Does female leadership matter in firm risk-taking and performance? Evidence from gender equality reforms in an emerging market

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ABSTRACT

Our article examines the impact of board gender diversity and female leadership on firm risk-taking and firm performance in Vietnam under the implementation of the National Strategy on Gender Equality. We find that female CEOs are associated with lower firm risk-taking and an

increase in firm accounting returns is attributed to a transition from male to female CEOs. Further, board gender diversity is independently identified to lower firm risk-taking and female leadership (i.e., female CEOs and chairwomen) generates higher accounting profit (measured by ROA) for their businesses under this reform agenda.

JEL Classification: G30, G32

Keywords: Board gender diversity; female leadership; risk-taking; firm performance.

I. Introduction

There have been a growing number of studies related to the topic of gender diversity in the corporate governance field. These studies provide evidence on the role of gender on corporate governance and firm performance. On one hand, intensifying female representation in top positions within the corporate sector can moderate business prejudices and foster business efficiency (Beaman et al., 2009). On the other hand, some business managers argue that the trend for increasing the number of women in boardrooms may consequently make women less motivated to progress their careers due to the insufficiency of female directors with strong competencies (Hwang, Shivdasani, and Simintzi, 2018). Other researchers associate this trend with the common phenomenon of tokenism in which women with less management power effectively play no significant role in their firms (Adam and Ferreira, 2009).

According to the World Bank's Women, Business and the Law database cited in the report of the International Finance Corporation (IFC, n.d), Vietnam, has fewer differences in the legal status between men and women in comparison to that of similar economies or neighbouring countries (IFC, n.d.). The national government has been making significant efforts to enhance gender equality and women's empowerment. National key laws including the Law of Gender Equality in 2006 and the Labour Law in 2012, followed by a National Strategy on Gender Equality during the 2011 - 2020 period. These laws aim to achieve substantive gender equality in terms of opportunity, participation, and benefits related to political, economic, cultural, and social fields. Following these initiatives there has been considerable achievement in increasing the ratio of women in the labour force which varied from 48.6% in 2010 (General Statistics Office, 2011) to 73% in 2015 (IFC, n.d.) and 79.1% in 2019 (World Economic Forum, 2019). Notably, there are 95,906 firms (57% of which are micro-enterprises, 42% SMEs, and 1% large enterprises) that are owned by women and these account for 21% of all registered enterprises in Vietnam (IFC, n.d.). Additionally, Vietnam, Cambodia, China, India, and Japan rank 87th, 89th, 106th, 112th, and 121st, respectively, in the Global Gender Gap Index (World Economic

Forum, 2019). However, gender-segregation in employment remains in Vietnam due to gender bias perceptions ingrained in the society over thousands of years under feudalism. IFC (n.d.) reports that 39% of Vietnamese female participants feel poorly engaged in company leadership positions and decision-making due to common reasons like childcare tasks, housework, and incomplete commitments outside of work. A preference for male applicants appears in 83% of management job posts and women tend to be restricted from recruitment because of pregnancy or having under-12-month-old children (IFC, n.d.). Many female-led enterprises face a lack of public recognition for their contribution to the national economic development (IFC, n.d.). A great disparity in economic participation still exists with only 27.3% of legislators, senior officials, and managers being female in comparison to that of 72.7% for male peers in 2019 (World Economic Forum - Global Gender Gap Report 2020, 2019). Overall, Vietnam represents an interesting environment to examine gender leadership and firm performance, given the legislative reforms on gender diversity. However, there are still ingrained corporate and social practices inhibiting the movement towards gender equality.

Generally, though gender equality has been evolving over the last decades and recently there is an emergence of new laws related to increasing female board representation in various global jurisdictions, there is still substantial evidence questioning the corporate or shareholder benefits from female board appointments or board gender mandates (Ahern and Dittmar, 2012; Hwang, Shivdasani, and Simintzi, 2018; Bertrand et al., 2019). Considering different perspectives and reconciling this controversial issue, this article aims to present evidence that contributes to the gender diversity debate in the corporate governance literature, by examining the topic in the context of Vietnam. In Vietnamese context, there is practical evidence of legislative and policy mandates in gender diversity. However, firmly fixed gender bias in social perceptions and behaviour restrains gender equality and women's empowerment in corporate governance. In more detail, we study whether board gender diversity and female leadership have implications for firm risk-taking and performance in Vietnam. We define board gender diversity based on

the percentage of female members in corporate boardrooms and examine specific gender differences through CEO and board chairperson roles. Our article focuses on answering the following questions. Firstly, are there any differences in risk-taking and performance of firms where board gender diversity and female leaders (i.e., female CEOs and chairwomen) exist? Secondly, is there evidence of changes in the impact of female board membership and female leadership on firm risk-taking and firm performance after the implementation of the National Strategy on Gender Equality in Vietnam in 2011?

To examine whether female leadership matters in corporate governance and is associated with firm risk-taking behaviour and performance, we focus on 329 listed firms in Vietnam. We firstly compare firm risk-taking and performance between firms run by a female CEO/Chairwoman with the sample firms run by a male CEO/Chairman using the propensity score matching (PSM) technique. The results from the PSM estimation and Hotelling test show that female leaders are indifferent with their male peers in terms of risk-taking behaviours and firm market value. In addition, firms with chairwomen appear to exhibit significantly higher ROA whereas firms with female CEOs have lower ROA in comparison with similar firms where males occupy these roles. We then employ the whole sample from 2006 to 2020 to run different regressions. We find that female CEO presence is negatively related to firm risk-taking. Additionally, a change from male to female CEO is associated with an increase in ROA. Since the National Strategy on Gender Equality started in 2011, we employ the difference-in-difference (DID) matching estimator to examine whether there are any changes in the impact of gender on both firm risk-taking and firm performance, before and after the strategy implementation. We find that under the impact of the National Strategy regarding gender equality, female leaders are associated with higher accounting profit whereas board gender diversity results in lowering risk-taking. However, there is still a lack of market recognition of the benefits of female board members, and particularly female CEOs and board chairpersons since the implement of this gender reform agenda. We also address the potential problems of

endogeneity and reserve causality in the regression models by employing IV GMM regressions and obtain consistent results. We employ the nearest-neighbour DID matching method as a robustness check for the DID matching estimators, and the results are still consistent with those generated from the DID matching estimator.

Our article contributies to the literature in the following ways. Firstly, we show that the degree of board gender diversity is not associated with risk-taking and firm performance over the sample period. Secondly, we find evidence that female CEOs expose their firms to lower risk-taking behaviour than their male counterparts and, more noticably, firms with a transition from a departing male to an incoming female CEO generally experience an increase in ROA. These results add to the scholarship on the impact of female leaders on firm performance in an emerging market where there is gender bias. Furthermore, under the impact of the National Strategy on Gender Equality on firm outcomes, firms led by female leaders (i.e., female CEOs and chairwomen) experience an increase in accounting profit. Thirdly, this study sheds a light in the examination of changes in the relationships between board gender diversity and female leadership and firm-level outcomes around the roll-out of Vietnam Government's National Strategy on Gender Equality in 2011, which provides a relatively unique natural experiment setting to evaluate the role of gender diversity and female leadership. The Vietnam Government's National Strategy on Gender Equality implemented in 2011 has resulted in the enhancement of female representation in boardrooms as well as recognition of their contribution in boosting firm accounting-based performance. However, this gender reform still lacks a significant recognition from the financial market and investors in the post-implementation period. Due to the limited impact of the National Strategy on Gender Equality on the relationships between gender diversity in the boardrooms and female leadership and firm outcomes, our results suggest that more work needs to be done at both government and corporate levels to extract the potential benefits from greater female involvement in corporate board and leadership roles.

The rest of the article is organised as follows. Section II presents a background for our research theme and hypothesis development. Next, Section III describes the data and variable construction. Section IV provides the empirical results with discussion. Section V presents our robustness checks, and the last section presents the conclusions and implications of our findings.

II. Background and hypothesis development

There are several theoretical frameworks for modeling individual, board and firm perceptions concerning the impact of women on corporate boards. There still exists a 'for' and 'against' literature, paired with empirical evidence on gender roles, corporate risk-taking, and firm value. The following sections summarize the literature and present our hypotheses.

Board gender diversity, firm risk-taking, and firm performance

Corporate boards are generally in charge of monitoring and providing advice for managers. The relationship between board gender diversity and firm outcomes is usually explained by the monitoring function of agency theory and by the diversity that women bring to the corporate boards (as in theresource dependency and upper echelons theories). Women on boards might modify the underlying supervision tasks and/or minimise the conflict with shareholders' interests (Hermalin and Weisbach, 2003), and consequently gender diversity in leadership positions is positively associated with firm performance (Hermalin and Weisbach, 2003; John, Litow, and Yeung, 2008; Bennouri et al., 2018). Additionally, women with different managerial backgrounds in terms of cognition- and perception-based values, may drive the outcomes of firms through enhancing strategic choice and performance levels (Hambrick and Mason, 1984). However, communication in boardrooms could be disrupted in situations where women intervene in the decision-making process with divergent viewpoints. Thus, increasing their representation on boards could result in negative impacts on firm performance (Adams and Ferreira, 2009; Ahern and Dittmar, 2012). Furthermore, opponents of increasing women representation on boards are convinced that women hold positions in the boardroom primarily

due to internal and external appeals for diversity (Farrell and Hersch, 2005), and that the administrative practice of adding women onto boards will possibly diminish firm performance. However, it has also been suggested that the potential relationship between female board membership and firm performance is driven by the country-level shareholder protection environment (Post and Byron, 2015). Vietnam is characterised by a weak institutional environment and lower quality corporate governance as well as highly concentrated equity ownership. Therefore, to some extent, these country-level characteristics are expected to affect the relation between board gender diversity, risk-taking, and firm performance. Given this setting, we expect to have support for certain theoretical predictions. Indeed, the weight of empirical evidence predicts that female participation will affect corporate risk-taking and firm performance. We propose our first set of hypotheses as follows:

Hypothesis 1:

Ceteris paribus, there is a negative relationship between board gender diversity and risk-taking.

Hypothesis 2:

Ceteris paribus, there is a positive relationship between board gender diversity and firm performance.

Female leadership, firm risk-taking, and firm performance

Female leadership representation is primarily explained by the upper echelons theory which highlights the significant impact of a leader's demographic attributes, background, and expertise, as well as personal traits such as risk-aversion preference, on the firm's success in terms of corporate strategic decisions and performance. Empirically, De Mel, McKenzie, and Woodruff (2008) show that firms led by male executives have higher returns to capital than female-led firms in Sri Lanka. Faccio, Marchica, and Mura (2016) also show that European firms run by female CEOs display more risk-avoidance behaviours than otherwise similar firms run by male CEOs. Moreover, these authors demonstrate that a transition from male to female

CEOs (or vice versa) is associated with an economically and statistically significant decline (growth) in corporate risk-taking. Vo, Nguyen, and Le (2020) recently report empirical findings for Vietnamese firms. They show that firms led by female CEOs have higher accounting profitability, lower systematic and idiosyncratic risks as well as lower volatility in ROA than male-led firms. Furthermore, the chairperson is responsible for stimulating an environment that is conducive to board cohesiveness (Machold et al., 2011). Chairwomen are predicted to enhance board performance due to personal effectiveness in managing board decision-making process, thereby having a positive association on firm performance (Nekhili, Chakroun, and Chtioui, 2018). However, Bennouri et al. (2018) show that the presence of chairwomen is negatively related to Tobin's Q, but positively associated with both ROA and ROE outcomes, suggesting different responses to female leadership.

