

BOARD GENDER DIVERSITY AND ITS RISK MONITORING ROLE: IS IT SIGNIFICANT?

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ABSTRACT

In recent years, there is an urgent call to strengthen board composition to safeguard against expropriation of shareholders' interest and to reinforce public confidence, specifically in a weaker governance setting. Board gender diversity receives considerable attention within the issues of corporate governance. This is because female directors are found to be more active in monitoring activities, cautious in decision making, less aggressive and risk averse as compared to male directors. We support this argument with evidence from a sample of listed firms in Malaysia. In line with the literature, we show that female directors play a significant monitoring role in reducing corporate risk taking behaviour. Our results are robust to endogeneity concern. Since board gender diversity plays a significant risk monitoring role, we recommend that there should be a continuous call to appoint female directors to the boardrooms among Malaysian listed firms to diversify the 'old boys club' corporate boardrooms.

Keywords: board gender diversity, female directors, risk monitoring, corporate risk taking, corporate governance

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INTRODUCTION

Board gender diversity can create better understanding of business environment to improve decision making process. Having gender diversity in the boardroom can also improve the quality of board's discussion and the ability to provide effective oversight of a firm's financial reporting and disclosure (Gul, Srinidhi, & Ng, 2011). This is because female directors are found to be more active in monitoring activities (Adams & Ferreira, 2009) and cautious in decision making, less aggressive and risk averse as compared to male directors (Huang & Kisgen, 2013; Levi, Li, & Zhang, 2014; Powell & Ansic, 1997) who are likely to be overconfident in their corporate decisions making (Lundeberg, Fox, & Puncchohar, 1994). For these reasons, women are frequently associated with less risk taking compared to men who tend to favour risky investment (Charness & Gneezy, 2012; Dwyer, Gilkeson, & List, 2002; Khaw, Liao, Tripe, & Wongchoti, 2016).

Corporate risk taking to some degree is fundamental to a firm survival and growth. Risk taking is an important source of competitive advantages. Firms have to take risk to innovate and to create economic value in the competitive and complex global economy. Growth-oriented corporate risk taking could contribute to the growth of the firms and shareholders' value (Faccio, Marchica, & Mura, 2011). Though riskier investment policy leads to increased shareholders' value and higher growth rate, excessive risk taking and mismanagement of risk in a weaker governance setting could lead to expropriation of shareholders' interest (John, Litov, & Yeung, 2008). Considerable attention is given to the issue related to corporate governance and risk taking behaviour, specifically in the aftermath of Global Financial Crisis in 2008 that revealed the shortcomings of corporate governance. The shortcomings of corporate governance have translated into a chained and magnified negative impact to the local and international markets.

In recent years, board gender diversity has received substantial attention within the issues of corporate governance. The proportion of female representatives in the corporate boardrooms becomes an important concern for the policymakers. Norway is the first country to mandate their listed firms to have at least 40% of women in the boardrooms and it managed to achieve full compliance in 2009. It is then followed by other countries adopting either mandatory quota (Germany, France, Belgium, Iceland and Italy) or voluntary target ratio ranging from 25% to 40% (Austria, Finland, the Netherlands, Spain, Sweden and the UK). Firms that could not achieve the target ratio have to explain the non-compliance in the annual reports and steps to be taken to achieve the target ratio in the subsequent years. Asian countries are also following suit, such as India, Japan, Singapore, including Malaysia.

In 2011, Malaysian regulators announced a policy that requires the public listed firms to have at least 30% of female directors on boards by 2016. The policy is echoed in the Malaysian Code on Corporate Governance (MCCG) 2012 that focuses on strengthening the structure and composition of corporate board. One of the recommendations calls for the board nominating committee to ensure women candidates are sought as part of the requirement exercise. To promote more women in the boardrooms, NAM Institute for the Empowerment of Women (NIEW) offers various courses to prepare the women to be part of the board members. However, the proportion of female board members among the public listed firms is still far behind the 30% target ratio. As of June 2016 according to Bursa Malaysia, the target ratio only reached 15.2% for the Top 100 listed firms based on their market capitalisation and 10.7% across the public listed firms. On 26 April 2017, Security Commission of Malaysia (SC) released a new MCCG that aims to increase female directors' ratio of the Top 100 firms from 16.8% (as of April 2017) to 30% by 2020.

Though there is an increase in female representation, the change is slow. The low representation of women on boards is not merely an inequality issue. Instead, it may signal a lack of confidence among the male-dominated management teams with the presence of female directors in the boardrooms. In other words, they could be doubtful as to how and to what extent board gender diversity can enhance corporate governance or be beneficial to the firms. The male-dominated boards could also feel uncomfortable to comply with the change since they are used to the "old boys club" or single gender corporate boardroom. This suggests an urgency to examine if the debated benefits of board gender diversity also extend to Malaysian firms in enhancing corporate governance from the risk taking perspective.

