

Effects of female directors on gender diversity at lower organization levels and CSR performance: Evidence in Japan¹

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Abstract

This paper examines the effects of board gender diversity on female representation in lower organization levels and corporate social responsibility (CSR) performance. Using a panel data of more than 1,000 Japanese listed firms from 2005 to 2014, we focus on firms that introduce female directors to their male dominant boards for the first time and find that the first-introduced female directors are positively associated with a greater number of female officers and managers. The introduction of the first female director is also associated with better CSR performance. Our results are statistically significant and suggest that board gender diversity has an effect on promoting gender diversity at the lower level and CSR performance in listed firms.

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Keywords: Board gender; CSR; Corporate governance; Japan

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1. INTRODUCTION

Gender gap at the boardroom has long attracted attention from academic researchers and policy makers. According to Deloitte (2019), using data relating to companies in 60 countries, women hold only 16.9 percent of board seats worldwide. For important positions, women hold only 5.3 percent of board chair positions and 4.4 percent of CEO roles globally (Deloitte, 2019). To address the inequality, many countries have required mandatory or voluntary quota for female leaders (e.g., 40% female board membership quota in Norway; 25% women board membership target in the UK). The increasing initiatives to encourage firms to have more female directors stimulate academia to address research questions on the effects of female leaders.

Researchers have tried to identify and quantify the impacts of female directors on the firms they serve, such as in financial performance (Adams and Ferreira, 2009; Conyon and He, 2017; Perryman et al., 2016), risk (Doan and Iskandar-Datta, 2020; Perryman et al., 2016), investment oversight (Harjoto et al., 2018), and the success of women CEOs (Cook and Glass, 2015). However, there are few studies on non-financial impacts of female directors such as effects on gender diversity below board level, women policies (Thams et al., 2018), LGBT friendly policies (Cook and Glass, 2016), and corporate social responsibility (CSR) performance (Harjoto and Rossi, 2019, Harjoto et al., 2015, Upadhyay and Zeng, 2014).

Moreover, previous studies have been mostly conducted on the US or European countries, which are developed economically and pro-active in female leadership and CSR policies. A country with a developed economy but not really pro-active in women support like Japan is an interesting context to investigate. While we find a small amount of literature measuring the effect of female directors on financial performance (Tanaka, 2019) in Japan, no existing literature uses other measures of corporate performance that are more relevant and

specific to women characteristics. Therefore, our study aims to fill the research gap by providing empirical evidence about the effects of female directors on gender diversity below board level, especially on female officers and female managers, and on CSR performance.

Using Japanese data, we examine a special sample group: first-introduced female directors, who are female directors that a firm appointed for its first time since the firm started listing. It is a fact that Japan lags on female empowerment² and boards of listed Japanese firms are often comprised solely of male directors; the number of firms with at least one female director is extremely low (Tanaka, 2019). Under the institutional changes in corporate governance in Japan recently, and as a result of the *Womanomics* policies package, introduced by Abe's Cabinet since 2013, which aims to empower women in the workplace and in leader positions, several firms have started introducing the first female directors to their all-male boards. It is interesting to investigate which firms introduced the first female directors and whether the first-introduced female directors will empower more women in the workplace and result in an increase of female officers and managers.

First introduction of a position in management and board can bring changes more differently (Oradi, 2021, Tang et al., 2021). By introducing a first female director(s), firms signal their commitment to diversity and this often creates a positive image among shareholders. Recently, all-male boards have faced strong rejection by foreign institutional investors. Foreign investors argue that “better diversity brings economic as well as cultural benefits”³. Empirical researchers also observed that gender mix drives CSR change and female board presence is strongly related to firms' social performance (Adams and Funk, 2011; Bear et al., 2010; Cumming et al., 2015; Harjoto et al., 2015; Huang and Kisgen, 2013; McGuinness et al., 2017).

² In Global Gender Gap Report 2020, Japan's gender gap is the largest among all advanced economies, ranking 121st out of 153 countries. World Economic Forum: http://www3.weforum.org/docs/WEF_GGGR_2020.pdf

³ Legal & General Investment Management votes against all Topix 100 companies that do not have at least one female representative on their board; Goldman Sachs Asset Management opposes candidates nominating committee or top executives if its board lacks female members. [<https://asia.nikkei.com/Business/Business-trends/Japan-s-all-male-boards-face-rejection-by-foreign-investors?>]

There are a lack of rigorous studies investigating the correlation between board gender diversity and CSR performance in Japanese firms. As women are highly underrepresented on corporate boards, we expect that the effects of female directors on CSR in Japan to be larger than that in other countries. We fill the gap by using Japanese data to examine the effect of first female directors on CSR performance.

We constructed an unbalanced data panel of non-financial listed firms in Japan from 2005 to 2014, obtaining around 9,600 firm-year observations from four major databases: CSR Database, CSR Ranking Database, Yakuin Shikiho (Directory of Directors) and Nikkei Corporate Governance Evaluation System. Our database shows that female directors comprise only a small part of the boardroom, with only 9% of firm-year observations revealing at least one female director on the board. 134 individual firms introduced first female directors during the research period, recording 140 first-introduced female directors individually.

First, we found that firms introducing their first female directors are associated with larger board size, more outside directors on boards, higher managerial ownership and foreign ownership ratio, higher ratio of female officers but lower ratio of women in managerial positions. Next, we examined the effects of female directors on female representation at lower organizational levels and found that the first introduction of a female director(s) is strongly associated with a greater number of female officers and managers in Ordinary Least Square (OLS) and fixed effects (FE) regressions. When we use propensity score matching and difference-in-difference methods to address the reserve causality problem by building a control group for the treatment firms having first-introduced female directors, we find that treatment firms increase the ratio of female officers after the introduction more than those of the control firms and that the difference is statistically significant. The coefficient for the ratio of female managers is also positive but not statistically significant. In short, we found more female officer representation after firms introduced the first female directors to the board.

We then examine the effects of first-introduced female directors on CSR performance and found that firms with first female directors are positively associated with the total CSR score in both OLS and fixed effects regressions. When we break up the CSR score into three component scores: Human resource utilization (HR) score, environment score and corporate governance & social performance score, the HR score has the strongest positive relation to the presence of a first female director. We confirm this finding with a propensity score matching estimation.

Our paper contributes to the existing literature in several ways. First, we provide empirical evidence about the effects of female directors on gender diversity below board levels in a unique setting where the gendered organizations are large. Instead of using the female director variable as a whole, we focus on a special sample, first-introduced female directors, in order to measure the before and after change, while also avoiding causality problems often arising between board gender diversity and employee gender diversity and CSR performance.

Second, in this paper we explore the impacts of female directors on specific CSR aspects in a rich dataset of Japanese firms. Prior studies focus on CSR as a single index while not really focusing on specific CSR aspects (Saridakis et al, 2020). We investigated CSR performance as a sum of three components (human resource, environment and corporate governance and social performance) and found an association between board gender diversity and female-favored HR policies, one of the important CSR aspects.

Third, we contribute to the existing literature by breaking up female directors into different types and compare the effects of inside female directors to those of outside female directors on female representation below board level and CSR performance. We find the same positive effects of both first outside and inside female directors on female managers and officers. Regarding CSR performance, coefficients of first outside female directors are positively associated with the CSR score and significant in both OLS and FE regressions, while the coefficient of first inside female directors is only statistically significant in OLS regression.