In the context of Vietnam, there is a great disparity in gender leadership. Women need to work harder as well as show better performance than men to get to the same position in the corporate management. The World Economic Forum - Global Gender Gap Report 2020 (2019) document that 19.3% of Vietnamese firms have female majority ownership. 22.4% of firms are led by female top managers. Additionally, female- and male-owned SMEs display similar risk-taking levels when seeking financing (IFC, n.d.). Anecdotal evidence from Vietnam indicates that firms with women occupying the chair position are as, or even more, efficient and productive as firms headed by chairmen. For instance, Vietjet Air, which is led by both a female Chair and Deputy Chair, has outperformed other firms in its sector during the last ten years. It has quickly become Vietnam's largest domestic airline and one of the fastest growing airlines in the aviation industry. Vinamilk, which is run by both a Chairwoman and female CEO, has grown quickly with annual ROA of around 40% over the last decade, and has always been the leading company in the dairy market (Vinamilk, n.d.). Based on these arguments, our article focuses on the two following hypotheses:

Hypothesis 3:

Ceteris paribus, there is a negative relationship between female leadership and risk-taking.

Hypothesis 4:

Ceteris paribus, there is a positive relationship between female leadership and firm performance.

Governance policy and the impact of female leadership on firm risk-taking and performance

What drives the appointment of female CEOs and female chairpersons is controversial in the literature. On one hand, Hermalin and Weisbach (1988) state that there is an increasing demand for intensive monitoring when a corporate board cannot efficiently evaluate a manager's ability. Accordingly, risky firms that provide vague signals to capital markets about managerial ability are more likely to recruit a greater proportion of female executives (Adams and Ferreira, 2009; Sila, Gonzalez, and Hagendorff, 2016). From another perspective, firms with better performance are more inclined to appoint women occupied in the upper echelons; and an insufficient female labour pool enables women to select the firms of their choice because of their higher risk aversion, or these firms are able to place more importance on achieving diversity (Farrell and Hersch, 2005). On the other hand, Sila, Gonzalez, and Hagendorff (2016) show that female board and managerial appointments may come from mandatory quotas or government policies. These authors argue that legislative policies associated with gender diversity may result in two possible actions taken to expand diverse gender representation in boardrooms. Either to increase the number of female members/leaders on boards or to decrease the board size (incorporating the departure of male directors). Therefore, under the pressure of government policies targeting gender equality, the traditional barriers relating to social norms, divergent culture, and gender schemas may disappear, and women may have more opportunities to demonstrate their ability. However, Ahern and Dittmar (2012) show that a law mandating 40% of female directors in Norwegian public companies resulted in a dramatical deterioration in firm-level Tobin's Q over the subsequent years. Additional constraints caused by the imposed

quota are younger and less experienced corporate boards, increasing probability of higher leverage and acquisition activity, as well as a decline in operating performance. Bertrand et al. (2019) subsequently also studied firms subjected to the Norwegian reform. They do not find robust evidence that the gender reform brought benefits to most women in businesses. Hwang, Shivdasani, and Simintzi (2018) also find that female diversity mandates in California resulted in a decline in shareholder value.

As mentioned above, the vital role of women as well as gender equality in Vietnam has been recognised and incorporated into the national sustainable development process through the key supporting laws and the National Strategy on Gender Equality over the 2011 - 2020 period. Since 2011 is the starting point of the government campaigns and policies to enhance gender equality in Vietnam, this timeframe allows us to consider whether government policy influenced the relationship between gender diversity, firm performance, and risk-taking, as well as changes associated with the strategy roll-out. We expect that reform initiatives and changes in social and market perception will reduce gender bias in corporate board leadership. We also expect that it will greater voice and authority for women in board leadership roles and reduce gender disparity. Therefore, we predict that:

Hypothesis 5:

Ceteris paribus, there is a stronger relationship between gender diversity and firm risk-taking and performance in the post-2011 government reform period relative to the pre-2011 period.

III. Data and variable construction

Our sample contains data on firm governance, performance and other firm characteristics for 329 Vietnamese listed non-financial firms from 15 different industries. The sample spans from 2006 to 2020. Most of the data used in the article, including accounting, governance, and gender information, were collected from the Vietnam Stock Exchange database, FiinPro and the financial statements of the firms.

Female board representation

Board gender diversity is measured by the percentage of women in corporate boardrooms and female leadership is represented independently by female CEO status and chairwoman status. Both female CEO and chairwoman status are proxied by dummy variables which are equal to 1 if the firm CEO and firm chairperson are females in each case; 0 otherwise. We identify the gender of a CEO, board chair and members of the board using the information provided in the database of the Vietnam Stock Exchange, or in the disclosure statements of their companies.

Risk-taking

The riskier the corporate operations are, the more volatile the returns. Therefore, the volatility of returns is a standard proxy for risk-taking as it captures the riskiness involved in firm decisions. We follow John, Litow, and Yeung (2008) and Faccio, Marchica, and Mura (2016) to develop a proxy for firm risk-taking based on the volatility of corporate earnings. The risk-taking measure is the standard deviation of the deviation of the firm's EBITDA/Total Assets ratio from the country average for the corresponding year over 5-year overlapping windows (2006–2010, 2007–2011, 2008–2012,and so on) for each firm. This deviation allows for removing the market risk component.

Firm performance

We consider two measures of firm performance in terms of accounting and market-based perspectives, namely return on assets (ROA) and Tobin's Q (see Table 1 for detailed description of these variables).

Control variables

The models estimated in our analyses contain several control variables to reduce the possibility that our results may be driven by time-varying omitted variable bias.

We follow Sila, Gonzalez, and Hagendorff (2016) and Faccio, Marchica, and Mura (2016) and employ a group of firm-level variables that are known to be correlated with firm operating performance. They are firm size (the logarithm of the book value of total assets), tangibility

(the ratio of fixed assets to total assets), firm leverage (the ratio of total debt to total assets) and growth opportunities (sales growth).

Following Bennouri et al. (2018), we employ variables that capture human capital including CEO Tenure, Chair Tenure, CEO and chair level of education. We also use an indicator variable for CEO and Chair Duality to proxy for the concentration of power in corporate boardrooms. Board size is controlled in the regression models since the larger the board size is, the more likely it is that compromises will occur in the decision-making process, to reduce risk (Sila, Gonzalez, and Hagendorff, 2016). In addition, there are many reasons leading a firm to change its CEO and those reasons potentially drive the regression results. Therefore, we also control for the three factors affecting CEO change, namely dismissal, designation and resignation by using dummy variables when examining the impact of female CEO replacement on firm risk-taking and firm performance outcomes.

Detailed description of these control variables is provided in Table 1. All continuous variables are winsorised at the top and bottom 1% of the distribution to eliminate the influence of outliers.

[Table 1 near here]

Descriptive statistics

[Table 2 near here]

Table 2 shows the descriptive statistics for all variables in our sample. On average, company boards are composed of approximately 15.2% of female members, and 43.5% of chairpersons simultaneously occupy the position of CEO. Also, 11.8% of firms have chairwomen, and 10.6% of those are run by female CEOs. CEO Duality is more prevalent in male-led companies. Across the firms in our sample, the average values for the risk-taking, Tobin's Q[1] and ROA variables are 81.3%, -0.5 and 8.5% respectively. Leverage is about 47.4%, on average. The firms have average annual sales growth of 23.5%, and tangible assets make up approximately 19.5% of total assets for the average firm. Figure 1 shows the trend in board size and board gender

[1] *Tobin's Q used in the regressions is the natural logarithm of firm Tobin's Q.*

diversity over the sample period. It suggests that the average number of female board members hovers at 0.80-0.90 (equivalent to the proportion of 15-16% female board members) across the sample period. These figures start to increase slightly from 2011 and noticeably reach the peak at one female member on the average sample firm board in 2020 (around 17.5%). This suggests that Government initiatives have encouraged female board representation at the corporate level albeit at relatively slow speed.

[Figure 1 near here]

IV. Empirical results

To address the question of whether board gender diversity as well as female leadership are associated with firm risk-taking and firm performance, we employ a variety of analyses.

Correlation matrix

We generate the pairwise correlation matrix to undertake a rudimentary check of the relation between the presence of female board members, female leaders, firm risk-taking, and firm performance variables. The correlation matrix is not tabulated. The proportion of women on boards is insignificantly negatively associated with firm risk-taking and positively correlated with firm valuation based on the Tobin's Q ratio. Female leaders are positively correlated with both firm risk-taking behaviour and firm performance although only the positive correlation coefficient between female chairwomen and ROA is statistically significant. There is also a significantly positive correlation between risk-taking and firm performance (both ROA and Tobin's Q).

T-test and propensity score matching (PSM) results

We compare means of all variables for firms with different female leaders using simple t-tests. This analysis unveils an important divergence in characteristics of firms and their CEO and chairperson. The results show that firms with chairwomen or female CEOs appear to have more female representatives on their boards, generate higher market value in comparison to firms where males occupy these roles (Table 3). Additionally, firms led by chairwomen show

higher ROA than their counterparts. Furthermore, male-led firms tend to have higher financial leverage than female-led firms, and male CEOs and chairmen tend to be, on average, better educated but less experienced than their female peers.

[Table 3 near here]

We further employ PSM models to examine the differences in ROA, Risk-Taking, and Tobin's Q measures between treated firms and control groups based on a set of firm, board, and executive characteristics (see Table 4). The control group, consisting of a sample of firms run by chairmen or male CEOs, is matched with a treatment group of firms identified by a similar set of firm-level characteristics, board size, and leadership personnel attributes but are led by chairwomen or female CEOs. Therefore, each dual-matched firm group is nearly identical to one-another apart from the decisive factor – the gender of the chairperson or CEO. This methodology helps alleviate problems involved with random selection. Specifically, we start this process by calculating the propensity score (i.e., probability) that a firm described by the given characteristics is run by a chairwoman. This score, by way of explanation, is determined as a function of Board Size, CEO Duality, Chair Tenure, CEO Tenure, CEO Education, Chair Education, Firm Size, Tangibility, Leverage, Growth Opportunities, Board Gender Diversity and ROA (for the Risk-Taking and Tobin's Q comparison), and Risk-Taking (for ROA and Tobin's Q comparison) within an industry-year group. We set a limit of 0.5% in absolute value for the difference between the propensity score of a firm in the treatment sample and its match in the control group, to sufficiently guarantee the similarity between them. A similar procedure is repeated for the PSM analysis of firms run by a male CEO and female CEO. We conduct a number of tests including the LR test, Hotelling F-test and Rubio's B&R and use the Rosenbaum bounds (Rosenbaum, 2002) to check the conditional independence assumptions of PSM. The results in Table 4 are consistent with the previous tests as they show that female leaders' presence (CEOs and board chairs) is unrelated to firm risk-taking. In addition, chairwomen are associated with higher ROA ratios whereas they show no impact on firm

market value. Female CEO presence is not associated with firm market value whereas it exhibits a weak negative relation with the ROA based on the PSM estimation.

[Table 4 near here]

Firm-fixed effect regression results

[Table 5 near here]

We run different firm- and year-fixed effect robust clustered regressions using the whole sample from 2006 to 2020 to study the role of gender on firm risk-taking behaviour and firm performance. The results reported in Table 5 indicate that the board gender diversity and chairwomen variables are unrelated to firm risk-taking. A gender-diverse boardroom and female leadership also do not affect firm performance with and without controlling for firm risk-taking level. However, female CEOs decrease firm risk-taking according to the statistically significant negative coefficient of -0.024 for the female CEO indicator in Regression (3).

These results are consistent with recent qualitative research in Vietnam reported in IFC (n.d.). Figure 1 shows that the average number of female board members fluctuates around one across the surveyed period except for the year 2020. Therefore, the average proportion of women in boardrooms is perceived to not be sufficient to drive any gender diversity outcome in Vietnam since adding one woman as a member to corporate boards is considered as a symbolic response to the call for gender diversity. We also document that firms with female CEOs have lower risk-taking levels. This result is in line with empirical research reported by Vo, Nguyen, and Le (2020) in Vietnam, and Faccio, Marchica, and Mura (2016) for European firms. Thus, female CEOs exhibit higher risk-avoidance behaviours. However, these results presented in Table 5 cover the whole sample period without considering the 2011 introduction of gender equality reform in Vietnam. This will be clarified in the following sections.

Difference-in-difference matching regression results

We follow Sila, Gonzalez, and Hagendorff (2016) to use the DID matching estimation that involves the use of DID estimation in conjunction with the propensity score matching model.