The issue of board gender diversity and corporate risk taking are relatively unexplored in the context of Malaysia, where majority of the public listed firms have fewer incentives to increase women participation in the boardrooms. Furthermore, existing studies on board gender diversity in Malaysia mainly examine the direct relationship between board gender diversity and firms' performance (see for example Low, Roberts, & Whiting, 2015; Yap, Chan, & Zainudin, 2017). To provide further insight, this study aims to examine if gender diversity in the boardrooms can be a significant monitoring tool to mitigate firms' risk taking behaviour that would ultimately affect firms' performance.

We utilise a sample of 631 non-financial firms listed in Malaysia with 5,019 firm-year observations over the 2000 to 2014 sample period to examine the research question. Our results suggest that corporate risk taking behaviour can

be mitigated by promoting gender diversity in the corporate boardrooms. This finding is not only statistically significant, but is also economically significant and is consistent with existing studies (e.g. Adams & Ferreira, 2009; Huang & Kisgen, 2013; Khaw et al., 2016; Levi et al., 2014). Robustness tests further confirm the negative relationship. Furthermore, we show that large and/or highly levered firms as well as firms run by male CEOs are more reluctant to change their existing risk taking behaviour, and hence have less incentive to elect female directors to their boardrooms even after the policy announcement in 2011 that calls for 30% female ratio.

Our main contribution is twofold. First, our findings further contribute to the ongoing debate on the importance of promoting board gender diversity as a governance tool to mitigate corporate risk taking behaviour. We provide empirical evidence from a developing market perspective, where the study on board gender diversity and risk taking is still relatively unexplored. Second, the results of this study offer significant implications to Malaysia policymakers. Our results convey that having female directors on boards is beneficial to promote good corporate governance. Therefore, it is recommended that policymakers should further promote board gender diversity among Malaysian firms by creating new and/or revising the existing policy to increase the presence of women in the boardrooms.

LITERATURE AND HYPOTHESIS DEVELOPMENT

The presence of more female directors in the boardrooms could create better public image of the firms and contribute to the improvement of firms' performance (Low et al., 2015). Firms with gender diverse board could increase creativities and innovations, as well as enhancing problem-solving given the better understanding of business environment, the differences in skills, knowledge and experience among the board members (Campbell & Minguez-Vera, 2008; Robinson & Dechant, 1997). The behavioural literature asserts that individual's risk taking preference is likely to depend on gender differences. Men and women have different emotional reaction to uncertainties that are likely to affect the possibility of outcomes.

Commonly, men are claimed to be overconfident, whereas women are emotional, more cautious, and less individualistic (Byrnes, Miller, & Schafer, 1999; Powell & Ansic, 1997). Moreover, women are found to be risk averse than men, thus are more likely to take less risk (Byrnes et al., 1999; Croson & Gneezy, 2009; Powell & Ansic, 1997). For example, women tend to trade less and prefer the buy and hold strategy, but men trade more often and opt for riskier investment (Barber & Odean, 2001). Dwyer et al. (2002) also find that women are

more conservative and less risky in handling their mutual fund investment, but Bliss and Potter (2002) find otherwise, where female fund managers hold slightly riskier portfolios than male fund managers.

On the other hand, Huang and Kisgen (2013) find that male executives have greater tendencies to engage in value destroying acquisitions. However, female directors are less likely to participate in merger and acquisition and if they do, female directors are more likely to pay lower acquisition premium (Levi et al., 2014) and the acquisitions made tend to offer higher returns (Huang & Kisgen, 2013). Furthermore, Faccio, Marchica and Mura (2016) find that CEO gender does affect corporate decision. Female CEOs are associated with less risk taking. Hence, firms run by female CEOs are less levered and less volatile in comparison to firms managed by male CEOs. The differences in risk attitudes between genders are, therefore, could explain the variation of corporate risk taking behaviour.

Gender diverse board create better understanding to improve the quality of board discussion and decision making process (Gul et al., 2011). Female directors appear to be tougher monitors and are likely to join the monitoring committee. Female directors also have better attendance at the board meetings than male directors (Adams & Ferreira, 2009). In other words, women tend to take their role more seriously while in the boardrooms, thus leading to better corporate governance (Singh & Vinnicombe, 2004). Though having women in the boardrooms contributes to a better monitoring, corporate decision making process would take longer time (Berger, Kick, & Schaeck, 2014) as women tend to be more cautious in their decision-making process. Hence, the presence of women in the boardrooms may lead to over monitoring for firms that already have strong corporate governance. However, Khaw et al. (2016) show that over monitoring is not an issue in a weak investor protection environment, like China. Instead, the presence of female directors is significant in alleviating excessive risk taking that may be harmful to firms, specifically in an emerging market environment. For these reasons, we hypothesise that:

Hypothesis: Board gender diversity is negatively related to corporate risk taking.

DATA AND METHODOLOGY

Sample Description

Sample consists of non-financial firms, publicly listed on the Bursa Malaysia stock exchange over the 2000 to 2014 sample period. Financial firms are excluded

due to the different risk characteristics in the financial structure and regulations compared to other non-financial industries. Final sample consists of 641 non-financial firms, with 5,019 firm-year observations after excluding any firm-year observations with missing financial information. To examine the research question, we have to hand-collect the data on board gender diversity, as well as board size, independent directors, female independent directors, CEO duality, and CEO gender from the firms' annual reports. Firms' specific data, which include risk taking and other related control variables are collected from the Datastream database.