Overall, the findings of a positive relation between female directors and gender diversity at organizational levels and CSR might have a broad implication for researchers, policy makers and business leaders when investigating or considering board gender diversity.

The rest of the paper is organized as follows: Section 2 summarizes the related literature and presents our hypotheses. Section 3 explains the data sources. Section 4 presents main empirical results. Section 5 shows results from additional tests and robustness tests. Section 6 concludes the research.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1. Why do female directors matter to gender diversity at organizational levels?

Related theories and empirical research show that female directors do matter regarding gender diversity at organizational levels.

Upper echelon theory (Hambrick and Mason, 1984) and *gender socialization theory* (Chodorow, 1974; Mason and Mudrack, 1996) explain the tendency of female directors to support female policies. Managers' personal values, attributes, attitudes and behaviors can influence employees' response to the work environment and firm activities (Ambrose et al., 2013). Female representation is more likely to pass policies related to women's issues (Hessami and da Fonseca, 2020). Hedge and Mishra (2019) investigate US firms and find that firms led by married CEOs have positive relations in particular with the diversity and employee relations components of CSR. Westphal and Milton (2000), in addition, find that CEOs and board members prefer to recruit new directors who are demographically similar. Furthermore, Ely (1995) finds that workplace inequality will be adjusted and reconstructed as a result of women's visibility in high level roles.

Female directors also build board diversity, which creates a more transparent and equal environment. Upadhyay and Zeng (2014) find that board diversity is negatively associated with corporate opacity (lack of transparency). This leads to more equal opportunities for females in firms. Furthermore, more female directors bring more networks and consultation for other women in firms, which will increase opportunities for women to overcome barriers in the working environment (Perryman et al., 2016) and give women a greater voice in HR policies supporting women. Perryman et al. (2016) also find that firms with greater gender diversity in top management moderates the compensation differences between female executives and male colleagues.

The *institutional theory* suggests that firms need to conform to the rules and belief systems prevailing in the environment in order to survive (DiMaggio and Powell, 1983). “Institutions” are not only formal organizations (e.g., government) but also norms, incentives, and rules (Matten and Moon, 2008). According to *institutional theory*, prior studies at different levels of institution such as European level (Grosvold et al., 2016), country level (Chizema et al., 2015), and state level (Thams et al., 2018) show the impact of institution/environment including regulation and policies on the role of women. Thams et al. (2018) find that firms in the institutional environment with progressive policies that protect women will have greater shares of female directors on their board. Therefore, at lower-level institutions, in firms having female directors that support CSR policies and support female led HR policies, there will be more female managers at lower levels.

According to Thams et al. (2018), work and family policies influence women's professional career. When women have a family, a set of critical family policies such as child care and maternity leave shape societal norms around their personal and work activities (Moore and Shackman, 1996). They will choose firms which have more progressive family policies (Esping-Andersen, 1999) as women have the expectation that women should be able to pursue both a family life and a work life. Taken together, progressive family policies can facilitate

women to fulfill their family obligations with greater ease and less fear of discrimination, and ultimately, reduce gender inequality (Moore and Shackman, 1996).

Women tend to take more time off to take care of their children or family, which limits their time to acquire knowledge, capabilities, and networks (Lyness and Thompson, 1997). Thus, women on career breaks miss out on opportunities for employer-provided training or mentoring, conference attendance, and access to leadership positions (Kossek and Ozeki, 1999) – the “motherhood penalty”. Therefore, policy on training, work rotation, recruitment as well as child care and maternity leave are important to support working women, especially female managers to balance their work and their life, which leads to the appointment of more female managers.

To now, theories and empirical studies have shown that there is a positive relationship between female directors and female representation below board level such as officers and managers (Skaggs et al., 2012). Therefore, we propose our first hypothesis as follows:

H1a: First female director is associated with greater female officer representation

H1b: First female director is associated with greater female manager representation

2.2. Why do female directors matter to CSR performance?

Impacts of female directors on CSR have been explained by several theories, notably *resource dependence theory* (Barney, 1991), *stakeholder theory* (Freeman, 1984), *upper echelon theory* (Hambrick and Mason, 1984) and *gender socialization theory*.

The *resource dependence theory* offers the rationale for board diversity in helping firms to access the resources necessary for CSR activities (Hillman and Dalziel, 2003). Board diversity will provide greater insights into markets, customers, employees and business opportunities, and thus help firms to manage dynamic changes in business conditions like CSR (Bear et al., 2010; Post et al., 2015).

The *stakeholder theory* suggests firms need to address demands of different stakeholders, which leads to more CSR. Diverse boards enable firms to assess the needs of different stakeholders, which may enhance the board's ability in effectively addressing CSR issues. Greater board diversity can increase the firm's ability to manage potential conflicts among stakeholders, and to identify the best strategies that would align different interests (Harjoto et al., 2015; McGuinness et al., 2017). Besides this, the number of women on boards may act as a signal that the firm pays attention to women and minorities, and is therefore socially responsible (Bear et al., 2010).

According to *upper echelon theory*, organizational outcomes are partially predicted by managerial background characteristics of the top-level management team. Women directors can affect firms because of their different values. According to *gender socialization theory* (Chodorow, 1974; Mason and Mudrack, 1996), women and men appear to differ in values when it comes to social responsibility because of moral reasoning and protective attitude. *Ethics of care theory* (Gilligan, 1982) states that women tend to have caring and ethical behavior more than men. It recognizes that human beings are dependent on their parents, especially their mothers, in their early years and a woman learns about caring through her role as a mother. This makes them better able to meet the needs of others than men (Held, 2005). A meta-analysis of gender differences conducted by Jaffee and Hyde (2000) shows that women are somewhat more likely than men to use care reasoning (i.e., maintaining relationships, responding to the needs of others, and feeling a responsibility not to hurt). Women are also more likely than men to identify situations requiring ethical judgment and to behave ethically (Post et al., 2011).

Women are more risk averse than men in making important corporate decisions (Huang and Kisgen, 2013; Doan and Iskandar-Datta, 2020, Perryman et al., 2016). In addition, female board directors are more diligent monitors and demand more audit efforts than male directors (Adams and Ferreira, 2009; Gul et al., 2009). Furthermore, female directors bring different

perspectives and experiences into the boardroom, which help improve the quality of board decisions and enhance the legitimacy of firm practices (Hillman et al., 2007). According to legitimacy theory, one of the reasons for firms to adopt CSR is for the purpose of legitimacy. Therefore, female directors tend to support activities such as CSR to increase legitimacy of firms.

International empirical studies show there is a positive relationship between female directors and CSR (Harjoto and Rossi, 2019, Zhang et al, 2013, McGuinness et al, 2017). A meta-analysis study demonstrates that female representation in the boardroom is positively related to higher CSR performance (Byron and Post, 2016). Studies even show that a female socialization environment such as family enhances pro-social policies, which leads to better CSR (Cronqvist and Yu, 2017, Hedge and Mishra, 2019). However, although accumulated research findings suggest that women are more likely to engage in CSR than men, empirical evidence supports the view that gender differences are not universal (Davidson and Freudenburg, 1996).