We aim to examine whether female CEOs resulting from a gender-diverse decision to transition from a male CEO to a female CEO is associated with firm-level risk-taking and performance. More specifically, the treatment group includes firms that transit from a departing male CEO to a female CEO, whereas the control group contains those that replace a departing male CEO with another male CEO. The DID estimator assumes that two similar firms are likely to have parallel trends without any treatment. Therefore, if there is any impact of treatment on the outcome, the impact should be reflected in the difference of the changes across the two firms (Roberts and Whited, 2013). We conduct comparative estimation for two periods, namely the full 2006-2020 period and the 2011-2020 sub-sample period. The former examines whether a transition from male to female CEOs relates to changes in firm risk-taking and performance for the entire studied period, whereas the latter considers the case contextualized following the introduction of the National Strategy on Gender Equality from 2011. The DID estimating equations are as follows:

$$(Risk-Taking)_{i,t} = \alpha_0 + \alpha_1(Female\ Appointment)_{i,t} \times (Post\ Period)_{i,t} + \alpha_2(Female\ Appointment)_{i,t} + \alpha_3(Post\ period)_{i,t} + \alpha_4(Board\ Gender\ Diversity)_{i,t} + \alpha_5(Chairwomen)_{i,t} + \alpha_6 ROA_{i,t} + \boldsymbol{\Gamma}(CONTROL)_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$(TOBINQ)_{i,t} = \alpha_0 + \alpha_1(Female\ Appointment)_{i,t} \times (Post\ Period)_{i,t} + \alpha_2(Female\ Appointment)_{i,t} + \alpha_3(Post\ period)_{i,t} + \alpha_4(Board\ Gender\ Diversity)_{i,t} + \alpha_5(Chairwomen)_{i,t} + \alpha_6(Risk-Taking)_{i,t} + ROA_{i,t} + \boldsymbol{\Gamma}(CONTROL)_{i,t} + \varepsilon_{i,t} \quad (2)$$

$$(ROA)_{i,t} = \alpha_0 + \alpha_1(Female\ Appointment)_{i,t} \times (Post\ Period)_{i,t} + \alpha_2(Female\ Appointment)_{i,t} + \alpha_3(Post\ period)_{i,t} + \alpha_4(Board\ Gender\ Diversity)_{i,t} + \alpha_5(Chairwomen)_{i,t} + \alpha_6(Risk-Taking)_{i,t} + \boldsymbol{\Gamma}(CONTROL)_{i,t} + \varepsilon_{i,t} \quad (3)$$

In the above equations, Female Appointment is a dummy variable that equals 1 if the firm belongs to the treatment group, and 0 when the firm is a part of the control group. The variable Post Period is also a dummy variable that takes the value of 1 in the post-treatment period, and 0 before the treatment. Treatment firms are matched to similar control firms using their

propensity score to move from an initial male CEO to a female CEO. Given the fact that the reason for CEO change might influence the regression results, we control for the three main reasons of CEO change, namely dismissing, designating and resigning. These are denoted by dummy variables (see Table 1) in all regressions. We have 32 firms in the treatment group and 383 firms in the control sample. The results of the weighted DID matching regressions[2] are reported in Table 6. Panel A and Panel B of Table 6 show positive and statistically significant coefficients for the $(Female\ Appointment)_{i,t} \times (Post\ period)_{i,t}$ interaction variable in Regression 1 and Regression 4, impling that a departure from a male CEOs to a female CEO increases ROA for the whole period and after the introduction of the National Strategy on Gender Equality. For Vietnam, female CEOs are expected to put greater effort in management, to compete with their male peers. This may explain their superior performance relative to male counterparts. However, CEO gender transition does not impose any significant changes on firm market value. The coefficients are insignificant in Regression 2 and Regression 5, in both Panels A and B of Table 6. These results may be explained by the gender bias culture in Vietnamese society. Along with a national emerging market exposed to high uncertainty and volatility in earnings on investments, investors likely interpret that those appointments either result from symbolic efforts for gender diversity or a power transfer within family-owned firms.

[Table 6 near here]

While we find different evidence related to the links between gender, firm risk-taking, and firm performance, it is possible that corporate diverse-gender decisions may also be affected by government policies. In Tables 7 and 8, we continue to examine the effect of policy implementation on the role of gender in corporate governance and to evaluate the observed impact of women on firm risk-taking and firm performance in Vietnam by estimating the following equations:

[2] *We employ the Stata module psmatch2 of Leuven and Sianesi (2003) with the option: fweight=_weight. This option reduces the number of observations to 56.*

$$(Risk-Taking)_{i,t} = \alpha_0 + \alpha_1(Gender)_{i,t} \times (Post2011)_{i,t} + \alpha_2(Gender)_{i,t} + \alpha_3(Post2011)_{i,t} + \alpha_4 ROA_{i,t} + \boldsymbol{\Gamma}(CONTROL)_{i,t} + \varepsilon_{i,t} \quad (4)$$

$$(ROA)_{i,t} = \alpha_0 + \alpha_1(Gender)_{i,t} \times (Post2011)_{i,t} + \alpha_2(Gender)_{i,t} + \alpha_3(Post2011)_{i,t} + \alpha_4 Risk-Taking_{i,t} + \boldsymbol{\Gamma}(CONTROL)_{i,t} + \varepsilon_{i,t} \quad (5)$$

$$(TOBINQ)_{i,t} = \alpha_0 + \alpha_1(Gender)_{i,t} \times (Post2011)_{i,t} + \alpha_2(Gender)_{i,t} + \alpha_3(Post2011)_{i,t} + \alpha_4 ROA_{i,t} + \alpha_5 Risk-Taking_{i,t} + \boldsymbol{\Gamma}(CONTROL)_{i,t} + \varepsilon_{i,t} \quad (6)$$

Gender represents Board Gender Diversity, Chairwoman status and Female CEO status (see the results in Tables 7 and 8). We employ the DID estimation methodology in Table 8.

[Tables 7, 8 near here]

The year 2011 marked the beginning of the National Strategy on Gender Equality. Since 2011, Vietnam has made significant efforts in legislative reform to enhance gender equality. Therefore, if the strategy has any practical implications on the impact of gender on corporate decision-making and its outcomes, the impact should be revealed in the coefficient of the $(Gender)_{i,t} \times (Post2011)_{i,t}$ variable, and the coefficient of the Gender variable, will demonstrate the underlying influence level of women on firm risk-taking and performance, after isolating the impact of the governmental intervention. Table 7 shows that the coefficient of the interaction variable Board Gender Diversity*Post 2011 is negative and significant in Regressions (3), whereas it is insignificant in the remaining regressions. More specifically, board gender diversity is increasingly negatively associated with risk-taking level, although board gender diversity has no influence on firm performance in the post-2011 period. The results in Panel A and Panel B of Table 8 show that female leaders are associated with an incrementally higher ROA as a result of the gender reform initiative. These latter results suggest that the implementation of the National Gender Strategy enhances the role of female executives as well as their contribution in boosting firm-level managerial efficiency. However, the results from Table 8 show that the government policy initiatives appear to have no impact on the

investors' perception of females as corporate leaders and their associated firm-level market value.

Generally, our results identify some highlights about the impact of female board membership and executive gender in the context of Vietnam. To summarize, we find that board gender diversity does not affect both risk-taking and firm performance since the average number of female members in boardrooms is likely not sufficient enough to extract positive benefits from gender diversity. Female CEOs and Chairwomen generally increase firm accounting returns under the impact of the national gender reform. Overall, these results provide limited evidence of the impact of the National Strategy on Gender Equality. Although they support a positive contribution of female leaders in enhancing firm operating performance, the benefits of female board members, and particularly female CEOs and board chairpersons is not acknowledged by investors. While Ahern and Dittmar (2012), Hwang, Shivdasani, and Simintzi (2018), Bertrand et al. (2019) do not support gender diversity mandates in corporate boards, we find supporting evidence for the Vietnam gender reform in improving the contribution of female executives in corporate governance. The identification of the differences in the impact of gender before and after the National Strategy on Gender Equality is our key contribution. Our finding differs from other studies that do not find a significant association between female board or leadership attributes, firm risk-taking, and/or firm performance in most developed countries (e.g., Carter et al., 2010; Sila, Gonzalez, and Hagendorff, 2016).

V. Robustness checks

There is no doubt that endogeneity and reverse causality are potential concerns in many aspects of corporate decision-making, and this is true in our analysis. Sila, Gonzalez, and Hagendorff (2016) propose to use a dynamic panel system GMM estimator to solve the problem of reserve causality that can cause a spurious negative association between gender diversity, director appointment process and risk-taking. Adams and Ferreira (2009) use the fraction of males with

board connections to female directors as an instrument to deal with endogeneity concerns. However, that instrumental variable (IV) is not exogenous in our data set.

To verify our findings, we examine the robustness of our results by employing IV GMM estimators. Board gender diversity is treated as an endogenous variable in all five regressions (see Tables 9 and 10) and is instrumented using different IVs, namely the ratio of the number of female chairs to the number of firms in the industry by year and the annual average of board gender diversity of the industry for Regressions (1) and (4), the ratio of the number of female CEOs to the number of firms in the industry by year, and the annual average of board gender diversity of the industry (i.e., Regressions (2), (4) and (5))[3]. Tests for endogeneity and over-identifying restrictions (Hansen J statistic), suggest suitable model specification for all Regressions in both Tables 9 and 10. The results shown in Table 9 are consistent with those presented in Table 5 as they confirm that when we do not control for the impact of the National Strategy on Gender Equality, only the existence of female CEOs show a significantly negative relationship with firm risk-taking. The impact of the departure from male CEOs to female CEOs (see Table 10) are still in line with those of the OLS DID estimators presented in Table 6, which show the positive link between the transition from a male to a female CEO and firm accounting profitability (ROA).

[Tables 9, 10 near here]

Since the number of observations in Table 6 exhibiting the difference in risk-taking and performance of firms with a transition from male to female CEOs and those with a transition from a departing male to another male CEO is quite low, we employ 10 neighbours of treatment firms to calculate the matched outcome which allows using all treatment and control firms (126) for the regressions. The estimation results remain consistent with those results derived from the DID matching estimators (see Table 11).

[3] *Vo, Nguyen, and Le (2020) use the ratio of the number of industry female CEOs to total CEOs as an IV for their regressions.*

[Table 11 near here]

Following Sila, Gonzalez, and Hagendorff (2016), as a further robustness check for the DID matching estimators in Table 8, we employ the DID nearest propensity estimators which relaxes the propensity score restriction from 5% to 10%. The results which are not tabulated are consistent with what we obtain from the DID matching estimators. The weighted DID matching estimator can be affected by the low propensity score. Therefore, we apply the DID nearest matching estimator which drops 5% of the treatment observations at which the propensity score density of the control observations is the lowest to check the robustness of the impact of the national gender equality reforms on the relation between female directors and firm risk-taking and performance[4]. The untabulated results are consistent with those of the weighted DID matching estimator presented in Table 8, respectively.