Variables Description

We use four different measures of risk taking. Based on Boubakri, Mansi and Saffar (2013), Faccio et al. (2011), John et al. (2008) and Khaw et al. (2016), *Risk 1* refers to the volatility of a firm's return on asset (ROA) over three-year overlapping periods. For example, the amount of risk-taking in year 2000 is measured as the volatility of ROA from year 2000 to 2002. *Risk 2* refers to the difference between maximum and minimum ROA in three-year interval. *Risk 3* is the firm's total risk measured by the standard deviation of daily stock return, while *Risk 4* is the systematic risk (Sila, Gonzalez & Hagendorff, 2016). Systematic risk is the beta coefficient on stock market portfolio from a market model regression using the FTSE Bursa Malaysia KLCI index¹.

The main variable of interest, board gender diversity is measured by (1) *Female ratio*, calculated as the number of female directors divided by the number of all directors on the board, and (2) *Female dummy* is equal to one if there is/are female director(s) in the boardroom and zero otherwise. We also control for other board characteristics that are found to affect corporate risk taking behaviour. *Board size* is the natural log of the total number of directors on a board. Firms with smaller board are less likely to accept riskier projects since smaller board with more independent directors provides greater monitoring (Raheja, 2005). In addition, it is more difficult to reach to an agreement in large groups (Cheng, 2008; Sah & Stiglitz, 1991). *Board independence* is the ratio of number of independent director to total number of directors. To preserve their market reputation, independent directors have the incentives to effectively carry out the monitoring task (Fama & Jensen, 1983) in protecting shareholders' interest. In line with the literature, board size (board independence) is expected to be positively (negatively) related to corporate risk taking.

However, board monitoring is found to be weak when CEO duality is present. A chair-CEO may have more discretion to allow hubris to drive the firm

to take up risky investments (Crossland & Hambrick, 2007). *CEO duality* is equal to one if a firm's CEO also serves as the chairman of the board of directors, and zero otherwise. Similarly, a male CEO is more likely to engage in higher risk taking. Firms run by male CEOs are found to have higher leverage, more volatile and lower chance of survival compared to firms run by female CEOs (Faccio et al., 2016). *Male CEO* is equal to one if the CEO is a male, and zero otherwise.

In addition, we control for a number of firm-specific variables such as firm size, profitability, sales growth, leverage, and tangibility. *Firm size* is measured by the natural logarithm of total assets. Firm size is expected to be negatively related to the corporate risk taking behaviour. Smaller firms are found to be more risk-seeking than larger firms (Faccio et al., 2011; Boubakri et al., 2013; John et al., 2008) to expand their business operations. *Profitability*, measured by firm's ROA is argued to be negatively related to risk taking. Less profitable firms have greater tendencies to take more risk to increase the firms' profitability than more profitable firms (Faccio et al., 2011). Firms with higher growth opportunities are expected to be positively related to corporate risk taking behaviour (Faccio et al., 2011; Sila et al., 2016) because this risk taking could contribute to the growth of the firms and shareholders' value. We use sales growth (*Sales growth*) as the proxies for growth and investment opportunities and is defined as the annual growth rate of sales.

When firms are highly leveraged, these firms are exposed to greater risk of uncertainty that would lead to higher risk of financial distress. Thus, leverage is found to be positively related to corporate risk taking (Faccio et al., 2011). *Leverage* is measured as total debt to total equity. *Tangibility*, measured by the ratio of net plant and equipment to total asset, is expected to be positively related to risk taking. Firms with higher tangibility have more capacity to take up more investment because the tangible assets can be used as collateral. Moreover, firms with higher tangible assets have higher liquidation value in the event of bankruptcy. The description of each variable is summarised in the Appendix.

RESULTS AND DISCUSSION

In this section, we present and discuss the results of the effects of board gender diversity on corporate risk-taking behaviour. We also present the results of the robustness checks.

Summary Statistics

Table 1 presents the summary statistics of the variables. On average, 52.78% of the firms' board consist exclusively of male directors, while female directors make up an average 8.71% of the directorships, with a maximum ratio of 50%. The average board size is reported as 7 and reaches a maximum number of 18.² For board independence, sample firms on average have 42.41% of independent directors on boards, with a maximum ratio of 100%. Eighty-nine percent (89%) of the sample firms have a male CEO, while 37.9% of the firms' CEOs also serve as the chairman of the board of directors.

Table 1
Summary statistics of the variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
Risk 1	5,019	3.7348	4.3583	0.0200	34.7923
Risk 2	5,019	6.4305	7.5538	0.0000	77.3500
Risk 3	4,944	0.5085	0.3496	0.0000	4.6881
Risk 4	4,944	0.8136	0.6487	-3.2588	5.0618
Female dummy	5,019	0.4722	0.4993	0.0000	1.0000
Female ratio	5,019	0.0871	0.1099	0.0000	0.5000
Board size	5,019	2.0009	0.2544	1.0986	2.8904
Board independence	5,019	0.4241	0.1151	0.1111	1.0000
Male CEO	5,019	0.8900	0.3129	0.0000	1.0000
CEO duality	5,019	0.3790	0.4852	0.0000	1.0000
Firm size	5,019	12.7931	1.3467	9.6103	18.2982
Profitability	5,019	0.0490	0.0693	-0.2569	0.3767
Sales growth	5,019	0.0670	0.1653	-0.4260	0.9559
Leverage	5,019	0.4825	0.5959	0.0000	3.9460
Tangibility	5,019	0.3808	0.2062	0.0000	0.9875

Notes: Obs = observations; Std. Dev. = standard deviation; Min = minimum; Max = maximum.