In Japan, to our best knowledge, there is a lack of rigorous studies of CSR in Japanese firms in relation to board gender diversity. Most recently, Kato and Kodama (2018) used data of Japanese listed firms from 2006 to 2014 and documented the positive and significant effects on gender diversity of CSR. Given the arguments from the above theories as well as the international empirical evidence, female directors are expected to be positively associated with CSR score. Therefore, we propose our second hypothesis as follows:

H2: Firms with first female directors are associated with better CSR score

3. DATA

3.1. Sample construction

We built our database from several extensively used databases in Japan. The first database is the Corporate Social Responsibility Database (CSR Database) provided by TOYO KEIZAI INC. The firm has implemented a questionnaire survey for all listed companies and unlisted major companies every year since 2005. They obtained valid answers and integrated them into a yearly database. We obtained detailed information about workforce and HR utilization in Japan from 2005 to 2014 from this database.

The second database is the CSR Ranking Database, also provided by TOYO KEIZAI INC. They used information from the CSR Database to conduct a CSR evaluation of each company. They have formulated the firm ranking based on a perfect overall score of 600 points, including 300 points of CSR criteria and 300 points of financial criteria. In this paper, we use the CSR score, maximum of 300 points, which comprises three components in the CSR: HR utilization (100 points possible), environment (100 points possible) and corporate governance and social performance (100 points possible). However, the CSR Ranking database starts from 2006 and only presents the top highest CSR score firms each year, for example the top 500, 600 or 700 highest CSR score firms.

The third database is the Directory of Directors, also provided by TOYO KEIZAI INC. This directory provides information on boards of directors, including current position title, name, age, education as well as previous experience of directors. In order to merge with the two above-mentioned CSR databases, we change from director-level database to firm-level database by creating dummies and sum-up variables.

The fourth database is NEEDS Corporate Governance Evaluation System (CGES) provided by Nikkei Inc., which provides us information about firms' governance and financial health. In addition, we use other data sources such as the Corporate Financial Databank provided by Development Bank of Japan⁴ (DBJ databank), firms' homepages and Nikkei Value

⁴ For data on subsidiary firms

Search in order to build the database of individual female directors. The novelty of our data set lies in the manual collection of information regarding education and working experience of first-introduced first female directors, and why and how they are introduced.

Overall, we obtained an unbalanced panel data, consisting of some 9,600 firm-year observations with yearly information on HR policies, CSR, board and firm characteristics. In term of individual firm number, we cover data on around 1,000 non-financial listed firms⁵ in Japan each year in average from 2005 to 2014. However, the firm-year observations of CSR score are smaller, about 5,260 firm-year observations, as the CSR Ranking database is available from 2006 and only provides the CSR score of the top highest score firms each year.

3.2. Variable building

To capture the representation of women on the board, we built *female director* and *first female* dummy variables. The *female director* dummy variable equals one if a firm has at least one female director on board or zero otherwise. *The first female* dummy variable equals one if the appointed female director is the first female director introduced to the board since the firm's listing. Moreover, we classify female directors into inside and outside directors and build the two corresponding variables, *first inside female director* and *first outside female director*.

To measure the gender diversity under board level, following previous studies (Bilimoria, 2006; Skaggs, 2012), we choose ratio of female managers and ratio of female officers as the main variables proxy for gender diversity at lower board level.

Regarding proxy variables for CSR performance, we use four variables, namely *CSR score*, *HR score*, *environment score* and *corporate governance and social performance score*, in which the *CSR score* is the sum of the latter three scores.

⁵ Equal to 30% of the total listed firms on all stock exchanges

Following Kato and Kodama (2018), we also control for board size, CEO power and firm idiosyncratic characteristics including financial health and ownership structure. *Board size* is measured by number of board members. *Outside director ratio* is measured by percentage of outside director per total board members. *CEO tenure* is measured by number of years served as president of the firm. *Industry dummy* is dummy variable for 33 industries classified by Tokyo Stock Exchange. *Total assets* is measured by total consolidated assets. *ROA* is calculated by ratio of income before tax and interest to total assets. *Free cash flow ratio* is free cash flow scaled by total assets. *Listing duration* is measured by number of years firm has been listed. Employee number. *Subsidiary firm* is measured by number of consolidated subsidiary firms. *Sales growth rate* is calculated by sales growth rate compared to last fiscal year. *Foreign ownership* is ratio of foreign investors' ownership to total shares. *Managerial ownership* is ratio of inside directors' ownership to total shares. Details of all variables and corresponding definitions are documented in Table 1.

[INSERT TABLE 1 HERE]

4. EMPIRICAL FINDINGS

4.1 Basic statistics

Table 2 shows the summary statistics of the main variables listed in Table 1. The sample consists of about 9,600 firm-year observations of the nonfinancial listed firms from 2005 to 2014 (data on CSR score are available from 2006 to 2014). The last two columns show the results of the t test and Wilcoxon rank-sum test to compare the difference of means and medians between the firms with female board member(s) and those without.

[INSERT TABLE 2 HERE]

The first four columns show the summary statistics of all firms available in our database; the mean board size is 8.7 people and only 12% of the directors in the boardroom are outside directors. Firms' financial health is relatively good with ROA of 5.39% and positive free cash flow. Foreign investors are prominent stakeholders of the firms with a mean ownership ratio of 12% while ownership ratios of managers, directors and CEOs are almost similar, from 4 to 6%. Listing duration is an average of 30 years and the sales growth rate is relatively small at 0.04, which implies that most of the firms in the database are long-established and in a stable growth state.

In the next columns, we divide the data set into two groups of firms: firm group with female board member and firm group without female board member. This break-up helps us compare the idiosyncratic characteristics of the two groups. We also carry out a univariate test for the statistical significance of the difference between the two groups. There are few firms with female board members, making up only 9% firm-year observations, which is predicted as past literature has stated that Japanese boardrooms are 'boys clubs'. Firms with female directors have a larger board size with more outside directors, a larger firm size (larger assets, more employees and more subsidiaries) and a larger foreign ownership ratio. Moreover, firms with female board members are associated with more female officers and female managers, implying that firms with more female board also have a greater supply of female managers (Matsa and Miller, 2011). In terms of industry, female directors are found most in services, retail trade, wholesale trade, electric appliances and foods industries. The results from univariate tests also show that firms with female board members are associated with a better CSR score. All mentioned differences are statistically significant.

In this paper, we aim to examine the effects of female directors on gender diversity below board level and CSR performance. Our assumption is that once firms have at least one female director on board, she will give more effort to promote a better working environment for women in firms, drawing more new women recruits and promoting the presence of female

staff and female managers at the workplace. On the other hand, by improving the board diversity, firms receive more attention from investors as the image of a diverse board with the presence of an outside director or female director is associated with better corporate governance. By improving the gender diversity at the organizational level as well as the governance environment, the firm directly improves CSR performance and its CSR ranking.

Table 2 shows that firms with female board members are associated with more female employees, female officers and female managers and better CSR performance. These findings suggest that firms with female board members are likely to have an attractive working environment for women or favor more women or simply need female employees. These facts also pose a research question for us to solve empirically – whether female management promotes a women-friendly working environment and CSR performance or the other way around.

To deal with this causality, we use a special group, the group of first-introduced female directors, who are female board members that firms introduced to their all-male boards for the first time. We consider the first introduction as a shock to firms with all male boards and measure the differences in firms' gender diversity and CSR performance before and after the introduction to explore the effects of female directors. We also apply the difference-in-difference method to examine whether there are differences between firms which introduced female directors and firms which did not.