VI. Conclusions and implications

Over the last decade, although there has been a lot of empirical research evaluating the gender-performance relation, the current literature position regarding the nature of this relationship is still surrounded by controversy. While some studies suggest that women on boards help enhance firm performance, others argue that firm performance would be diminished by gender diversity. There is also the evidence that report no causal relationship between gender and firm performance. Mixed evidence is also presented in the examination of gender and firm risk-taking relations. We contribute to the literature by discovering the different impact of female board membership and female leadership on firm risk-taking and firm performance. This is undertaken for Vietnam, which features a substantial gender bias culture, although the Vietnamese Government has legislated to reduce gender inequality and empower women in national socio-economic development strategies. Our paper makes a key contribution by examining variations in the above relationships around national legislative reforms. This setting

[4] *We also employ the nearest DID matching estimator with 10 neighbors of treatment. The results which are not tabulated are consistent with the weighted DID matching estimator.*

provides a relatively unique natural experiment to evaluate the role of gender diversity and female leadership on firm-level performance. Based on a sample of 329 listed firms in Vietnam, we show that board gender diversity neither alters the risk-taking behaviour associated with board-level decision-making nor affects firm performance. Female CEOs lower firm risk-taking and firms moving from a departing male to new female CEOs, experience an increase in firm accounting performance. Noticeably, adding women to corporate boards lowers risk-taking whereas both female CEOs and female board chairs increase firm value in terms of ROA. In contrast to underlying expectations, this reform receives no significant responses from investors. On one hand, these results serve to expose misconceptions facing women entrepreneurs due to gender inequality that attribute a positive effect for the Vietnam Government's National Strategy on Gender Equality. On the other hand, although our results support a positive contribution of female leaders to enhancing firm operating performance, the benefits of female board members and female leadership within the financial market and by investors have yet to be acknowledged. This elucidates the fact that the gender reform process requires much time and effort to change the social perceptions in a community where gender bias still persists. Our findings suggest that more work needs to be done at both government and corporate levels to continue with the reform initiatives to promote gender equality for a broader societal and cultural change. The reform not only aims to achieve women's progression in the workforce and other aspects, but it could also be favourable in terms of economical merits for both businesses and the national economy.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Table 1: Description of variables

Our study employs a variety of variables that proxy for governance, performance, risk-taking and other characteristics of sample firms. Governance variables are Board Size, Board Gender Diversity, Chairwomen and Female CEO. Firm performance is measured by Tobin's Q and ROA. Firm risk-taking is measured by the volatility of earnings over the sample period. A group of variables such as Firm Size, Leverage, Growth Opportunity, and Tangibility is included to capture firm-level characteristic whereas CEO Duality, CEO Tenure, Chair Tenure, CEO Education, and Chair Education account for the attributes of CEO and Chairperson. Reasons for CEO change are also controls in regressions that examine the impact of CEO replacements. All variables are winsorised at the top and bottom 1% of the distribution to eliminate the influence of outliers.

Panel A: Governance Variables	
(1) Board Size	The total number of people on corporate boards
(2) Board Gender Diversity	The percentage of board seats occupied by females
(3) Chairwoman	Indicates whether the company's Chair is a woman. It is a dummy variable which equals 1 if the Chair is a woman and 0 otherwise
(4) Female CEO	Indicates whether the company's Chief Executive Officer is a woman. It is a dummy variable which equals 1 if the CEO is a woman and 0 otherwise
Panel B: Performance Variables	
(1) TobinQ	$\text{TobinQ} = \frac{\text{Market Capital+Total Liabilities+Preferred Equity+Minority Interest}}{\text{Total Assets}}$ This measure is presented in natural logarithm value.
(2) ROA	$ROA = \frac{Earnings\ before\ interest\ and\ taxes}{Total\ Assets}$
Panel C: Risk-taking variable	
Risk-Taking	Risk-Taking is measured by company earnings volatility. $Risk\text{-}Taking_{i,t} = \sqrt{\frac{1}{4}\sum_{j=0}^{4}\left(E_{i,t+j} - \frac{1}{4}\sum_{j=0}^{4} E_{i,t+j}\right)^2}$, where $E_{i,t} = \frac{EBITDA_{i,t}}{Total\ Assets_{i,t}} - \frac{1}{N_t}\sum_{i=1}^{N_t}\frac{EBITDA_{i,t}}{Total\ Asset_{i,t}}$. ($N_t$ denotes the firms within the country in year t; $EBITDA_{i,t}$ is defined as earnings before interest, depreciation and amortization of firm i in year t)
Panel D: Others control variables	
(1) Firm Size	Firm size is represented by the natural logarithm value of total assets
(2) Leverage	$\text{Leverage} = \frac{\text{Total Liabilities}}{\text{Total Assets}}$
(3) Growth Opportunities	$Growth\ Opportunities = Sales\ growth = \frac{Sale\ Revenue\ of\ year\ t - Sale\ Revenue\ of\ year\ t-1}{Sale\ Revenue\ of\ year\ t-1} \times 100$
(4) Tangibility	$Tangibility = \frac{Fixed\ Assets}{Total\ Assets} \times 100$
(5) CEO Duality	Indicates whether the firm's Chief Executive Officer is also Chair of the Board. It is a dummy variable which equals 1 if the CEO is simultaneously the Chair of the board and 0 otherwise.
(6) CEO Tenure	The number of years the CEO has been in the CEO position. It is specified in natural logarithm value.
(7) Chair Tenure	The number of years the Chair has been in the Chair position. It is specified in natural logarithm value.
(8) CEO Education	Indicates the CEO's level of education. There are seven levels of academic qualification, which is 1 if CEOs have graduated from high school, 2 if CEOs have graduated from vocational school, 3 if CEOs hold the degree of associate, 4 if CEOs hold a bachelor's degree, 5 for those having a master's degrees, 6 for those holding Doctorate degrees and 7 if CEOs are Associate Professors; with the variable based on their highest academic qualification.
(9) Chair Education	Indicates the Chair's level of education. There are seven levels of academic qualification, which is 1 if Chairperson has graduated from high school, 2 if Chairperson has graduated from vocational school, 3 if Chairperson holds the degree of associate, 4 if Chairperson holds a bachelor's degree, 5 for those having a master's degrees, 6 for those holding Doctorate degrees and 7 if they are Associate Professors; with the variable based on their highest academic qualification.
(10) Dismiss	Indicates that a firm's CEO is formally asked to leave his/her position under the decision of the corporate board. It is a dummy variable which equals 1 if the firm has CEO dismissal and 0 otherwise.
(11) Designate	Indicates that a firm's CEO is selected by the corporate board. It is a dummy variable which equals 1 if the firm has CEO designation and 0 otherwise.
(11) Resign	Indicates that a firm's CEO gives up his/her job. It is a dummy variable which equals 1 if the firm has CEO resignation and 0 otherwise.

Table 2: Summary Statistics

The sample contains data on firm governance, performance, risk-taking, and other firm characteristics for 326 non-financial firms in Vietnam over the 2006-2020 period. Most of the data used in the paper, including accounting, governance, and gender information, are collected from the Vietnam Stock Exchange database and the financial statements of the firms.

Variable	Obs	Mean	Std. Dev.	Min	Max
Board Gender Diversity	3480	0.1518	0.1671	0	0.6000
Risk-Taking	2331	0.8132	0.3982	0.1253	1.5376
Chairwoman	3508	0.1180	0.3227	0	1
Female CEO	3509	0.1060	0.3079	0	1
Chair Tenure	3481	1.5178	0.8875	0	3.1355
CEO Tenure	3495	1.4537	0.8613	0	3.091
Chair Education	3473	4.2206	0.8113	1	7
CEO Education	3477	4.2695	0.7044	1	7
TobinQ	3022	-0.5431	0.6732	-2.9137	0.9348
ROA	3499	0.0850	0.0994	-0.9518	0.9928
Board Size	3484	5.7216	1.2684	3	10
CEO Duality	2573	0.4349	0.4958	0	1
Leverage	3509	0.4743	0.2079	0.0385	0.9056
Firm Size	3509	27.8685	1.342	23.794	31.6025
Tangibility	3509	0.1954	0.2013	0.0001	0.8535
Growth Opportunities	3364	0.2345	0.7574	-0.7841	5.8599

Table 3: Mean comparison of firms with Chairwoman (female CEOs) to those without
This table shows mean comparisons of governance, performance, risk-taking and other firm-level characteristics across firm-years in which firms have Chairwoman (Female CEOs) to firm-years with Chairman (Male CEOs) for our sample of complete data. The total number of observations is 3,137. Superscripts [a], [b] and [c] indicate significance at 1%, 5% and 10% levels.

Variable	Mean comparison of firms with Chairwoman to those without			Mean comparison of firms with female CEOs to those without		
	Chairwoman	**Chairman**	**Difference**	**Female CEOs**	**Male CEOs**	**Difference**
Board Gender Diversity	0.3543	0.1245	0.2297[a]	0.3339	0.1304	0.2035[a]
Risk-Taking	0.8153	0.8141	0.0012	0.8259	0.8116	0.0142
Chair Tenure	1.6563	1.4992	0.1571	1.7288	1.4928	0.2359[a]
CEO Tenure	1.7344	1.4165	0.3180[a]	1.6985	1.4245	0.2739[a]
Chair Education	4.0944	4.2376	-0.1432[a]	4.0929	4.2356	-0.1427[a]
CEO Education	4.1087	4.2907	-0.1820[a]	4.1402	4.2849	-0.1448[a]
Board Size	5.6448	5.7271	0.0823	5.7596	5.7165	0.0431
TobinQ	-0.4997	-0.5496	0.0499[c]	-0.4792	-0.5508	0.0716[b]
ROA	0.1022	0.0827	0.0195[a]	0.0852	0.0850	0.0002
Leverage	0.4611	0.4761	-0.0150[c]	0.4761	0.4741	0.0019
Firm Size	27.9205	27.8545	0.0660	28.2686	27.8212	0.4475[a]
Tangibility	0.1392	0.2026	-0.0634[a]	0.1554	0.2001	-0.0447
Growth Opportunities	0.1873	0.2429	-0.0557[c]	0.2822	0.2288	0.0534
Number of observations	414	3,107		372	3,137	

Table 4: Difference in risk-taking, ROA, and Tobin's Q between firms with Chairwoman (female CEOs) and firms with Chairman (male CEOs) - Propensity score matching estimation

We employ propensity score matching models to estimate the difference in ROA, Risk-taking, and Tobin's Q between firms with chairwomen (female CEOs) and a matching control group including firms owned by chairmen (male CEOs) with no observable differences in firm-level characteristics. This propensity score is determined as a function of Board Size, CEO Duality, Chair Tenure, CEO Tenure, CEO Education, Chair Education, Firm Size, Tangibility, Leverage, Growth Opportunities, Board Gender Diversification and ROA (for the Risk-taking and Tobin's Q comparison), Risk-taking (for ROA and Tobin's Q comparison) within an industry-year group. We set a limit of 0.5% in absolute value for the difference between the propensity score of a firm in the control sample and its matching one in order to sufficiently guarantee the similarity between them. We also employ LR test, Rubio's B & R test (B-R) and Hotelling F-test as alternative tests. For the propensity score estimation, we check the conditional independence assumption using the Rosenbaum bounds for average treatment effects on the treated in the presence of unobserved heterogeneity. Superscripts a, b and c indicate statistical significance levels of 1%, 5% and 10% levels, respectively. Gamma is the log odds of differential assignment due to unobserved factors. Sig+/- is upper/lower bound significance level, t-hat+/- is upper/lower bound Hodges-Lehmann point estimate and CI+/- is upper/lower bound confidence interval (a= 0.95) in Rosenbaum bounds. * denotes if B>25%, R outside [0.5; 2].