Table 2 reports the pairwise correlation matrix of the key variables. As per our expectation, the *Female ratio* is negatively related to *Risk 1* to *Risk 4*. The correlation matrix does not suggest any serious multicollinearity concerns.

Univariate Analysis

We conduct univariate analysis to examine whether firms with female directors on boards and firms without female directors on boards have different risk-taking levels. We estimate both the t-test and z-test. Table 3 shows that the differences in mean and median of the four risk-taking measures between firms with female directors on boards and male-only boards are statistically significant at the 1% level except the median difference of *Risk 1*. The univariate analysis indicates that firms with female directors on boards take less risk than firms without female directors on boards.

Baseline Regression Results

To examine the effects of board gender diversity on corporate risk-taking behaviour, we use multivariate regression of panel data, controlling for industry and year fixed-effects with robust standard errors. The initial regression specification is as follows:

$$Risk = \alpha + \beta_1 Female\ ratio + \beta_2 Board\ size + \beta_3 Board\ independence + \beta_4 Male\ CEO + \beta_5 CEO\ duality + \beta_6 Firm\ size + \beta_7 ROA + \beta_8 Sales\ growth + \beta_9 Leverage + \beta_{10} Tangibility + \varepsilon$$

We estimate the regression model using the four risk-taking measures defined earlier. Following existing studies, *Risk 1 and Risk 2* are the dependent variables for the first year of the rolling period over which the risk-taking measures are computed (Boubakri et al., 2013; John et al., 2008). The regression results are presented in Panel A of Table 4. *Female ratio* is used to measure gender diversity on board. *Female ratio* is negatively related to *Risk 1* to *Risk 4*. The results are statistically significant at the 1% level, respectively, supporting our hypothesis. The coefficient of *Female ratio* in Model 1 indicates that on average one standard deviation increase in the proportion of female directors on board leads to a 4.0417% decrease in the level of risk-taking measured by *Risk 1*. The result is also economically significant given the mean value of the risk measure of 3.7348%.³ For robustness checks, we repeat the regressions using *Female dummy* as the measure for board gender diversity. The results reported in Panel B of Table 4 are qualitatively similar to the results reported in Panel A, except *Risk 2* which is insignificant though the coefficient is negative.

Table 2
Correlation matrix of the identified variables

	Risk 1	Risk 2	Risk 3	Risk 4	Female dummy	Female ratio	Board size	Board independence	Male CEO	CEO duality	Firm size	ROA	Sales growth	Leverage	Tangibility	
Risk 1	1															
Risk 2	0.0243	1														
Risk 3	-0.0008	0.1655	1													
Risk 4	0.0255	0.079	0.1132	1												
Female dummy	-0.0448	-0.0493	-0.0471	-0.0562	1											
Female ratio	-0.0354	-0.0523	-0.0282	-0.0693	0.8383	1										
Board size	0.0185	-0.1263	-0.2175	-0.0145	0.152	-0.0179	1									
Board independence	-0.0529	0.0705	0.0651	0.0675	-0.0806	-0.0122	-0.3656	1								
Male CEO	0.0164	-0.0498	-0.0374	0.01	-0.0566	-0.0986	0.0755	-0.0425	1							
CEO duality	-0.0288	-0.0379	0.0473	-0.0256	0.0386	0.0609	-0.0718	-0.0693	0.0593	1						
Firm size	0.0032	-0.1353	-0.3899	0.1978	-0.0127	-0.0415	0.3229	0.0129	0.0301	-0.0941	1					
Profitability (ROA)	-0.0109	-0.1472	-0.3277	-0.1436	0.0696	0.0535	0.1083	-0.0492	0.0593	-0.0109	0.146	1				
Sales growth	0.0051	-0.0745	-0.192	-0.031	0.0317	0.0251	0.0739	-0.0529	0.0341	-0.0162	0.124	0.3898	1			
Leverage	0.0455	0.0531	0.1238	0.1585	-0.0773	-0.0971	0.0214	-0.0009	0.0496	0.0024	0.2032	-0.2072	-0.0084	1		
Tangibility	0.0477	-0.0783	-0.002	0.0175	0.0527	0.0398	0.0563	-0.0411	0.0842	0.0206	0.0857	-0.1236	-0.0396	0.0508	1	

