M., Basso, L. F. C., & Areal, N. (2021). Indicators used to measure service innovation and manufacturing innovation. *Journal of Innovation & Knowledge*, *6*(1), 11–26. https://doi.org/10.1016/j.jik.2019.12.001

Tohidi, H., & Jabbari, M. M. (2012). The important of innovation and its crucial role in growth, survival and success of organizations. *Procedia Technology*, *1*, 535–538. https://doi.org/10.1016/j.protcy.2012.02.116

Trott, P. (2017). *Innovation management and new product development* (6th ed.). Pearson.

Tylecote, A., & Visintin, F. (2008). *Corporate governance, finance and the technological advantage of nations*. Routledge. https://doi.org/10.4324/9780203933886

Vafeas, N. (1999). Board meeting frequency and firm performance. *Journal of Financial Economics*, *53*(1), 113–142. https://doi.org/10.1016/S0304-405X(99)00018-5

Valencia, V. S. (2018). Corporate governance and CEO innovation. *Atlantic Economic Journal*, *46*(1), 43–58. https://doi.org/10.1007/s11293-017-9563-5

Wan, W., Zhou, F., Liu, L., Fang, L., & Chen, X. (2021). Ownership structure and R&D: The role of regional governance environment. *International Review of Economics & Finance*, *72*, 45–58. https://doi.org/10.1016/j.iref.2020.11.002

Westphal, J. D. (1999). Collaboration in the boardroom: Behavioral and performance consequences of CEO-board social ties. *Academy of Management Journal*, *42*(1), 7–24. https://doi.org/10.5465/256871

Wincent, J., Anokhin, S., & Örtqvist, D. (2010). Does network board capital matter? A study of innovative performance in strategic SME networks. *Journal of Business Research*, *63*(3), 265–275. https://doi.org/10.1016/j.jbusres.2009.03.012

Yoo, T., & Sung, T. (2015). How outside directors facilitate corporate R&D investment? Evidence from large Korean firms. *Journal of Business Research*, *68*(6), 1251–1260. https://doi.org/10.1016/j.jbusres.2014.11.005