Panel A: Difference in risk-taking, ROA, and Tobin's Q between firms with Chairwoman and firm without- Propensity score matching estimation

(1) Risk taking

Sample	**Treated**	**Controls**	**Difference**	**S.E.**	**T-stat**
Unmatched	0.8351	0.8490	-0.0139	0.0244	-0.57
ATT	0.8351	0.8793	-0.0442	0.0749	-0.59
Number of observations	1,733	265			
On support/Off support			1,998/340		
Mean Bias			14.8		
Median Bias			10.0		
B - R			99.1[c] - 1.16		
LR Chi-square stats			111.46[a]		
Hotelling test (F-stats)			0.0023		

Rosenbaum bounds for average treatment effects on the treated in the presence of unobserved heterogeneity (N = 265 matched pairs)

Gamma	**sig+**	**sig-**	**t-hat+**	**t-hat-**	**CI+**	**CI-**
1	0.0661	0.0661	-0.0495	-0.0495	-0.1188	0.0137
2	2.8e-11	0.9996	-0.2192	0.1150	-0.2857	0.1862
3	0	1	-0.3060	0.2047	-0.3798	0.2860

(2) ROA

Sample	**Treated**	**Controls**	**Difference**	**S.E.**	**T-stat**
Unmatched	0.1016	0.0860	0.0156	0.0067	2.33[a]
ATT	0.1016	0.0727	0.0289	0.0176	1.64[b]
Number of observations	265	1,733			
On support/Off support			1,998/340		
Mean Bias			13.2		
Median Bias			10.2		
B - R			100.3[*] - 0.80		
LR Chi-square stats			115.90[a]		
Hotelling test (F-stats)			14.0841[a]		

Rosenbaum bounds for average treatment effects on the treated in the presence of unobserved heterogeneity (N = 265 matched pairs)

Gamma	**sig+**	**sig-**	**t-hat+**	**t-hat-**	**CI+**	**CI-**
1	0.00007	0.00007	0.0289	0.0289	0.01450	0.0438
2	0.8285	0	-0.0071	0.0648	-0.0221	0.0820
3	0.9999	0	-0.02670	0.0864	-0.0440	0.1039

(3) TobinQ

Sample	Treated	Controls	Difference	S.E.	T-stat
Unmatched	-0.2913	-0.3488	0.0574	0.0455	1.26
ATT	-0.2913	-0.4135	0.1222	0.1356	0.90
Number of observations	236	1,482			
On support/Off support			1,718/ 219		
Median Bias			14.4		
Mean Bias			10.7		
B - R			96.1* - 0.98		
LR Chi-square stats			97.02[a]		
Hotelling test (F-stats)			1.7275		

Rosenbaum bounds for average treatment effects on the treated in the presence of unobserved heterogeneity (N = 236 matched pairs)

Gamma	sig+	sig-	t-hat+	t-hat-	CI+	CI-
1	0.0233	0.0233	0.1276	0.1276	0.0020	0.2523
2	0.9953	4.5e-12	-0.1641	0.4184	-0.2978	0.5507
3	1	0	-0.3310	0.5819	-0.4825	0.7240

Panel B: Difference in risk-taking, ROA, and Tobin's Q between firms with female CEOs and firm without - Propensity score matching estimation

(1) Risk taking

Sample	Treated	Controls	Difference	S.E.	T-stat
Unmatched	0.8536	0.8460	0.0077	0.0264	0.29
ATT	0.8536	0.8024	0.0512	0.0617	0.83
Number of observations	224	1,633			
On support/Off support			1,857/473		
Median Bias			16.6		
Mean Bias			12.3		
B - R			116.2* - 0.80		
LR Chi-square stats			121.61[a]		
Hotelling test (F-stats)			0.2897		

Rosenbaum bounds for average treatment effects on the treated in the presence of unobserved heterogeneity (N = 265 matched pairs)

Gamma	sig+	sig-	t-hat+	t-hat-	CI+	CI-
1	0.0661	0.0661	-0.0495	-0.0495	-0.119	0.0137
2	2.8e-11	0.9996	-0.2192	0.1150	-0.2857	0.1862
3	0	1	-0.3060	0.2050	-0.3798	0.2857

(2) ROA

Sample	Treated	Controls	Difference	S.E.	T-stat
Unmatched	0.0973	0.0858	0.0115	0.0073	1.58[c]
ATT	0.0973	0.1263	-0.0290	0.0135	-2.14[b]
Number of observations	224	1633			
On support/Off support			1,857/473		
Median Bias			16.0		
Mean Bias			12.1		
B - R			116.0* - 0.69		
LR Chi-square stats			120.78[a]		
Hotelling test (F-stats)			0.0017		

Rosenbaum bounds for average treatment effects on the treated in the presence of unobserved heterogeneity (N = 247 matched pairs)

Gamma	sig+	sig-	t-hat+	t-hat-	CI+	CI-
1	0	0	0.0650	0.0650	0.0634	0.0667
2	0	0	0.0449	0.0888	0.0434	0.0909
3	0	0	0.0348	0.1045	0.0334	0.1070

(3) TobinQ

Sample	Treated	Controls	Difference	S.E.	T-stat
Unmatched	-0.2872	-0.3449	0.0577	0.0487	1.19
ATT	-0.2872	-0.1616	-0.1256	0.1207	-1.04
Number of observations	197	1,399			
On support/Off support			1,596/339		
Median Bias			15.6		
Mean Bias			13.1		
B - R			109.3* - 0.72		
LR Chi-square stats			100.04		
Hotelling test (F-stats)			3.2659[c]		

Rosenbaum bounds for average treatment effects on the treated in the presence of unobserved heterogeneity (N = 197 matched pairs)

Gamma	sig+	sig-	t-hat+	t-hat-	CI+	CI-
1	0.0189	0.0189	-0.1380	-0.1380	-0.2597	-0.0065
2	3.8e-11	0.9821	-0.4001	0.1378	-0.5358	0.2852
3	0	1.0000	-0.5498	0.3012	-0.7024	0.4726

Table 5: Gender diversification, firm risk-taking, and performance – Firm fixed effect regressions

This table reports panel regression results with firm- and year-fixed effects. Regressions (1) and (2) examine the impact of gender on firm performance without considering the influence of risk-taking. Next, column (3) illustrates whether gender directly affects firm risk-taking. Regressions (4) and (5) display how gender influences firm performance when we control for the effect of firm risk-taking behaviours. The dependent variables are ROA in Regressions (1) and (4), whereas the dependent variable is Tobin's Q in Regressions (2) and (5), respectively. Risk-Taking is the dependent variable in Regression (3). We use Robust standard errors to account for heteroscedasticity and firm-level clustering. These are in parentheses. Superscripts [a], [b] and [c] indicate statistical significance at 1%, 5% and 10% levels, respectively.

Variable	(1) ROA	(2) TOBINQ	(3) RISK-TAKING	(4) ROA	(5) TOBINQ
Board Gender Diversity	-0.017	0.053	0.041	-0.014	0.164
	(0.018)	(0.133)	(0.027)	(0.020)	(0.159)
Chairwoman	0.010	0.027	-0.009	0.010	0.008
	(0.008)	(0.096)	(0.008)	(0.008)	(0.115)
Female CEO	-0.014	-0.008	-0.024[c]	-0.017	0.015
	(0.011)	(0.084)	(0.014)	(0.011)	(0.092)
CEO Education	0.008[c]	-0.035	0.010	0.007	-0.019
	(0.005)	(0.044)	(0.006)	(0.005)	(0.048)
Chair Education	-0.003	0.035	-0.004	-0.007	0.049
	(0.006)	(0.053)	(0.003)	(0.006)	(0.059)
Chair Tenure	-0.003	0.022	0.003	-0.002	0.035
	(0.002)	(0.024)	(0.002)	(0.003)	(0.027)
CEO Tenure	0.003	0.023	0.002	0.002	0.030
	(0.002)	(0.021)	(0.003)	(0.003)	(0.024)
Board Size	0.004[c]	-0.008	-0.000	0.005[c]	-0.008
	(0.003)	(0.014)	(0.002)	(0.003)	(0.017)
CEO Duality	0.003	0.001	0.009[c]	0.004	-0.000
	(0.005)	(0.045)	(0.005)	(0.006)	(0.048)
Leverage	-0.164[a]	1.372[a]	0.023	-0.165[a]	1.267[a]
	(0.020)	(0.184)	(0.024)	(0.022)	(0.209)
Firm Size	0.014[b]	0.028	-0.011[c]	0.010	-0.007
	(0.006)	(0.041)	(0.006)	(0.006)	(0.052)
Tangibility	-0.088[a]	0.209	0.014	-0.095[a]	0.229
	(0.020)	(0.151)	(0.017)	(0.022)	(0.184)
Growth Opportunities	0.011[a]	-0.004	-0.003[c]	0.012[a]	-0.003
	(0.002)	(0.016)	(0.002)	(0.002)	(0.017)
ROA		0.952[b]	-0.012		0.879[c]
		(0.448)	(0.025)		(0.487)
Risk-Taking				-0.013	-0.065
				(0.027)	(0.208)
Constant	-0.220	-0.971	1.137[a]	-0.110	-0.086
	(0.153)	(1.157)	(0.166)	(0.167)	(1.449)
Observations	2,375	2,047	2,041	2,041	1,760
R-squared	0.166	0.226	0.979	0.169	0.185
Number of firms	277	276	261	261	258
Firm FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Robust Cluster	YES	YES	YES	YES	YES

Table 6: Impact of female CEO appointments on firm risk-taking and performance - DID matching estimator

This table reports results from weighted DID matching estimators with year- and industry-fixed effects. We conduct two tests of estimation for two sub-periods, namely the 2006-2020 period and the 2011-2020 period, which is contextualised to be under the impact of the National Strategy on Gender Equality. In each panel, Regressions (1) and (2) examine the effect of female CEO appointments on firm performance without considering the influence of risk-taking. Next, Regression (3) examines whether female CEO appointment directly affects firm risk-taking. Regressions (4) and (5) display how female CEO appointments influence firm performance when we control for the effect of firm risk-taking behaviours. The dependent variables are ROA in Regressions (1) and (4), whereas the dependent variable is Tobin's Q in Regressions (2) and (5), respectively. Risk-Taking is the dependent variable in Regression (3). Treatment firms are ones that transit from a departing male CEO to a female CEO, whereas control firms are featured by a replacement of a departing male CEO by another male CEO. Treatment firms are matched with the similar control firms using their propensity score of appointing a female CEO. Female appointment is a dummy variable that equals 1 if the firm belongs to the treatment group and 0 when the firm is a part of the control group. Post Period is also a dummy variable that takes 1 in the post-treatment period and 0 before the treatment. We use robust standard errors to capture heteroscedasticity and firm-level clustering. These are in parentheses. [a], [b] and [c] indicate statistical significance at 1%, 5% and 10% levels, respectively.