Table 3
Univariate analysis

Variable	Board with female director	Board without female director	Board with female director		Board without female director		Board with female director minus board without female director	
	Obs.	Obs.	Mean value	Median value	Mean value	Median value	Mean difference (t-value)	Median difference (z-value)
Risk 1	2370	2649	3.5285	2.2111	3.9193	2.2748	-3.1736***	1.5400
Risk 2	2370	2649	6.0368	3.8650	6.7827	4.3000	-3.4959***	-4.2710***
Risk 3	2325	2619	0.4910	0.4050	0.5240	0.4387	-3.3153***	-4.3380***
Risk 4	2325	2619	0.7749	0.6820	0.8479	0.7674	-3.9556***	-4.4370***

Notes: *, ** or *** indicates significance at the 90%, 95% or 99% confidence levels, respectively.
Obs. = Observations

For the control variables, board size is negatively related to *Risk 2*, *Risk 3* and *Risk 4*, indicating that large board provides better monitoring. CEO duality is also negatively related to *Risk 1* and *Risk 2*, indicating that the duality leads to risk averse, which is inconsistent with our expectation. We argue that the relationship between board size, CEO duality and risk-taking may not be linear. We further address this issue by conducting a robustness check in the following section. On the other hand, board independence shows mixed results. For example, it is negatively associated with *Risk 1* but is positively related to *Risk 2* and *Risk 4*, which is inconsistent with our expectation. In addition, well performing firms are found to take less risk, whereas highly levered firms take more risk, in line with Faccio et al. (2011). These firms are exposed to higher risk of financial distress; therefore have to take riskier investment projects for higher returns. *Tangibility* is positively related to risk taking in Models 1 and 3, in which firms with higher tangibility have more capacity to take up riskier projects, but not in Models 2 and 4.

Overall, the panel data regression results indicate that female directors mitigate the risk-taking behaviour among Malaysian listed firms. As discussed, women tend to take their role more seriously than men while in the boardrooms, thus they have greater incentive monitoring the firm operations and management. A good level of monitoring is also beneficial to the female directors' reputation. In brief, our findings support the board gender diversity's policy that calls for the public-listed firms in Malaysia to appoint more female directors to the boardrooms.

Table 4
Board gender diversity and corporate risk-taking

Panel A: Gender diversity is measured by the proportion of female directors on board to total board size (Female ratio)				
	Risk 1	Risk 2	Risk 3	Risk 4
Female ratio	-1.3735*** (0.0099)	-2.9254*** (0.0020)	-0.0994** (0.0110)	-0.2410*** (0.0012)
Board size	-0.1593 (0.5712)	-1.8488*** (0.0002)	-0.0863*** (0.0000)	-0.1429*** (0.0002)
Board independence	-2.0768*** (0.0001)	3.0128*** (0.0035)	0.0337 (0.4507)	0.3822*** (0.0000)
Male CEO	0.0777 (0.6871)	-0.9227** (0.0262)	-0.0218 (0.1792)	0.0362 (0.2261)
CEO duality	-0.2788** (0.0278)	-0.6617*** (0.0026)	0.0022 (0.7989)	-0.0037 (0.8348)
Firm size	-0.0475 (0.3727)	-0.5840*** (0.0000)	-0.1028*** (0.0000)	0.0999*** (0.0000)
Profitability	-0.0003 (0.9799)	-0.1309*** (0.0000)	-0.0109*** (0.0000)	-0.0133*** (0.0000)
Sales growth	0.0019 (0.6466)	-0.0084 (0.3254)	-0.0006** (0.0224)	-0.0001 (0.8903)
Leverage	0.0027** (0.0182)	0.0075*** (0.0029)	0.0009*** (0.0000)	0.0008*** (0.0000)
Tangibility	1.1016*** (0.0007)	-2.4817*** (0.0002)	0.0830*** (0.0001)	-0.0792* (0.0807)
Constant	5.1390*** (0.0000)	18.9319*** (0.0000)	1.9915*** (0.0000)	-0.2926** (0.0157)
Industry fixed effect	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Observation	5019	5019	4944	4944
Adj R ²	0.0083	0.0641	0.3591	0.1654

(continue on next page)

Table 4 (continued)

Panel B: Gender diversity is measured by a dummy variable that is equal to one if there is/are female director(s) in the boardroom and zero otherwise (Female dummy)				
	Risk 1	Risk 2	Risk 3	Risk 4
Female dummy	-0.4202*** (0.0014)	-0.2730 (0.2254)	-0.0161* (0.0575)	-0.0347** (0.0477)
Board size	-0.0149 (0.9590)	-1.7490*** (0.0006)	-0.0807*** (0.0000)	-0.1308*** (0.0008)
Board independence	-2.1018*** (0.0001)	3.0659*** (0.0030)	0.0346 (0.4387)	0.3852*** (0.0000)
Male CEO	0.0775 (0.6880)	-0.8469** (0.0411)	-0.0202 (0.2117)	0.0406 (0.1735)
CEO duality	-0.2756** (0.0290)	-0.6889*** (0.0017)	0.0016 (0.8517)	-0.0054 (0.7620)
Firm size	-0.0571 (0.2865)	-0.5802*** (0.0000)	-0.1029*** (0.0000)	0.0997*** (0.0000)
Profitability	0.0004 (0.9732)	-0.1320*** (0.0000)	-0.0109*** (0.0000)	-0.0133*** (0.0000)
Sales growth	0.0018 (0.6622)	-0.0087 (0.3088)	-0.0006** (0.0207)	-0.0001 (0.8605)
Leverage	0.0027** (0.0180)	0.0077*** (0.0020)	0.0009*** (0.0000)	0.0008*** (0.0000)
Tangibility	1.1181*** (0.0006)	-2.5504*** (0.0001)	0.0817*** (0.0001)	-0.0829* (0.0674)
Constant	5.0527*** (0.0000)	18.4990*** (0.0000)	1.9798*** (0.0000)	-0.3226*** (0.0072)
Industry fixed effect	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Observation	5019	5019	4944	4944
Adj R ²	0.0093	0.0626	0.3587	0.1645