4.2 First introduction of female director

Table 3 shows the summary statistics of all first-introduced female directors documented in our database. The sample consists of the firms that were listed from 2005 to 2014 and whose primary industry is not financial services. First introduction of female directors takes one in that year if firms introduced at least one female director on their boards for the

first time, and zero otherwise. Overall, there are 134 individual firms appointing their first female directors and the total individual female directors is 140 people, among whom 60% are outside female directors. In the years 2013 and 2014, there was a significant increase in first introduction of outside female directors, two times higher than the introduction of inside female directors.

[INSERT TABLE 3 HERE]

Not every firm introduces female directors to their boards, so we assume that the introduction of female directors is associated with firms' idiosyncratic characteristics. We go one step further by examining the introduction stories of each female director and find several notable points below.

Firstly, most first-introduced female directors are truly firm insiders. They often joined firms from young, internally trained recruits by rotating among different departments, and gradually climbed the corporate ladder to higher positions as managers, executives and eventually directors after more than ten years in service. Their corporate lives are very much like male counterparts. These female insiders also receive support from the current CEO and several of them later become CEO after the former CEO stepped down. The second in-house source for female directors is female heirs coming from the firms' founding families. They are wives, sisters or daughters of the firm founders, who are concurrently or were previously firm CEOs. The third source of inside directors is the firm's large shareholders, but they do not belong to the founding families. Among the three types of inside directors, the first is found to be the most popular.

Secondly, regarding the introduction stories of first outside female directors, we find three common sources that firms often seek directors from. The first source is professional directors from other firms, who are often lawyers or legal advisers. The reasoning for the introduction of these outside directors is that firms often mentioned that law specialists on board will give advice on national and international legal matters from a professional

standpoint when firms expand overseas, monitor the firm's management as an objective person and contribute to strengthening the management system. The second source is university professors. They often work for big universities in the professions of law and economics. The third source is female CEOs from partner firms. Among the three types, the third type is the least common. In addition, firms face the difficulty of finding outside female directors as they often prefer ones with well-known profiles or experienced with outside directorship; there is a very small pool for these outside directors, which leads to the fact that one outside female director often holds more than one board seat at the same time.

Finally, firms' judgements and expectations about the roles of inside female and outside female directors are different. When appointing the first inside female directors, firms mentioned the in-depth knowledge and experience of the introduced female insider regarding the firm's business and expected them to provide a boost to management. On the other hand, when appointing first outside female directors, firms often stressed their ability to strengthen corporate governance as well as their ability to monitor the activities of management.

4.3 First introduction of female director and gender diversity under board level

4.3.1 OLS and fixed effect regressions

Table 4 presents the results of OLS and FE regressions. We first use OLS with a robust standard error estimator in examining the relation between first female director and female representation at lower organizational levels. We use two dependent variables, *ratio of female managers* and *ratio of female officers*, while the major independent variable is *first female director* dummy variable. Following previous studies (Bilimoria, 2006; Skaggs et al, 2012), to control for other possible factors that may explain for the variance in the number of female officers and female managers, we add control variables for board characteristics (*board size*,

outside director ratio), firm characteristics (*total assets in the log form, sales growth rate, listing duration, leverage, ROA, subsidiary firm, foreign ownership ratio and managerial ownership ratio*), industry and year effects in the regressions. Definitions of the control variables are shown in Table 1.

[INSERT TABLE 4 HERE]

Column 1 and 2 of Table 4 show the result of OLS regression. The coefficients of *first female director* are positive and strongly significant for *ratio of female managers* and *ratio of female officers* implying that the presence of women directors was positively correlated with the number of female officers and the number of female managers.

Column 3 and 4 of Table 4 show the fixed effect regression results. With fixed effect regression, we can control for unobserved heterogeneity which is not controlled in OLS regression. The coefficients of *first female director* in fixed effects regressions are still both positive and significant for *ratio of female officers* and *ratio of female managers* but of smaller magnitude in comparison to those in OLS regressions. In addition, we find a strongly significant effect of first female director presence on *ratio of female officers* but a slightly significant effect on *ratio of female managers* in FE regressions. The difference in results between FE and OLS regression suggests that there is unobserved heterogeneity among firms in the data set, which affects the relation between first female director presence and female officers and managers.

In brief, we find consistent evidence in OLS and FE regressions that the presence of the first female director is likely positively associated with representation of female officers and female managers, supporting hypotheses H1a and H1b.

4.3.2 Propensity score matching and difference-in-difference estimator (PSM DiD estimator)

We do further tests to examine the above findings by applying the propensity score matching and difference-in-difference methods. Using difference-in-difference estimation, we focus on the changes in ratio of female officers and female managers after the first introduction of female directors. If the first female director presence helps to increase the number of females working as officers or managers, we may be able to observe the positive changes. In detail, we measure the change in outcomes from one year before to three years after the first female director introduction with the four year-windows: (-1, 0) (-1, 1), (-1, 2) and (-1, 3). Year 0 refers to the year t when a firm first introduced a female director; Year -1 refers to one year before year t and so on.

Moreover, first female board members might have a special set of skills and experience which benefit firms of specific characteristics rather than the firms universally. To control for the confounding effects of the differences in firm characteristics between firms introducing first female director and firms without female directors, we use the propensity score matching method to build a control group of firms. The control firms must have similar firm idiosyncratic characteristics with firms having female board members, but their boards have no female board members. After matching each treatment firm to its control firm found by propensity score matching, we run difference-in-difference estimation to calculate the difference in *ratio of female officers/ratio of female managers* in the treatment firms before and after first introduction and minus the corresponding difference in the control group.

To find the control firms, we run logit regression on the probability of firms introducing their first female director. However, to avoid the case that a treated firm might become the control firm of other treated firms, firm-year observations after the first introduction of the treated firms are deleted. Details of regression results are shown in Appendix 1. We then estimate the propensity score and match one control firm for each treated firm based on their closest propensity score. The matched pairs must be also in same industry and same year as

well. Overall, we come up with a short list of 74⁶ firms used in the difference-in-difference analysis from the pool of 134 treated firms.

Table 5 presents the PSM DiD estimation results. In Panel A, we present the results for the changes in ratio of female managers and ratio of female officers. The first column shows the four year-windows used for the performance comparison. The next two columns show the changes in the outcome of *ratio of female managers*. The DiD result for the outcome of ratio of women managers shows that in all four year-windows, the coefficients are associated with the positive interaction but are not statistically significant. However, the effects for *ratio of female officers* are with positive coefficients for all four year-windows and the differences are statistically significant, and especially strongly significant in the four year-windows: (-1, +1), (-1, +2) and (-1, +3).

[INSERT TABLE 5 HERE]

Panel B of Table 5 presents the mean comparison of *ex post* firm characteristics between treated firms and control firms matched by closest propensity scores. The first column shows the list of variables proxy for board and firm characteristics that we used in the logit regression. The second column details the total pair observations for each window comparison. We have 74 control-treated firm pairs. The next two columns show the mean of variables for each group. The last column presents the test for statistical difference and the result shows that the two groups are well matched and do not suffer from large bias, which ensures our matching quality.