Variable	Panel A: 2006-2020 period					Panel B: 2011-2020 period				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	ROA	TOBINQ	RISK-TAKING	ROA	TOBINQ	ROA	TOBINQ	RISK-TAKING	ROA	TOBINQ
Female Appoint	0.028[a]	-0.057	-0.011	0.028[a]	-0.057	0.026[b]	-0.087	-0.019[c]	0.027[b]	-0.087
*Post Period	(0.010)	(0.072)	(0.009)	(0.010)	(0.072)	(0.012)	(0.084)	(0.011)	(0.012)	(0.084)
Female Appointment	-0.032[a]	-0.001	0.010[c]	-0.030[a]	-0.001	-0.031[a]	0.001	0.020[b]	-0.030[a]	0.001
	(0.007)	(0.051)	(0.006)	(0.007)	(0.051)	(0.009)	(0.063)	(0.008)	(0.009)	(0.063)
Post Period	-0.022[a]	0.002	-0.011[b]	-0.024[a]	0.000	-0.023[a]	-0.009	-0.014[b]	-0.025[a]	-0.010
	(0.006)	(0.041)	(0.005)	(0.006)	(0.041)	(0.006)	(0.045)	(0.006)	(0.006)	(0.045)
Board Gender	-0.024[c]	-0.059	-0.019[c]	-0.022[c]	-0.058	-0.027[c]	-0.024	-0.019	-0.025[c]	-0.024
Diversity	(0.012)	(0.088)	(0.011)	(0.012)	(0.088)	(0.014)	(0.098)	(0.014)	(0.014)	(0.098)
Chairwoman	0.006	0.044	0.003	0.007	0.046	0.010	0.035	0.001	0.010	0.035
	(0.006)	(0.043)	(0.005)	(0.006)	(0.043)	(0.007)	(0.049)	(0.007)	(0.007)	(0.049)
Dismiss	-0.016[a]	-0.072[c]	0.002	-0.020[a]	-0.076[b]	-0.013[b]	-0.081[b]	0.002	-0.016[a]	-0.082[b]
	(0.006)	(0.038)	(0.005)	(0.006)	(0.038)	(0.006)	(0.041)	(0.006)	(0.006)	(0.041)
Designate	0.003	0.003	-0.003	0.007	0.007	0.006	0.005	-0.005	0.010[b]	0.007
	(0.005)	(0.032)	(0.004)	(0.005)	(0.032)	(0.005)	(0.034)	(0.005)	(0.005)	(0.034)
Resign	-0.001	-0.004	-0.002	-0.005	-0.008	-0.002	0.001	-0.003	-0.005	0.000
	(0.006)	(0.042)	(0.005)	(0.006)	(0.042)	(0.006)	(0.044)	(0.006)	(0.006)	(0.044)
CEO Education	-0.002	-0.018	0.007[a]	-0.001	-0.017	-0.003	-0.002	0.010[a]	-0.002	-0.002
	(0.003)	(0.021)	(0.003)	(0.003)	(0.021)	(0.003)	(0.024)	(0.003)	(0.003)	(0.024)
Chair Education	-0.002	-0.013	0.004[c]	-0.001	-0.012	0.001	-0.023	0.005[c]	0.002	-0.023
	(0.003)	(0.019)	(0.002)	(0.003)	(0.019)	(0.003)	(0.022)	(0.003)	(0.003)	(0.022)
Chair Tenure	-0.004	-0.011	0.001	-0.004	-0.011	-0.004[c]	-0.017	0.000	-0.004	-0.017
	(0.002)	(0.017)	(0.002)	(0.002)	(0.017)	(0.003)	(0.018)	(0.002)	(0.003)	(0.018)
CEO Tenure	-0.005	-0.003	-0.006[b]	-0.007[b]	-0.004	-0.005	-0.017	-0.009[a]	-0.006[c]	-0.018
	(0.003)	(0.022)	(0.003)	(0.003)	(0.022)	(0.003)	(0.024)	(0.003)	(0.003)	(0.024)
Board Size	0.002	0.007	-0.000	0.001	0.006	0.001	0.017	-0.001	0.001	0.017
	(0.002)	(0.011)	(0.001)	(0.001)	(0.011)	(0.002)	(0.012)	(0.002)	(0.002)	(0.012)
CEO Duality	-0.003	0.010	0.008[b]	-0.002	0.011	-0.005	-0.010	0.010[b]	-0.004	-0.010
	(0.004)	(0.030)	(0.004)	(0.004)	(0.030)	(0.005)	(0.035)	(0.005)	(0.005)	(0.035)
Leverage	-0.231[a]	1.427[a]	-0.006	-0.211[a]	1.436[a]	-0.256[a]	1.566[a]	0.001	-0.235[a]	1.571[a]
	(0.009)	(0.075)	(0.009)	(0.009)	(0.075)	(0.011)	(0.086)	(0.012)	(0.011)	(0.087)
Firm Size	0.007[a]	0.017	-0.003[b]	0.007[a]	0.017	0.011[a]	0.003	-0.005[a]	0.012[a]	0.003
	(0.002)	(0.012)	(0.001)	(0.002)	(0.012)	(0.002)	(0.014)	(0.002)	(0.002)	(0.014)
Tangibility	-0.037[a]	0.006	0.004	-0.044[a]	-0.001	-0.033[a]	0.032	0.006	-0.036[a]	0.030
	(0.010)	(0.073)	(0.009)	(0.010)	(0.073)	(0.011)	(0.081)	(0.011)	(0.011)	(0.081)
Growth Opportunities	0.007[a]	0.002	0.000	0.008[a]	0.003	0.007[a]	0.014	-0.001	0.008[a]	0.015
	(0.002)	(0.017)	(0.002)	(0.002)	(0.017)	(0.003)	(0.020)	(0.003)	(0.003)	(0.020)
ROA		1.149[a]	-0.015		1.122[a]		0.849[a]	-0.009		0.837[a]
		(0.150)	(0.018)		(0.153)		(0.174)	(0.023)		(0.177)
Risk-Taking				0.536[a]	0.386				0.464[a]	0.179
				(0.054)	(0.396)				(0.063)	(0.452)
Constant	0.040	-0.568	0.952[a]	-0.015	-0.605	-0.080	-1.419[a]	0.988[a]	-0.127[b]	-1.439[a]
	(0.044)	(0.490)	(0.039)	(0.044)	(0.491)	(0.050)	(0.352)	(0.047)	(0.049)	(0.356)
Observations	2,375	2,047	2,041	2,375	2,047	1,725	1,632	1,435	1,725	1,632
R-squared	0.296	0.329	0.967	0.325	0.329	0.335	0.296	0.931	0.356	0.296
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Robust cluster	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 7: Government policy, board gender diversity, firm risk-taking, and performance
This table reports the firm-fixed effect regression results for the difference in impact of board gender diversity on firm outcomes before and after the National Strategy on Gender Equality. Regressions (1) and (2) examine the impact of gender on firm performance without considering the influence of risk-taking. Next, column (3) illustrates whether gender directly affects firm risk-taking. Regressions (4) and (5) display how gender influences firm performance when we control for the effect of firm risk-taking behaviours. The dependent variables are ROA in Regressions (1) and (4), whereas the dependent variable is Tobin's Q in Regressions (2) and (5), respectively. Risk-Taking is the dependent variable in Regression (3). We use robust standard errors to capture heteroscedasticity and firm-level clustering. These are in parentheses. BGD is board gender diversity. Superscripts [a], [b] and [c] indicate statistical significance at 1%, 5% and 10% levels, respectively.

Variable	(1) ROA	(2) TOBINQ	(3) RISK-TAKING	(4) ROA	(5) TOBINQ
BGD*Post 2011	0.009	0.007	-0.042[c]	0.015	0.036
	(0.023)	(0.230)	(0.022)	(0.023)	(0.231)
Board Gender Diversity	-0.024	0.047	0.071[a]	-0.025	0.135
	(0.025)	(0.240)	(0.026)	(0.026)	(0.243)
Post 2011	-0.075[a]	-1.514[a]	-0.747[a]	-0.036	-1.543[a]
	(0.019)	(0.424)	(0.010)	(0.027)	(0.480)
Chairwoman	0.010	0.027	-0.009	0.010	0.008
	(0.008)	(0.096)	(0.008)	(0.008)	(0.116)
Female CEO	-0.014	-0.008	-0.025[c]	-0.017	0.015
	(0.010)	(0.084)	(0.013)	(0.011)	(0.093)
CEO Education	0.008[c]	-0.035	0.010	0.007	-0.019
	(0.005)	(0.044)	(0.006)	(0.005)	(0.048)
Chair Education	-0.003	0.035	-0.004	-0.007	0.049
	(0.006)	(0.053)	(0.003)	(0.006)	(0.059)
Chair Tenure	-0.003	0.022	0.003	-0.002	0.035
	(0.002)	(0.024)	(0.002)	(0.003)	(0.028)
CEO Tenure	0.003	0.023	0.001	0.002	0.030
	(0.002)	(0.021)	(0.003)	(0.003)	(0.024)
Board Size	0.004[c]	-0.008	-0.000	0.005[c]	-0.008
	(0.002)	(0.014)	(0.002)	(0.003)	(0.017)
CEO Duality	0.003	0.001	0.010[c]	0.004	-0.0003
	(0.005)	(0.045)	(0.005)	(0.006)	(0.048)
Leverage	-0.164[a]	1.372[a]	0.024	-0.165[a]	1.267[a]
	(0.020)	(0.183)	(0.024)	(0.022)	(0.209)
Firm Size	0.014[b]	0.028	-0.010	0.010	-0.008
	(0.006)	(0.041)	(0.006)	(0.006)	(0.052)
Tangibility	-0.088[a]	0.209	0.015	-0.095[a]	0.228
	(0.020)	(0.150)	(0.017)	(0.022)	(0.184)
Growth Opportunities	0.012[a]	-0.004	-0.003[c]	0.012[a]	-0.002
	(0.002)	(0.016)	(0.002)	(0.002)	(0.018)
ROA		0.952[b]	-0.011		0.879[c]
		(0.448)	(0.025)		(0.488)
Risk-Taking				-0.012	-0.063
				(0.027)	(0.209)
Constant	-0.215	-0.966	1.110[a]	-0.102	-0.059
	(0.153)	(1.144)	(0.168)	(0.169)	(1.446)
Observations	2,375	2,047	2,041	2,041	1,760
R-squared	0.166	0.226	0.979	0.169	0.185
Number of firms	277	276	261	261	258
Firm FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Robust	YES	YES	YES	YES	YES

Table 8: Government policy, female leadership (Chairwomen, female CEOs), firm risk-taking, and performance – DID matching estimator
This table reports the results for the difference in the impact of female leadership on firm outcomes before and after the National Strategy on Gender Equality using the weighted DID matching estimator. Gender*Post2011 is presented in turn for Chairwomen*Post 2011 (Panel A) and Female CEOs*Post 2011 (Panel B) where Post 2011 is 1 for the post-2011 period and 0 otherwise. In each panel, Regressions (1) and (2) examine the impact of gender on firm performance without considering the influence of risk-taking. Next, Regression (3) illustrates whether gender directly affects firm risk-taking. Regressions (4) and (5) display how gender influences firm performance when we control for the effect of firm risk-taking behaviours. The dependent variables are ROA in Regressions (1) and (4), whereas the dependent variable is Tobin's Q in Regressions (2) and (5), respectively. Risk-Taking is the dependent variable in Regression (3). Year- and industry- fixed effects are included in all regressions. We use robust standard errors to capture heteroscedasticity and firm-level clustering. These are in parentheses. Superscripts [a], [b] and [c] indicate statistical significance at 1%, 5% and 10% levels, respectively.