Note: *, ** or *** indicates significance at the 90%, 95% or 99% confidence levels, respectively.

Robustness Checks

We perform robustness checks to further explore the effect of gender diversity on board in this section.

Interaction of Board Size and CEO Duality

In the previous section, we argue that the relationship between board size, CEO duality and risk-taking may not be linear. Board monitoring is expected to be weak when CEO duality is present. The powerful chair-CEO may have more discretion to allow hubris to drive firms to take up risky investments (Crossland & Hambrick, 2007). In this section, we further test the relationship between board size, CEO duality and risk-taking by creating an interaction term, *Board size* × *CEO duality*. We argue that boards play a weaker monitoring function in CEO duality firms because the coordination problem becomes much more complicated in these firms. The free-riding problem (Jensen, 1993) becomes more likely in any CEO influential boards.

Table 5
Interaction of board size and CEO duality and risk taking

	Risk 1	Risk 2	Risk 3	Risk 4
Female ratio	-1.3199** (0.0135)	-2.8681*** (0.0026)	-0.1022*** (0.0083)	-0.2363*** (0.0015)
Board size	-0.5758 (0.1060)	-2.2938*** (0.0004)	-0.0662*** (0.0035)	-0.1758*** (0.0002)
Board independence	-2.0441*** (0.0002)	3.0477*** (0.0032)	0.0322 (0.4703)	0.3847*** (0.0000)
Male CEO	0.0906 (0.6396)	-0.9089** (0.0287)	-0.0223 (0.1689)	0.0371 (0.2143)
CEO duality	-2.4203** (0.0115)	-2.9498* (0.0886)	0.1067 (0.1544)	-0.1748 (0.2257)
Board size × CEO duality	1.0763** (0.0245)	1.1499 (0.1705)	-0.0524 (0.1416)	0.0859 (0.2232)
Firm size	-0.0459 (0.3893)	-0.5823*** (0.0000)	-0.1029*** (0.0000)	0.1000*** (0.0000)
Profitability	-0.0002 (0.9872)	-0.1308*** (0.0000)	-0.0109*** (0.0000)	-0.0133*** (0.0000)

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Table 5: (continued)

	Risk 1	Risk 2	Risk 3	Risk 4
Sales growth	0.0018 (0.6705)	-0.0085 (0.3176)	-0.0006** (0.0239)	-0.0001 (0.8746)
Leverage	0.0026** (0.0190)	0.0074*** (0.0030)	0.0009*** (0.0000)	0.0008*** (0.0000)
Tangibility	1.1255*** (0.0006)	-2.4563*** (0.0002)	0.0820*** (0.0001)	-0.0776* (0.0874)
Constant	5.9193*** (0.0000)	19.7655*** (0.0000)	1.9535*** (0.0000)	-0.2304* (0.0828)
Industry fixed effect	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Observation	5019	5019	4944	4944
Adj R ²	0.0090	0.0642	0.3593	0.1655

Note: *, ** or *** indicates significance at the 90%, 95% or 99% confidence levels, respectively.

Table 5 shows the results when the interaction term, *Board size* × *CEO duality*, is added into the regression model. The coefficients of *Board size* are still negatively significant in Models 2 to 4, while the coefficients of *CEO duality* are negatively significant in Models 1 to 2. However, the coefficient of *Board size* × *CEO duality* is significantly positive in Model 1 at the 5% level. These results may imply that large board size in a powerful board presents weak monitoring because a chair-CEO is more likely to have more says in the decision making when board size is large. Furthermore, when we control for the possible non-linear relationship between board size and CEO-duality, *Female ratio* remains negatively related to the risk-taking measures, further supporting our hypothesis.

Sub Period Analysis

In 2011, Malaysian regulators announced a policy that requires the public listed firms to have at least 30% of female directors on board by 2016. In this section, we examine this regulation effect by conducting a sub period analysis. We divide the whole sample into two sub periods; 2000 to 2010 and 2011 to 2014. The intuition is that there should be a significant increase in the female directors' ratio after the announcement of the board gender diversity policy in 2011. Moreover, we expect to find a sizable negative relationship between board gender diversity and corporate risk taking indicating an enhanced monitoring role in the post-policy period (2011–2014) that contributes to the policy success. However, we could not find the expected results whereby the monitoring effect is expected to be more

pronounced in the post-policy period than in the pre-policy period (2000–2010). The results are not reported here, but are available upon request.