In short, using PSM DiD estimation, we find strong empirical evidence of differences in the change in ratio of female officers between firms with first female director introduction and their corresponding control firms. The firms with first introduction increase the ratio of female officers in the next three years more than those of the control firms. The differences are

⁶Several firms delisted after the first introduction; several other firms introduced the first female directors in recent years so the incoming years are out of our research date range.

statistically significant. We also find an increase in the ratio of female managers after the first introduction of female directors; however, the finding is not statistically significant. It can be explained that officers are easy to recruit while managers are more difficult to recruit and change, which depends on the needs of managers of firms. Tangpong et al. (2021) also indicate that successful turnarounds are characterized by top management vacancy in primary functions before the new CEO arrival and by top management stability in support functions after the new CEO arrival. The results from the PSM DiD estimation strongly support hypothesis H1a. This finding suggests that female directorship is an important factor in the advancement of women below board level, similar with findings by previous literature (Burke, 1994; Skaggs et al, 2012)

4.4 First introduction of female director and CSR performance

4.4.1 OLS and fixed effect regression

Similar to the analysis on the effects of the first female directors on the ratio of female officers and managers, we first run OLS and fixed effect regressions to examine the effects of first female director presence on CSR performance proxied by CSR score. As CSR score comprises three sub-scores: HR utilization, the environment and corporate governance & social performance, it is interesting to examine whether there are variations among the three sub-scores. Therefore, we use four dependent variables in the regressions: *CSR score*, *HR score*, *environment score*, *corporate governance and social performance score (CG_SP score)*.

In addition, compared to the sample used for analyzing the effects of first female directors on gender diversity of lower levels of the organization, the sample size for measuring

CSR performance is smaller⁷, consisting of more than 5,000 firm-year observations. Among 134 firms having introduced first female directors, only 77 firms have information on CSR scores.

Table 6 presents the results from OLS and fixed effect regressions used to examine the relations between first female director representation and CSR performance. Columns 1, 2, 3 and 4 present the results of OLS regression with robust standard error. The major independent variable of interest is *first female director* dummy. The coefficient of *first female director* is positive and strongly significant for the *CSR score* implying a positive correlation between first female director presence and CSR performance. Regarding the relation between *first female director* and the three sub-CSR scores, the coefficients of *first female director* are positive and significant for *HR score* and *CG_SP score*. We find no relation between first female director and environment score. This insignificant result can be explained that the environment requirements in Japan are quite strict, which can hardly change while HR and CG are easier to implement and adjust. So far, OLS regression results offer initial support for hypothesis H2.

[INSERT TABLE 6 HERE]

Columns 5, 6, 7 and 8 of Table 6 show the results of fixed effect regressions. It is important to examine the hypotheses with fixed effect regression as OLS regression does not control for unobserved heterogeneity, which might cause bias to our regression result. Similar to OLS regressions, we find robust significant effects of first female director on CSR score. However, compared to OLS regression, the coefficient magnitude of *first female director* is smaller. Regarding the relation of *first female director* to the three sub-CSR scores, only the coefficient of *first female director* is positive and significant for the *HR score*, similar with OLS regression. There is no relation between first female director and environment score or corporate governance and social performance score.

⁷CSR Ranking database is available from 2006 and only presents the top highest CSR score firms each year, for example the top 500, 600 or 700 highest CSR score firms.

In brief, using OLS and fixed effect regressions, we find that the coefficients of first female director to CSR score and HR score are strongly positive and statistically significant after we control for board characteristics, firm characteristics, industry and year effects. This implies that the first female director representation is likely associated positively with better CSR performance via the improvement of the HR score.

4.4.2 Propensity score matching estimation

To now, empirical results of OLS and fixed effects show that there is a positive relation between first female director representation and CSR performance. However, results possibly suffer from sample selection bias as our sample is restricted to firms that are listed on the stock exchanges and have information on the CSR score. In order to solve this problem, we implement a propensity score matching estimator to build a control group based on observable firm characteristics between treatment group (group having first female directors) and control group (group having no female directors). Each treated firm will be matched with a control firm that has the closest propensity score within the same year.

Table 7 shows the results of propensity score matching estimation with Probit regression, in which the dependent variable is *first female director* dummy, and outcome is four CSR performance proxies (*CSR score*, *HR score*, *environment score* and *CG_SP score*). Panel A of Table 7 reports the average treatment effect on the treatment group (ATT) by nearest-neighbor matching with one neighbor (and no caliper). The ATT value is positive for the outcome *CSR score*, meaning the treatment group performs better than the control group in terms of the CSR score, with the difference being statistically significant.

[INSERT TABLE 7 HERE]

Furthermore, ATT values are strongly positive for outcome proxies *HR score* and *corporate governance and social performance score* in that the treatment group has better CSR

performance than the control group owing to better HR utilization and corporate governance and social performance. The difference is strongly statistically significant.

In Panel B of Table 7, we present the mean comparison of *ex post* firm characteristics between treated firms and control firms matched by closest propensity scores as well as the test results for statistical difference. The *ex post* variables of the two groups are well balanced as there are no statistically significant differences in any variables used. This shows that the two groups are well matched.

In short, the results of the propensity score matching estimator are consistent with OLS and fixed effect regressions: that first female director representation is positively associated with CSR performance.

5. ADDITIONAL TESTS AND ROBUSTNESS CHECK

5.1. Different types of first female directors and gender diversity under board level

By now, we find robust and consistent empirical evidence that introduction of a first female director contributes to greater gender diversity below board level, especially the ratio of female officers. In this section, we break up the sample of the firms having the first female directors into two subsets based on the types of the first female directors: inside and outside. As the roles of inside and outside directors are not the same, we expect that there are variations in the effects of first outside and first inside females on gender diversity under board level.

Table 8 presents the results from OLS and FE regressions to examine the effects of first outside female directors and first inside female directors on the ratio of female managers and the ratio of female officers. Similar to previous analysis, we also use two dependent variables: *ratio of female managers* and *ratio of female officers*. The main independent variables are *first outside female director* and *first inside female director*. We also control for board

characteristics, firm characteristics, industry and year effects in all regressions by using the same control variables in Table 4.

[INSERT TABLE 8 HERE]

Column 1 and 2 of Table 8 present the results of OLS regressions. The coefficients of *first outside female director* and *first inside female director* are both positive and strongly statistically significant, implying the positive relation between the presence of first outside and inside female directors and the number of female officers and managers. Regarding the magnitude, the coefficients of *first inside female director* are larger than those of *first outside female director*.

Column 3 and 4 of Table 8 present the results of fixed effect regressions. Compared to the results of OLS regressions, there are variations in the size, magnitude and statistical significance of coefficients. The coefficients of *first outside female director* are both positive and strongly statistically significant in relation to the ratio of female managers and officers although the magnitudes are smaller than those in OLS regressions. On the other hand, the coefficient of *first inside female director* is only positive and strongly statistically significant in relation to the ratio of female officers. We find no relation between the presence of the first inside female directors and the ratio of female managers. Similar to the explanation for Table 6, it can be explained that officers are easy to recruit while managers are more difficult to recruit and change, which depends on the needs of managers of firms.

In brief, additional tests on the effects of the different types of first female directors on gender diversity under board level show a positive relation between the presence of the first outside female directors and the number of female officers and managers. As for inside female directors, we only find a positive relation with the ratio of female officers.