Variable	Panel A: Chairwomen					Panel B: Female CEOs				
	(1) ROA	(2) TOBINQ	(3) RISK-TAKING	(4) ROA	(5) TOBINQ	(1) ROA	(2) TOBINQ	(3) RISK-TAKING	(4) ROA	(5) TOBINQ
Gender*Post 2011	0.024[a]	-0.066	-0.013	0.022[b]	-0.051	0.031[a]	-0.142	0.005	0.029[a]	-0.132
	(0.008)	(0.092)	(0.009)	(0.009)	(0.100)	(0.009)	(0.095)	(0.009)	(0.009)	(0.103)
Post 2011	-0.077[a]	-1.506[a]	-0.752[a]	-0.036	-1.533[a]	-0.053[a]	-1.458[a]	-0.755[a]	-0.041[c]	-1.480[a]
	(0.014)	(0.417)	(0.013)	(0.023)	(0.476)	(0.014)	(0.418)	(0.013)	(0.023)	(0.478)
Board Gender	-0.019	0.059	0.042[b]	-0.016	0.169	-0.019	0.071	0.040[b]	-0.016	0.180
Diversity	(0.014)	(0.153)	(0.016)	(0.017)	(0.183)	(0.015)	(0.153)	(0.016)	(0.017)	(0.183)
Chairwoman	-0.008	0.079	0.001	-0.006	0.047	0.008	0.031	-0.009	0.010	0.011
	(0.010)	(0.106)	(0.010)	(0.011)	(0.118)	(0.008)	(0.078)	(0.008)	(0.008)	(0.090)
Female CEO	-0.012	-0.014	-0.026[a]	-0.014	0.008	-0.031[a]	0.083	-0.027[a]	-0.033[a]	0.092
	(0.008)	(0.085)	(0.009)	(0.010)	(0.101)	(0.010)	(0.104)	(0.010)	(0.011)	(0.116)
CEO Education	0.008[b]	-0.036	0.010[b]	0.008[c]	-0.019	0.010[b]	-0.032	0.010[b]	0.007	-0.015
	(0.004)	(0.041)	(0.004)	(0.004)	(0.047)	(0.004)	(0.041)	(0.004)	(0.004)	(0.047)
Chair Education	-0.003	0.035	-0.004	-0.007[c]	0.049	-0.003	0.037	-0.004	-0.007[c]	0.051
	(0.003)	(0.036)	(0.004)	(0.004)	(0.041)	(0.004)	(0.036)	(0.004)	(0.004)	(0.041)
Chair Tenure	-0.003	0.022	0.003	-0.002	0.035	-0.003	0.023	0.003	-0.002	0.035
	(0.002)	(0.023)	(0.002)	(0.003)	(0.027)	(0.002)	(0.023)	(0.002)	(0.003)	(0.027)
CEO Tenure	0.003	0.023	0.002	0.002	0.030	0.003	0.021	0.002	0.002	0.029
	(0.002)	(0.023)	(0.002)	(0.002)	(0.026)	(0.002)	(0.023)	(0.002)	(0.002)	(0.026)
Board Size	0.004[b]	-0.008	-0.000	0.005[a]	-0.008	0.006[a]	-0.007	-0.000	0.005[b]	-0.007
	(0.002)	(0.018)	(0.002)	(0.002)	(0.021)	(0.002)	(0.018)	(0.002)	(0.002)	(0.021)
CEO Duality	0.003	-0.001	0.009[b]	0.004	-0.002	0.001	0.001	0.009[b]	0.004	-0.001
	(0.004)	(0.045)	(0.005)	(0.005)	(0.051)	(0.004)	(0.045)	(0.005)	(0.005)	(0.051)
Leverage	-0.165[a]	1.373[a]	0.024	-0.166[a]	1.268[a]		1.373[a]	0.022	-0.166[a]	1.268[a]
	(0.013)	(0.154)	(0.015)	(0.015)	(0.178)		(0.154)	(0.015)	(0.015)	(0.178)
Firm Size	0.013[a]	0.030	-0.010[b]	0.010[b]	-0.005	-0.005	0.033	-0.011[b]	0.010[b]	-0.002
	(0.004)	(0.046)	(0.004)	(0.005)	(0.056)	(0.004)	(0.046)	(0.004)	(0.005)	(0.056)
Tangibility	-0.089[a]	0.213	0.014	-0.095[a]	0.233	-0.097[a]	0.226	0.013	-0.097[a]	0.245
	(0.015)	(0.165)	(0.016)	(0.016)	(0.185)	(0.015)	(0.166)	(0.016)	(0.016)	(0.185)
Growth Opportunities	0.011[a]	-0.004	-0.003[c]	0.012[a]	-0.002	0.010[a]	-0.005	-0.003[c]	0.012[a]	-0.004
	(0.002)	(0.019)	(0.002)	(0.002)	(0.021)	(0.002)	(0.019)	(0.002)	(0.002)	(0.021)
ROA		0.963[a]	-0.010		0.887[a]		0.981[a]	-0.013		0.905[a]
		(0.233)	(0.023)		(0.261)		(0.233)	(0.023)		(0.261)
Risk-Taking				-0.011	-0.070				-0.014	-0.055
				(0.025)	(0.262)				(0.025)	(0.262)
Constant	-0.206[b]	-1.027	1.127[a]	-0.096	-0.130	0.210[b]	-1.193	1.141[a]	-0.086	-0.328
	(0.104)	(1.257)	(0.119)	(0.127)	(1.569)	(0.102)	(1.263)	(0.119)	(0.127)	(1.577)
Observations	2,375	2,047	2,041	2,041	1,760	2,375	2,047	2,041	2,041	1,760
R-squared	0.170	0.226	0.979	0.172	0.185	0.109	0.227	0.979	0.174	0.186
Number of firms	277	276	261	261	258	277	276	261	261	258
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Robust	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 9: Gender diversification, firm risk-taking, and performance – IV GMM regression

This table reports panel regression results using the GMM estimator with firm- and year-fixed effects. Regressions (1) and (2) examine the impact of gender on firm performance without considering the influence of risk-taking. Next, Regression (3) illustrates whether gender diversity directly affects firm risk-taking. Regressions (4) and (5) display how gender diversity influences firm performance when we control for the effect of firm risk-taking behaviour. The dependent variables are ROA in Regressions (1) and (5), whereas the dependent variable is Tobin's Q in Regressions (2) and (4), respectively. Risk-Taking is the dependent variable in Regression (3). Board gender diversity is treated as endogenous in all five regressions and is instrumented for using different suitable instrumental variables across the model specifications. In Regression (1) and (4), IVs used are the annual ratio of the number of female chairs to the number of firms of the industry and the annual average of board gender diversity of the industry. In regressions (2), (4) and (5), IVs are the annual ratio of the number of female CEOs to the number of firms in the industry and the annual average of board gender diversity of the industry. Tests for endogeneity and over-identifying restrictions (Hansen J statistic) suggest suitable model specification. We use robust standard to capture heteroscedasticity and firm-level clustering. The standard errors are in parentheses. Superscripts [a], [b] and [c] indicate statistical significance at 1%, 5% and 10% levels, respectively.

Variable	(1) ROA	(2) TOBINQ	(3) RISK-TAKING	(4) ROA	(5) TOBINQ
Board Gender Diversity	-0.051	0.003	0.086	0.078	0.788
	(0.078)	(0.681)	(0.082)	(0.100)	(0.817)
Chairwoman	0.012	0.037	-0.012	-0.010	-0.091
	(0.013)	(0.114)	(0.013)	(0.017)	(0.138)
Female CEO	0.001	-0.032	-0.025[c]	-0.014	-0.103
	(0.009)	(0.081)	(0.014)	(0.011)	(0.092)
CEO Education	-0.005	-0.018	0.006[b]	-0.005	-0.024
	(0.003)	(0.022)	(0.003)	(0.003)	(0.025)
Chair Education	-0.001	-0.012	0.004[c]	-0.001	-0.007
	(0.003)	(0.020)	(0.002)	(0.003)	(0.021)
Chair Tenure	-0.005[b]	-0.009	0.001	-0.003	-0.003
	(0.003)	(0.017)	(0.002)	(0.003)	(0.020)
CEO Tenure	0.002	0.009	-0.002	0.001	0.007
	(0.003)	(0.016)	(0.002)	(0.003)	(0.019)
Board Size	0.002	0.006	-0.001	0.000	0.005
	(0.002)	(0.011)	(0.001)	(0.002)	(0.013)
CEO Duality	-0.002	0.014	0.008[b]	-0.001	-0.008
	(0.004)	(0.031)	(0.004)	(0.005)	(0.033)
Leverage	-0.225[a]	1.436[a]	0.000	-0.232[a]	1.398[a]
	(0.012)	(0.093)	(0.009)	(0.013)	(0.108)
Firm Size	0.012[a]	0.017	-0.003[b]	0.007[a]	0.009
	(0.003)	(0.013)	(0.001)	(0.002)	(0.015)
Tangibility	-0.039[a]	0.004	0.009	-0.034[a]	-0.011
	(0.009)	(0.068)	(0.008)	(0.010)	(0.078)
Growth Opportunities	0.010[a]	0.001	-0.001	0.006[b]	-0.009
	(0.002)	(0.017)	(0.002)	(0.003)	(0.019)
ROA		1.178[a]	-0.009		1.302[a]
		(0.263)	(0.015)		(0.290)
Risk-Taking				-0.020	0.036
				(0.023)	(0.186)
Constant	-0.101	-2.033[a]	0.170[a]	0.013	-1.973[a]
	(0.069)	(0.367)	(0.037)	(0.055)	(0.400)
Endogeneity statistics	0.0957	0.0054	1.4336	1.0746	1.001
Hansen J statistics	0.4288	0.0202	0.0035	0.9134	0.5491
First-stage F-statistics	35.7514[a]	22.7537[a]	27.447[a]	27.3834[a]	18.3653[a]
Observations	2,375	2,047	2,041	2,041	1,760
R-squared	0.266	0.327	0.966	0.267	0.239
Year FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Robust Cluster	YES	YES	YES	YES	YES

Table 10: Impact of female CEO appointments on firm risk-taking and performance – IV GMM DID matching estimator

This table reports results from weighted DID matching estimators with year- and industry-fixed effects. We conduct two tests of estimation for two sub-periods, namely the 2006-2020 period and the 2011-2020 period, which is contextualized to be under the impact of the National Strategy on Gender Equality. In each panel, Regressions (1) and (2) examine the effect of female CEO appointments on firm performance without considering the influence of risk-taking. Next, Regression (3) illustrates whether female CEO appointment directly affects firm risk-taking. Regressions (4) and (5) display how female CEO appointments influence firm performance when we control for the effect of firm risk-taking behaviours. The dependent variables are ROA in Regressions (1) and (4), whereas the dependent variable is Tobin's Q in Regressions (2) and (5), respectively. Risk-Taking is the dependent variable in Regression (3). Treatment firms are ones that transit from a departing male CEO to a female CEO, whereas control firms are featured by a replacement of a departing male CEO by another male CEO. Treatment firms are matched with the similar control firms using their propensity score of appointing a female CEO. Female appointment is a dummy variable that equals 1 if the firm belongs to the treatment group and 0 when the firm is a part of the control group. Post Period is also a dummy variable that takes 1 in the post-treatment period and 0 before the treatment. We use robust standard errors to capture heteroscedasticity and firm-level clustering. The standard errors are in parentheses. [a], [b] and [c] indicate statistical significance at 1%, 5% and 10% levels, respectively. Tests for endogeneity and over-identifying restrictions (Hansen J statistic) suggest good model specification.