To answer this puzzle, firstly, we perform a time trend analysis of the female representation in the boardrooms as shown in Table 6. Our sample observations show that there is an increasing trend of female directors on board. On average, in the pre-policy period (2000–2010), 7.72% of the board members are female and the average increased to 9.63% in the post-policy period. Nonetheless, the increased is still too minor to achieve the 30% requirement and the anticipated improvement in the monitoring role.

Table 6
Time trend of female directors' representation on boards

Year	Mean	Min	Max
2000	5.44%	0.00%	57.14%
2001	6.35%	0.00%	57.14%
2002	7.09%	0.00%	50.00%
2003	7.45%	0.00%	42.86%
2004	7.97%	0.00%	50.00%
2005	7.95%	0.00%	50.00%
2006	8.01%	0.00%	50.00%
2007	8.42%	0.00%	50.00%
2008	8.48%	0.00%	50.00%
2009	8.77%	0.00%	50.00%
2010	8.99%	0.00%	50.00%
2011	9.24%	0.00%	50.00%
2012	9.14%	0.00%	50.00%
2013	9.85%	0.00%	60.00%
2014	10.29%	0.00%	60.00%

Determinants of Having Female Directors on Boards

Furthermore, we examine the determinants of having female directors on board using a logistic regression where the dependent variable is *Female dummy*. The results are presented in Table 7. Model 1 shows that firms with large board, firms with CEO also serving as the board's chairman, well-performing firms, and firms with more tangible assets are more likely to have female directors on board, while large firms, firms with male CEOs, and firms with higher leverage are less likely to

have female directors serving on boards. This is because firms run by male CEOs and highly levered firms have higher tendencies to take riskier projects (Faccio et al., 2011), thus the lower tendencies to appoint female directors to monitor their risk taking behaviour. Conversely, firms that adopt board independence as their governance tool are less likely to have female directors on boards because outside directors are effective in monitoring corporate risk taking behaviour (Brick & Chidambaran, 2008).

Table 7
Determinants of having female directors on boards

	Model 1	Model 2	Model 3
Board size	1.4979*** (0.0000)	1.1193*** (0.0000)	2.3917*** (0.0000)
Board independence	-0.7357** (0.0108)	-0.7782** (0.0174)	-0.5940 (0.1675)
Male CEO	-0.5365*** (0.0000)	-0.3550*** (0.0011)	-0.9503*** (0.0000)
CEO duality	0.2327*** (0.0002)	0.2390*** (0.0005)	0.2415*** (0.0094)
Firm size	-0.1742*** (0.0000)	-0.2097*** (0.0000)	-0.1166*** (0.0031)
Profitability	0.0165*** (0.0010)	0.0191*** (0.0004)	0.0118* (0.0932)
Sales growth	0.0010 (0.6039)	-0.0017 (0.4143)	0.0077*** (0.0042)
Leverage	-0.0020*** (0.0002)	-0.0006 (0.3034)	-0.0062*** (0.0000)
Tangibility	0.7223*** (0.0000)	0.4934*** (0.0031)	1.2253*** (0.0000)
Constant	-1.6829*** (0.0019)	-0.9749 (0.1384)	-5.0967*** (0.0000)
Industry dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Observation	5019	4237	3431
Pseudo R ²	0.0567	0.0454	0.1075

Note: *, ** or *** indicates significance at the 90%, 95% or 99% confidence levels, respectively.

Models 2 and 3 repeat the analysis using alternative samples. Model 2 includes firms without female directors and firms with only one female directors on boards, while Model 3 consists of firms without female directors and firms with more than one female directors on boards. Results are qualitatively similar to those reported in Model 1. In brief, we argue that to mitigate the risk taking behaviour, particularly among the riskier firms and/or firms that have higher tendencies to take risk, there is an urgency to increase board gender diversity. We argue that this could also be the reason why we could not find more significant monitoring role of board gender diversity in the post-policy period than in the pre-policy period where the appointment of female directors to the boardrooms is voluntarily. Putting it in other words, firms that intend to be more risk-taking are reluctant to appoint female directors on board.

Endogeneity

In this section, we address the possible endogeneity concern related to our results. The endogeneity concern is that female directors could self-select firms that exhibit lower risk-taking. We use the dynamic generalised method of moments (GMM) approach to address this causality issue. The dynamic GMM is argued to have advantages compared to the traditional fixed effect estimates (Wintoki, Linck, & Netter, 2012). It is recommended that the GMM approach should be applied in the corporate governance studies (Wintoki et al., 2012). Utilising the GMM, in Table 8, we find that the coefficients of *Female ratio* are highly significant at the 1% level when regressing on *Risk 1* and *Risk 4*. The *Female ratio* coefficients are still negative although not significant when regressing on *Risk 2* and *Risk 3*, confirming that firms with female directors are less risk-taking.