5.2 Different types of first female directors and CSR performance

In this section, we examine the effect of the different types of first female directors on CSR performance. So far, the results of OLS, fixed effect regressions and propensity score matching estimation show that first female director representation is positively associated with CSR performance proxied by CSR score. Whether there are differences in the effects of inside and outside female directors on CSR performance or not, we run OLS and fixed effect regressions with four dependent variables: *CRS score*, *HR score*, *environment score* and *CG_SP score*. The main independent variables are *first outside female director* and *first inside female director*. We use the same control variable set in Table 6 to control for board characteristics, firm characteristics, industry and year effects.

Table 9 presents the effect of different types of first female directors on CSR performance. Column 1, 2, 3 and 4 present the results of OLS regressions. The coefficients of *first outside female director* and *first inside female director* are both positive and strongly statistically significant for *CSR score*. Regarding the three components of CSR score, the coefficients of *first outside female director* and *first inside female director* are both positive and strongly statistically significant for *HR score* and *CG_SP score*, implying the positive relation between the presence of first outside and inside female directors and CSR performance comes from the improvement of HR score and CG_SP score.

[INSERT TABLE 9 HERE]

Column 5, 6, 7 and 8 of Table 9 present the results of FE regressions. Compared to OLS regressions, there are variations in relation between types of female directors and CSR performance. The coefficient of *first outside female director* is positive and strongly statistically significant for *CSR score* while we find no effects of first inside female director on CSR score. Regarding the three components of CSR score, the coefficients of *first outside female director* is positive and strongly statistically significant for *HR score*, slightly significant for *CG_SP score* and no effect for *environment score*, implying the positive relation between the presence of first outside female directors and CSR performance comes mainly from the HR

score. Meanwhile, we find no empirical relation between the presence of the first inside female directors and CSR performance, yet the coefficients of *first inside female director* are all negative and slightly statistically significant for *CG_SP score*.

In brief, there are differences in the effects of first inside and outside female directors on CSR performance. The presence of first outside female directors is strongly positive associated with better CSR performance in both OLS and fixed effect regressions, suggesting that the effects of outside female directors on improving CSR ranking are likely larger than those of inside female directors. The reason is that the outside director can have more impacts on policies and strategy because they do not have inside conflicts as inside directors (Oradi, 2021).

3. CONCLUSION

This paper is the first study using Japanese data to examine the effects of board gender diversity on the gender diversity at the organizational levels and on CSR performance. We use a unique sample of Japanese listed firms having introduced female directors to their all-male boards for the first time. In short, we find strong and consistent empirical evidence that the introduction of a first female director is positively associated with greater representation of women officers and better CSR score. In addition, we find that the firms introducing first female directors are likely associated with a larger board, more outside directors, a larger foreign ownership ratio and more female employees.

Furthermore, we contribute to the related literature by providing empirical evidence on the effects of different types of female directors. That is, the effects of outside female directors on improving gender diversity below board level and CSR ranking is likely larger than those of inside female directors.

These results provide strong empirical evidence that the changes in corporate governances, through improving board gender diversity, can benefit firms in terms of narrowing the gender gap below board level as well as improving firm's CSR rankings. This study might contribute to the knowledge of researchers, policy makers and business leaders in Japan about the effects of board gender diversity.

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Table 1: Variable definition and data sources

Variables	Definitions	Source
<i>Board gender diversity variables</i>		
<i>Female director</i>	Equal one if firm has at least one female director or zero otherwise	Directory of Directors
<i>First female</i>	Equal one if firm introduced its first female director or zero otherwise	Authors
<i>Variables of Gender diversity under board level</i>		
<i>Ratio of female managers</i>	Ratio of management positions held by women	CSR Database
<i>Ratio of female officers</i>	Ratio of <i>female</i> officers	CSR Database
<i>CSR score variables</i>		
<i>CSR score</i>	Total CSR score, totaling of HR score, Environment score, Corporate governance and social performance score, max 300 points	CSR Ranking database
<i>HR score</i>	Human resource utilization score, max 100 point	CSR Ranking database
<i>Environment score</i>	Environment score, max 100 points	CSR Ranking database
<i>CG_SP score</i>	Corporate governance & social performance score, max 100 points	CSR Ranking database
<i>Control variables</i>		
<i>Board size</i>	Number of board members	Nikkei Needs CGES
<i>Outside director ratio</i>	Percentage of outside director per total board members	Directory of Directors
<i>CEO tenure</i>	Number of years served as president of the firm.	Nikkei Needs CGES
<i>Industry dummy</i>	33 industries classified by Tokyo Stock Exchange	Nikkei Needs CGES
<i>Total assets</i>	Total consolidated assets	Nikkei Needs CGES
<i>ROA (%)</i>	Ratio of income before tax and interest to total assets.	Nikkei Needs CGES
<i>Free cash flow ratio (%)</i>	Free cash flow scaled by total assets	Nikkei Needs CGES
<i>Listing duration</i>	Number of years firm has been listed	Nikkei Needs CGES
<i>Employee number</i>	Total employee number	CSR Database
<i>Subsidiary firm</i>	Number of consolidated subsidiary firms	DBJ databank
<i>Sales growth rate</i>	Sales growth rate compared to last fiscal year	Nikkei Needs CGES
<i>Foreign ownership (%)</i>	Ratio of foreign investors' ownership to total shares	Nikkei Needs CGES
<i>Managerial ownership (%)</i>	Ratio of inside directors' ownership to total shares	Nikkei Needs CGES

Table 2: Summary statistics

Variables	All firms				Firms with female director				Firms without female director				Statistic for difference between firms with and without directors	
	Obs	Mean	SD	Median	Obs	Mean	SD	Median	Obs	Mean	SD	Median	t-Statistic	Z-Statistic
Female director	9,643	0.091	0.288	0.000										
First female director	9,643	0.014	0.117	0.000										
Ratio of female managers	7,332	3.74	7.17	1.4	1,013	8.58	12.33	4.3	6,319	2.97	5.56	1.1	22.39***	17.18***
Ratio of female officers	7,293	1.055	3.69	0	1,011	5	7.35	2.1	6,282	0.42	2.05	0	58.72***	53.94***
CSR score	5,262	186.09	47.55	181.8	457	214.13	51.98	219.6	4,805	183.42	46.24	178.9	13.42***	12.2***
HR score	5,262	57.33	17.64	56.4	457	72.49	17.05	75	4,805	55.89	17.01	54.7	19.93***	18***
Environment score	5,262	62.96	20.19	64.4	457	65.87	23.70	70.5	4,805	62.69	19.81	64	3.19***	4.24***
Corporate governance & social performance score	5,262	65.53	17.27	65	457	75.55	16.70	79.2	4,805	64.58	17.02	64	13.23***	12.81***
Board size	9,643	8.75	3.76	8	880	9.09	3.71	9	8,763	8.72	3.76	8	2.74***	4.20***
Outside director ratio (%)	9,643	12	15.1	7.69	880	20.56	19.36	17.91	8,763	11.14	14.33	5.88	17.92***	15.38***
Total assets (log)	9,636	11.2	1.97	11.09	879	11.48	2.43	11.35	8,757	11.18	1.92	11.08	4.30***	3.04***
Employee number	9,637	9,463	27,842	1,536	879	18,648	48,996	1,846	8,758	8,541	24,555	1,520	10.31***	3.60***
Subsidiary firm	8,886	38.13	89.47	11	822	80.57	189.21	14	8,064	33.81	70.52	11	14.44***	4.28***
Sale growth rate	9,495	0.04	0.29	0.03	855	0.06	0.38	0.03	8,640	0.04	0.28	0.03	1.51	1.29
Listing duration (year)	9,643	30.77	21.05	25	880	27	22.55	17	8,763	31.15	20.85	26	5.59***	6.05***
CEO tenure	9,643	5.89	7.73	3	880	6.99	9.47	3	8,763	5.78	7.52	3	4.40***	0.2
Leverage	9,636	52	20	53	879	53	20	56	8,757	52	20	52.53	1.15	1.36
ROA	9,603	5.39	7.78	4.64	870	6.1	10.23	4.91	8,733	5.32	7.49	4.59	2.82***	3.50***
Free cash flow ratio	9,613	1.19	13.16	1.96	877	0.76	11.98	1.72	8,736	1.23	13.27	1.99	1.02	1.24
Foreign ownership ratio	9,641	12.12	12.99	7.68	880	15.96	15.76	12.8	8,761	11.74	12.62	7.34	9.23***	6.91***
Managerial ownership ratio	9,604	6.07	13.11	0.64	875	9.25	15.1	0.6	8,729	5.75	12.85	0.64	7.54***	0.14