Variable	Panel A: 2006-2020 period					Panel B: 2011-2020 period				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	ROA	TOBINQ	RISK-TAKING	ROA	TOBINQ	ROA	TOBINQ	RISK-TAKING	ROA	TOBINQ
Female Appointment*Post Period	0.030[a]	-0.057	-0.009	0.027[a]	-0.075	0.026[a]	-0.100	-0.018	0.019[c]	-0.101
	(0.009)	(0.067)	(0.011)	(0.009)	(0.076)	(0.009)	(0.077)	(0.013)	(0.010)	(0.087)
Female Appointment	-0.039[a]	0.015	0.003	-0.038[a]	-0.040	-0.033[a]	0.046	0.019	-0.027[b]	-0.031
	(0.008)	(0.061)	(0.012)	(0.008)	(0.067)	(0.010)	(0.080)	(0.012)	(0.011)	(0.099)
Post Period	-0.013[c]	-0.012	-0.006	-0.013[c]	0.042	-0.019[b]	-0.049	-0.013	-0.021[b]	0.018
	(0.007)	(0.057)	(0.006)	(0.007)	(0.064)	(0.009)	(0.068)	(0.008)	(0.010)	(0.084)
Board Gender	0.114	-0.312	0.094	0.104	0.687	0.015	-0.631	0.002	-0.062	0.430
Diversity	(0.096)	(0.681)	(0.091)	(0.103)	(0.801)	(0.121)	(0.781)	(0.096)	(0.137)	(1.108)
Dismiss	-0.020[a]	-0.071[c]	0.002	-0.023[a]	-0.046	-0.014[b]	-0.081[b]	0.001	-0.017[a]	-0.063
	(0.006)	(0.037)	(0.005)	(0.006)	(0.043)	(0.006)	(0.039)	(0.005)	(0.006)	(0.045)
Designate	0.003	0.001	-0.000	0.002	0.023	0.006	0.001	-0.004	0.004	0.020
	(0.005)	(0.034)	(0.005)	(0.005)	(0.039)	(0.005)	(0.037)	(0.005)	(0.005)	(0.043)
Resign	-0.007	-0.001	-0.002	-0.004	-0.006	-0.002	0.017	-0.003	0.003	0.002
	(0.006)	(0.045)	(0.005)	(0.006)	(0.053)	(0.006)	(0.048)	(0.006)	(0.007)	(0.056)
Chairwoman	-0.021	0.093	-0.019	-0.021	-0.103	0.003	0.156	-0.004	0.016	-0.066
	(0.020)	(0.138)	(0.019)	(0.021)	(0.161)	(0.025)	(0.163)	(0.021)	(0.028)	(0.226)
CEO Education	-0.002	-0.015	0.006[a]	-0.002	-0.021	-0.003	0.002	0.010[a]	-0.002	0.002
	(0.003)	(0.022)	(0.002)	(0.003)	(0.024)	(0.004)	(0.026)	(0.003)	(0.004)	(0.028)
Chair Education	-0.001	-0.014	0.004[c]	-0.001	-0.007	0.001	-0.028	0.005[c]	0.002	-0.020
	(0.003)	(0.020)	(0.002)	(0.003)	(0.021)	(0.004)	(0.023)	(0.003)	(0.004)	(0.024)
Chair Tenure	-0.003	-0.012	0.001	-0.002	-0.007	-0.004	-0.024	0.001	-0.003	-0.016
	(0.003)	(0.017)	(0.002)	(0.003)	(0.020)	(0.003)	(0.021)	(0.002)	(0.003)	(0.025)
CEO Tenure	-0.003	-0.008	-0.005	-0.005	0.019	-0.004	-0.030	-0.009[b]	-0.006	0.001
	(0.003)	(0.024)	(0.003)	(0.004)	(0.028)	(0.004)	(0.029)	(0.004)	(0.004)	(0.035)
Board Size	0.001	0.006	-0.000	-0.000	0.004	0.001	0.018	-0.001	-0.000	0.020
	(0.002)	(0.011)	(0.001)	(0.002)	(0.013)	(0.002)	(0.013)	(0.001)	(0.002)	(0.015)
CEO Duality	-0.006	0.015	0.006[c]	-0.005	-0.014	-0.007	0.005	0.009[c]	-0.004	-0.029
	(0.005)	(0.032)	(0.004)	(0.005)	(0.034)	(0.006)	(0.038)	(0.005)	(0.006)	(0.042)
Leverage	-0.224[a]	1.411[a]	-0.002	-0.231[a]	1.395[a]	-0.252[a]	1.531[a]	0.001	-0.268[a]	1.506[a]
	(0.012)	(0.095)	(0.009)	(0.013)	(0.110)	(0.014)	(0.111)	(0.013)	(0.016)	(0.138)
Firm Size	0.007[a]	0.016	-0.003[a]	0.006[a]	0.005	0.011[a]	0.004	-0.005[a]	0.011[a]	-0.012
	(0.002)	(0.013)	(0.001)	(0.002)	(0.015)	(0.002)	(0.015)	(0.002)	(0.002)	(0.018)
Tangibility	-0.037[a]	-0.008	0.005	-0.035[a]	-0.016	-0.033[a]	0.014	0.006	-0.030[a]	-0.007
	(0.009)	(0.068)	(0.008)	(0.010)	(0.076)	(0.011)	(0.078)	(0.010)	(0.012)	(0.089)
Growth Opportunities	0.006[b]	0.005	-0.002	0.006[b]	-0.008	0.007[a]	0.018	-0.001	0.007[b]	0.014
	(0.002)	(0.017)	(0.002)	(0.003)	(0.019)	(0.003)	(0.016)	(0.003)	(0.003)	(0.019)
ROA		1.148[a]	-0.010		1.283[a]		0.824[a]	-0.008		0.968[a]
		(0.265)	(0.016)		(0.293)		(0.309)	(0.022)		(0.353)
Risk-Taking				-0.015	0.048				-0.015	-0.058
				(0.024)	(0.195)				(0.030)	(0.226)
Constant	-0.018	-1.876[a]	0.176[a]	0.047	-1.875[a]	-0.118[c]	-1.499[a]	0.237[a]	-0.059	-1.425[a]
	(0.053)	(0.377)	(0.037)	(0.055)	(0.408)	(0.062)	(0.416)	(0.045)	(0.062)	(0.453)
Observations	2,375	2,047	2,041	2,041	1,760	1,725	1,632	1,435	1,435	1,352
R-squared	0.260	0.326	0.966	0.272	0.247	0.332	0.279	0.930	0.347	0.212
Hansen J statistic	2.2359	0.1473	1.4667	1.71253	0.8030	0.1205	.661103	.044824	.063732	.130489
Endogeneity statistic	0.7937	0.4825	2.2768	0.8679	0.0135	2.3259	.569473	.105646	.396436	.725929
First-stage F-statistics	27.6739	19.6348	25.0689	24.9081	16.7972	14.0604	15.4924	12.2321	11.145	11.5652
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Robust	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 11: Impact of female CEO appointments on firm risk-taking and performance – DID nearest matching estimator

This table reports results from the DID nearest matching estimators. To increase the number of observations of regressions, we employ 10 neighbours of treatment firms to calculate the matched outcome. We conduct two tests of estimation for two periods of time, namely the 2006-2020 period and the 2011-2020 period, which is contextualized to be under the impact of the National Strategy on Gender Equality. In each panel, Regressions (1) and (2) examine the effect of female CEO appointments on firm performance without considering the influence of risk-taking. Next, Regression (3) illustrates whether female CEO appointment directly affects firm risk-taking. Regressions (4) and (5) display how female CEO appointments influence firm performance when we control for the effect of firm risk-taking behaviours. The dependent variables are ROA in Regressions (1) and (4), whereas the dependent variable is Tobin's Q in Regressions (2) and (5), respectively. Risk-taking is the dependent variable in Regression (3). Treatment firms are ones that transit from a departing male CEO to a female CEO whereas control firms are featured by a replacement of a departing male CEO by another male CEO. Treatment firms are matched with the similar control firms using their propensity score of appointing a female CEO. Female Appointment is a dummy variable that equals 1 if the firm belongs to the treatment group and 0 when the firm is a part of the control group. Post Period is also a dummy variable that takes the value of 1 in the post-treatment period and 0 before the treatment. Industry- and year-fixed effects are included in all regressions. We use robust standard errors to capture heteroscedasticity and firm-level clustering. The standard errors are in parentheses. [a], [b] and [c] indicate statistical significance at 1%, 5% and 10% levels, respectively.

Variable	**Panel A: 2006-2020 period**					**Panel B: 2011-2020 period**				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	ROA	**TOBINQ**	**RISK-TAKING**	**ROA**	**TOBINQ**	**ROA**	**TOBINQ**	**RISK-TAKING**	**ROA**	**TOBINQ**
Female Appoint*Post Period	0.029[a]	-0.056	-0.011	0.026[b]	-0.084	0.027[b]	-0.086	-0.019[c]	0.020[b]	-0.119
	(0.010)	(0.073)	(0.009)	(0.011)	(0.082)	(0.012)	(0.084)	(0.011)	(0.010)	(0.096)
Female Appointment	-0.031[a]	-0.001	0.010[c]	-0.032[a]	-0.000	-0.031[a]	0.001	0.020[b]	-0.028[a]	-0.000
	(0.007)	(0.051)	(0.006)	(0.008)	(0.056)	(0.009)	(0.063)	(0.008)	(0.007)	(0.071)
Post Period	-0.020[a]	0.004	-0.011[b]	-0.019[a]	0.004	-0.022[a]	-0.008	-0.014[b]	-0.021[a]	-0.003
	(0.006)	(0.042)	(0.005)	(0.007)	(0.048)	(0.007)	(0.047)	(0.006)	(0.006)	(0.054)
Board Gender	-0.022[c]	-0.050	-0.018[c]	-0.025[c]	-0.015	-0.026[c]	-0.016	-0.019	-0.028[c]	0.038
Diversity	(0.012)	(0.088)	(0.011)	(0.014)	(0.101)	(0.014)	(0.098)	(0.014)	(0.014)	(0.117)
Dismiss	-0.019[a]	-0.073[c]	0.002	-0.023[a]	-0.050	-0.014[b]	-0.082[c]	0.001	-0.017[a]	-0.068
	(0.006)	(0.040)	(0.005)	(0.007)	(0.045)	(0.006)	(0.043)	(0.006)	(0.006)	(0.049)
Designate	0.001	0.004	-0.002	0.000	0.012	0.006	0.007	-0.004	0.005	0.013
	(0.005)	(0.033)	(0.004)	(0.005)	(0.037)	(0.005)	(0.036)	(0.005)	(0.005)	(0.041)
Resign	-0.005	-0.007	-0.001	-0.003	-0.001	-0.002	0.004	-0.002	0.002	0.009
	(0.007)	(0.046)	(0.006)	(0.008)	(0.052)	(0.007)	(0.048)	(0.007)	(0.006)	(0.056)
Chairwoman	0.006	0.043	0.003	0.004	0.033	0.010	0.034	0.001	0.010	0.016
	(0.006)	(0.043)	(0.005)	(0.007)	(0.047)	(0.007)	(0.049)	(0.007)	(0.007)	(0.056)
CEO Education	-0.002	-0.017	0.007[a]	-0.002	-0.015	-0.003	-0.002	0.010[a]	-0.003	0.003
	(0.003)	(0.021)	(0.003)	(0.003)	(0.023)	(0.003)	(0.024)	(0.003)	(0.004)	(0.027)
Chair Education	-0.001	-0.013	0.004[c]	-0.001	-0.010	0.001	-0.024	0.005[c]	0.003	-0.019
	(0.003)	(0.019)	(0.002)	(0.003)	(0.021)	(0.003)	(0.022)	(0.003)	(0.004)	(0.025)
Chair Tenure	-0.004	-0.010	0.001	-0.003	-0.011	-0.004	-0.017	0.000	-0.003	-0.020
	(0.002)	(0.017)	(0.002)	(0.003)	(0.018)	(0.003)	(0.018)	(0.002)	(0.003)	(0.021)
CEO Tenure	-0.005[c]	-0.002	-0.006[b]	-0.006[c]	0.008	-0.005	-0.017	-0.009[a]	-0.006	-0.005
	(0.003)	(0.022)	(0.003)	(0.003)	(0.025)	(0.003)	(0.025)	(0.003)	(0.004)	(0.029)
Board Size	0.001	0.005	-0.000	0.000	0.007	0.001	0.016	-0.001	-0.000	0.020
	(0.001)	(0.011)	(0.001)	(0.002)	(0.012)	(0.002)	(0.012)	(0.002)	(0.002)	(0.014)
CEO Duality	-0.003	0.011	0.008[b]	-0.003	-0.004	-0.005	-0.009	0.010[b]	-0.005	-0.022
	(0.004)	(0.030)	(0.004)	(0.005)	(0.033)	(0.005)	(0.035)	(0.005)	(0.005)	(0.039)
Leverage	-0.232[a]	1.425[a]	-0.006	-0.239[a]	1.350[a]	-0.256[a]	1.565[a]	0.001	-0.267[a]	1.482[a]
	(0.009)	(0.075)	(0.009)	(0.010)	(0.083)	(0.011)	(0.086)	(0.012)	(0.015)	(0.098)
Firm Size	0.007[a]	0.016	-0.003[b]	0.006[a]	0.009	0.011[a]	0.001	-0.005[a]	0.011[a]	-0.009
	(0.002)	(0.012)	(0.001)	(0.002)	(0.013)	(0.002)	(0.014)	(0.002)	(0.002)	(0.015)
Tangibility	-0.039[a]	0.000	0.004	-0.038[a]	-0.030	-0.034[a]	0.026	0.006	-0.031[a]	-0.010
	(0.010)	(0.073)	(0.009)	(0.011)	(0.081)	(0.011)	(0.081)	(0.011)	(0.012)	(0.093)
Growth Opportunities	0.007[a]	0.002	0.000	0.007[a]	0.002	0.007[a]	0.014	-0.001	0.007[a]	0.017
	(0.002)	(0.017)	(0.002)	(0.002)	(0.019)	(0.003)	(0.020)	(0.003)	(0.003)	(0.023)
ROA		1.147[a]	-0.015		1.247[a]		0.848[a]	-0.009		0.940[a]
		(0.150)	(0.018)		(0.165)		(0.174)	(0.023)		(0.197)
Risk-Taking				-0.024	-0.041				-0.013	-0.112
				(0.028)	(0.197)				(0.009)	(0.225)
Constant	0.043	-0.544	0.954[a]	0.075	-0.345	-0.075	-1.383[a]	0.990[a]	-0.061	-1.051[b]
	(0.044)	(0.489)	(0.039)	(0.056)	(0.555)	(0.050)	(0.352)	(0.047)	(0.059)	(0.456)
Observations	2,375	2,047	2,041	2,041	1,760	1,725	1,632	1,435	1,435	1,352
R-squared	0.297	0.329	0.967	0.302	0.267	0.335	0.296	0.931	0.346	0.219
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Robust	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Figure 1. Board characteristics by year