Table 8
Endogeneity test: Board gender diversity and corporate risk-taking

	Risk 1	Risk 2	Risk 3	Risk 4
L. Risk 1	0.7911*** (0.0102)			
L. Risk 2		0.8194*** (0.0091)		
L. Risk 3			0.4366*** (0.0107)	
L. Risk 4				0.1149*** (0.0161)
Female ratio	-1.2837** (0.5963)	-0.7062 (1.2699)	-0.0595 (0.0721)	-0.5348*** (0.1679)

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Table 8 (continued)

	Risk 1	Risk 2	Risk 3	Risk 4
Board size	0.6667** (0.3091)	1.7728*** (0.5750)	-0.0761** (0.0310)	0.0811 (0.0789)
Board independence	1.1143** (0.5527)	-1.9231** (0.9614)	-0.0662 (0.0598)	-0.4520*** (0.1492)
Male CEO	0.7889** (0.3198)	-0.3424 (0.5788)	0.0027 (0.0302)	0.1875*** (0.0628)
CEO duality	0.0799 (0.1852)	-0.8405* (0.4318)	0.0392 (0.0253)	-0.0291 (0.0531)
Firm size	0.1922** (0.0955)	0.7963*** (0.2312)	-0.1207*** (0.0101)	-0.1288*** (0.0311)
Profitability	-0.0095 (0.0089)	-0.0474*** (0.0157)	-0.0009 (0.0009)	0.0023 (0.0018)
Sales growth	-0.0027 (0.0020)	0.0266*** (0.0045)	-0.0001 (0.0002)	0.0003 (0.0006)
Leverage	0.0025 (0.0016)	-0.0068*** (0.0027)	0.0013*** (0.0001)	0.0022*** (0.0004)
Tangibility	-0.7727** (0.3767)	-0.6348 (0.7803)	-0.4507*** (0.0410)	0.1756* (0.0920)
Constant	-3.9984*** (1.5510)	-10.5209*** (3.2786)	2.1066*** (0.1383)	2.0185*** (0.4247)
Observation	4,220	4,220	4,157	4,157
Chi ² (<i>p</i> -value)	0.0000	0.0000	0.0000	0.0000

Note: *, ** or *** indicates significance at the 90%, 95% or 99% confidence levels, respectively.

CONCLUSION

Significant attention is given to the issue related to board composition. Being the first line governing body of firms, boards oversee strategies that address firms' sustainability and stakeholders' interests. Globally, regulators are actively promoting board gender diversity, including Malaysia to enhance corporate governance. In 2011, Malaysia regulators announced a policy that requires the public listed firms to have at least 30% of female directors on boards, but to date the target ratio is yet to be achieved. The examination of the relationship between board gender diversity and corporate risk taking is lacking for emerging markets. Though corporate risk-taking is often viewed to have a positive impact on firm value and growth, excessive risk taking has received much blame following the

2008 global financial crisis. Excess risk-taking is suggested to be associated with worse shareholder protection in weak institutional settings.

Consistently, in the univariate and multivariate panel tests, we show that firms with female director ratio on boards are associated with less risk taking. In other words, our results indicate that female directors can mitigate the risk-taking behaviour among Malaysian listed firms. Our findings add support to the much debated argument that board gender diversity can be an effective corporate governance tool, mainly in a weaker governance environment like the emerging markets. This is because female directors are more cautious and can change the decision-making dynamics of the boards. Moreover, female directors are tougher monitors and more active in joining monitoring committees, or demanding for a higher audit effort than male directors. Therefore, we recommend that public listed firms in Malaysia should appoint more female directors to their boardrooms in support of the board gender diversity policy.

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NOTES

1. For robustness, we also use weekly and monthly stock returns and FTSE Bursa Malaysia EMAS index to determine *Risk 3* and *Risk 4*. Results are qualitatively similar to those reported.
2. We report the value of the natural log of the total number of directors on boards in Table 1.
3. We use the standard approach to calculate the economic significance as the coefficient of a variable multiplies with the standard deviation of the variable divided by the mean value of the dependent variable.

APPENDIX

Variable	Definition
Risk taking measures:	
Risk 1	Standard deviations of a firm's return on asset (ROA) over three-year overlapping periods.
Risk 2	Difference between maximum and minimum ROA in three-year interval.
Risk 3	Standard deviation of daily stock return.
Risk 4	Beta coefficient on stock market portfolio from a market model regression using the FTSE Bursa Malaysia KLCI index.
Board characteristics	
<i>Female ratio</i>	Number of female directors divided by the number of all directors on the board, and (2) y is equal to one if there is/are female director(s) in the boardroom and zero.
<i>Female dummy</i>	Dummy variable equals to one if there is/are female director(s) in the boardroom and zero.
<i>Board size</i>	Natural log of the total number of directors on board.
<i>Board independence</i>	Number of independent directors divided by the total number of directors on board.
<i>Male CEO</i>	Dummy variable equals to one if the CEO is a man and zero otherwise.
<i>CEO duality</i>	Dummy variable equals one if the CEO is also the chairman of the board and zero otherwise.
Control variables:	
<i>Firm size</i>	Natural log of total assets.
<i>Profitability</i>	Profitability proxy measured by return on assets (ROA).
<i>Sales growth</i>	Annual growth rate of sales.
<i>Leverage</i>	Total debt to total equity.
<i>Tangibility</i>	Net plant and equipment to total asset,

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