Note: This table shows the summary statistics of main variables used in this paper. The sample consists of the listed firms from 2005 to 2014, whose primary industry is not financial services. The definitions of the variables are explained in Table 1. The last two columns show the results of the t test and Wilcoxon rank-sum test to compare the difference of means and medians between the firms with female director and firms without. When we perform the t test, we adjust standard errors for firm-level clustering. *, ** and *** indicate significance at the 10, 5 and 1% levels, respectively.

Table 3: Summary statistics for first-time introduced female directors

Distribution of first-introduced female director per year				
Year	Total firms having first-introduction	Total first female directors	Total first outside female director	Percent of first outside female director
	(firm)	(person)	(person)	(%)
All	134	140	84	60.00
2005	3	3	2	66.67
2006	16	17	8	47.06
2007	11	11	6	54.55
2008	11	11	6	54.55
2009	8	8	2	25.00
2010	17	18	11	61.11
2011	8	8	4	50.00
2012	16	17	8	47.06
2013	22	24	18	75.00
2014	22	23	19	82.61

Note: This table shows the summary statistics for firms' first appointments of female directors to board. The sample consists of the firms that were listed from 2005 to 2014 and whose primary industry is not financial services. First introduction of female directors takes one if firms introduced at least one female directors on their boards for the first-time, and zero otherwise. *, ** and *** indicate significance at the 10, 5 and 1% levels, respectively.

**Table 4: First female director and gender diversity at the lower organizational levels
– OLS and fixed effects regression –**

	Ratio of female managers	Ratio of female officers	Ratio of female managers	Ratio of female officers
Regression type	OLS	OLS	FE	FE
Model	(1)	(2)	(3)	(4)
First female director	3.26*** (4.93)	5.29*** (12.58)	0.48* (1.75)	2.74*** (13.50)
Total assets (log)	-0.68*** (-6.38)	-0.15*** (-2.62)	0.21 (0.86)	0.76*** (4.25)
Sale growth rate	-0.24 (-0.52)	-0.29 (-1.36)	0.37** (2.12)	-0.05 (-0.40)
Listing duration (year)	-0.02*** (-3.63)	-0.01*** (-3.96)	0.02 (0.01)	-0.24 (-0.15)
Leverage	0.00 (0.16)	-0.01** (-2.48)	-0.00 (-0.02)	0.00 (0.02)
ROA	0.02 (0.94)	0.01 (0.86)	-0.02* (-1.81)	-0.02*** (-3.06)
Subsidiary firms	0.00*** (4.52)	0.00*** (3.89)	0.00 (0.36)	-0.00 (-0.26)
Board size	0.03* (1.66)	-0.01 (-0.67)	0.00 (0.15)	0.01 (0.56)
Outside director ratio (%)	0.02** (2.38)	0.00 (1.18)	0.01* (1.76)	0.01*** (3.16)
Foreign ownership (%)	0.08*** (7.91)	0.01*** (2.67)	-0.01 (-0.85)	0.01 (1.17)
Managerial ownership (%)	0.04* (1.78)	0.01* (1.70)	0.01 (1.37)	0.00 (0.82)
Constant	8.20*** (6.06)	2.39*** (3.54)	-3.52 (-0.05)	-0.31 (-0.01)
Observations	6,293	6,259	6,293	6,259
Adjusted R-squared	0.25	0.17	-0.26	-0.23
Industry dummy	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes

Note: This table shows results of OLS and fixed effect regressions examining the effects of first female director on gender diversity at the lower organizational levels proxied by ratio of female managers and ratio of female officers. The sample consists of the listed firms from 2005 to 2014, whose primary industry is not financial services. *, ** and *** indicate significance at the 10, 5 and 1% levels, respectively. Robust standard errors are in parentheses.

**Table 5: First female director and gender diversity at the lower organizational levels
- Propensity score matching difference in difference estimation-**

Panel A: DiD estimation results

Year window	Ratio of female managers		Ratio of female officers	
	DID	Robust SE	DID	Robust SE
[-1, 0]	2.239	(2.894)	2.423	(1.444)*
[-1, +1]	2.204	(3.350)	5.221	(1.556)***
[-1, +2]	4.18	(4.640)	7.151	(2.216)***
[-1, +3]	2.060	(3.082)	5.166	(2.283)**

Panel B: Mean *ex post* firm characteristics: Treated firms vs Control firms

<i>Variables</i>	Obs	Firms with first female director	Firms without female director	Statistic for difference
		Mean	Mean	t-Statistic
Employee number (log)	74	8.313	8.225	0.25
Board size	74	9.932	9.622	0.51
Outside director ratio (%)	74	24.074	24.615	0.16
Ratio of female managers	74	6.649	5.874	0.48
Ratio of female officers	74	5.643	4.055	1.43
Listing duration (year)	74	30.743	33.041	0.59
Total assets (log)	74	12.207	12.271	0.16
ROA	74	6.052	7.742	1.15
Leverage	74	54.306	54.840	0.15
Managerial ownership (%)	74	7.132	6.084	0.45
Foreign ownership (%)	74	20.989	20.032	0.33

Note: This table shows the Propensity score matching Difference-in-difference estimation result. Firms introduced first female directors are treated firms. For each treated firm, we find one matched control firm, not introducing female director during the research period with similar firm characteristics *ex post* matching. Each treated firm and its matched control are also in same industry in the same year. *, ** and *** indicate significance at the 10, 5 and 1% levels, respectively. Robust standard errors are in parentheses.

Table 6: First female director and CSR performance - OLS and FE regression –

Regression type	OLS				FE			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Model	CSR score	HR score	Environment score	CG_SP score	CSR score	HR score	Environment score	CG_SO score
First female director	8.70*** (4.52)	6.06*** (7.45)	-1.02 (-1.11)	3.65*** (5.60)	3.73** (2.23)	3.32*** (3.66)	-0.51 (-0.74)	0.93 (1.36)
Total assets (log)	20.72*** (40.65)	6.02*** (26.91)	7.52*** (31.84)	7.16*** (35.21)	10.57*** (5.08)	3.85*** (3.42)	3.72*** (4.32)	2.96*** (3.47)
Sale growth rate	-0.08 (-0.05)	-1.36 (-1.62)	0.74 (0.89)	0.53 (1.15)	-2.16** (-2.38)	-1.30*** (-2.64)	-0.59 (-1.57)	-0.28 (-0.75)
Listing duration (year)	0.18*** (6.37)	0.06*** (5.06)	0.08*** (6.03)	0.03*** (3.24)	-20.98* (-1.78)	-13.86** (-2.17)	-1.51 (-0.31)	-5.85 (-1.21)
Leverage	-0.11*** (-3.77)	-0.03** (-2.10)	-0.04*** (-2.91)	-0.04*** (-3.70)	-0.16*** (-2.83)	-0.07** (-2.46)	-0.02 (-1.05)	-0.06** (-2.44)
ROA	-0.41*** (-4.38)	0.05 (1.26)	-0.35*** (-7.27)	-0.11*** (-2.86)	-0.04 (-0.53)	0.03 (0.65)	-0.07** (-2.14)	-0.00 (-0.02)
Subsidiary firms	-0.01 (-1.25)	0.01*** (3.63)	-0.01*** (-4.32)	-0.01*** (-3.02)	0.04*** (4.07)	0.02*** (3.67)	0.00 (0.60)	0.02*** (4.47)
Board size	-0.42*** (-3.14)	-0.14** (-2.35)	-0.10* (-1.66)	-0.17*** (-3.29)	-0.22 (-1.48)	0.01 (0.17)	-0.05 (-0.79)	-0.18*** (-3.00)
Outside director ratio (%)	0.34*** (10.00)	0.13*** (8.32)	0.06*** (4.08)	0.15*** (11.64)	0.04 (0.94)	0.03 (1.07)	-0.02 (-0.86)	0.03* (1.76)
Foreign ownership (%)	-0.07 (-1.47)	0.02 (0.76)	-0.05** (-2.35)	-0.03* (-1.71)	0.17** (2.51)	0.07* (1.79)	0.07*** (2.63)	0.03 (1.11)
Managerial ownership (%)	0.05 (0.69)	0.10*** (2.96)	-0.10** (-2.57)	0.06* (1.69)	0.81*** (6.20)	0.43*** (6.01)	0.22*** (4.02)	0.17*** (3.17)
Observations	5,095	5,095	5,095	5,095	5,095	5,095	5,095	5,095
Adjusted R-squared	0.63	0.48	0.56	0.55	0.17	0.05	0.02	0.18
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table shows results of OLS and fixed effects regression examining the effects of first female director on CSR performance. *, ** and *** indicate significance at the 10, 5 and 1% levels, respectively. Robust standard errors are in parentheses.

Table 7: First female director and CSR performance – PSM Estimation –**Panel A: Propensity Score matching estimation results:**

Propensity score matching: CSR score		Propensity score matching: Environment score	
Nearest-neighbor matching		Nearest-neighbor matching	
ATT	11.478** (4.491)	ATT	-0.328 (1.894)
Propensity score matching: HR score		Propensity score matching: CG_SP score	
Nearest-neighbor matching		Nearest-neighbor matching	
ATT	6.746*** (1.610)	ATT	5.052*** (1.481)

Panel B: Mean *ex post* firm characteristics: Treated firms vs Control firms

	Treated group: Firms with first female	Control group: Firms without female	Statistic for difference between treated and control group
<i>Variables</i>	Mean	Mean	t-Statistic
Total assets (log)	13.166	13.056	0.74
Sale growth rate	0.06326	0.10112	-0.75
Listing duration (year)	41.546	39.261	1.27
Leverage	55.799	53.966	1.14
ROA	5.748	6.2282	-1.2
Subsidiary firms	116.27	94.75	1.54
Board size	10.725	10.845	-0.38
Outside director ratio (%)	26.226	24.148	1.38
Foreign ownership (%)	22.58	22.351	0.19
Managerial ownership (%)	1.5433	1.6656	-0.29

Note: This table shows results of Propensity score matching estimation examining the effects of first female director on CSR performance. *, ** and *** indicate significance at the 10, 5 and 1% levels, respectively.

**Table 8: First female director and gender diversity at the lower organizational levels
-Comparison between Outside and Inside first female director-**

<i>Regression type</i>	OLS	OLS	FE	(FE
<i>Model</i>	(1)	(2)	(3)	(4)
<i>Dependent variable</i>	Ratio of female managers	Ratio of female officers	Ratio of female managers	Ratio of female officers
First outside female director	1.50*** (3.25)	2.05*** (6.79)	0.74** (2.37)	1.72*** (7.24)
First inside female director	6.27*** (3.88)	9.63*** (11.42)	-0.04 (-0.08)	3.74*** (11.36)
Controls	Yes	Yes	Yes	Yes
Observations	6,293	6,259	6,293	6,259
Adjusted R-squared	0.25	0.20	-0.26	-0.23
Industry dummy	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes

Note: This table shows results of OLS and fixed effects regressions examining the effects of first outside female directors and first inside female directors on gender diversity at the lower organizational levels. *, ** and *** indicate significance at the 10, 5 and 1% levels, respectively. Robust standard errors are in parentheses.

**Table 9: First female director and CSR performance
-Comparison between Outside and Inside first female director-**

<i>Regression type</i>	OLS	OLS	OLS	OLS	FE	FE	FE	FE
<i>Model</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Dependent variable</i>	CSR score	HR score	Environment score	CG_SP score	CSR score	HR score	Environment score	CG_SP score
First outside female director	7.71*** (3.94)	5.31*** (6.08)	-0.53 (-0.57)	2.93*** (4.19)	5.45*** (3.02)	4.05*** (4.14)	0.07 (0.09)	1.36* (1.83)
First inside female director	9.37** (2.16)	6.45*** (3.72)	-1.51 (-0.71)	4.38*** (3.11)	-4.77 (-1.55)	-0.76 (-0.46)	-1.63 (-1.28)	-2.42* (-1.92)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,095	5,095	5,095	5,095	5,095	5,095	5,095	5,095
Adjusted R-squared	0.63	0.48	0.56	0.55	0.17	0.05	0.02	0.18
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table shows results of OLS and fixed effects regressions examining the effects of first outside female directors and first inside female directors on CSR performance. *, ** and *** indicate significance at the 10, 5 and 1% levels, respectively. Robust standard errors are in parentheses.

Appendix 1: Determinants of first female directors – for PSM DiD estimation

Dependent variable =	Logit First Female Director
Employee number (log)	-0.0832 (0.628)
Board size	0.293** (0.115)
Outside director ratio (%)	0.146*** (0.0297)
Ratio of female managers	-0.167*** (0.0588)
Ratio of female officers	0.661*** (0.101)
Listing duration (year)	-0.0171 (0.0317)
Total assets (log)	0.873 (0.629)
ROA	0.0625* (0.0347)
Leverage	0.0323 (0.0241)
Managerial ownership	0.0277* (0.0158)
Foreign ownership	0.0342 (0.0374)
Constant	-31.78*** (8.351)
Observations	5,473
Pseudo R-squared	0.177
Industry dummy	Yes
Year dummy (2005~2012)	Yes

Note: This table shows results of Logit regression on the probability of firms' introducing their first female director used in Propensity score matching Difference-in-Difference estimation. First introduction of female directors takes one if firms introduced at least one female directors on their boards for the first-time, and zero otherwise. Observations after first introduction are deleted. *, ** and *** indicate significance at the 10, 5 and 1% levels, respectively. Robust standard errors are in parentheses.