

Do Women Leaders Promote Sustainability? Analyzing the Effect of Corporate Governance Composition on Environmental Performance

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ABSTRACT

In this study, we investigate the impact women leaders have on the corporate environmental strategies of organizations. Using a dataset of all Fortune 500 CEOs and boards of directors for a ten-year period, we examine several aspects of gender in leadership on environmental strategy. Specifically, we test the impact of women CEOs, the proportion of women on the BOD, the number of interlinks women board members hold, and the interactive and cumulative effects of women CEOs and gender diverse boards. Findings suggest that firms characterized by gender diverse leadership teams are more effective than other firms at pursuing environmentally friendly strategies. This study contributes to research on corporate governance and environmental performance by showing how the gender composition of leaders affects corporate practice. Copyright © 2015 John Wiley & Sons, Ltd and ERP Environment

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Introduction

IN JUNE 2014, THE OBAMA ADMINISTRATION AND THE ENVIRONMENTAL PROTECTION AGENCY (EPA) ANNOUNCED ONE OF THE boldest measures to date to curb climate change (Davenport, 2014). Yet, despite evidence that most Americans believe that climate change is occurring, protecting the environment has not emerged as a top political priority, a fact that contributes to significant political barriers to affecting meaningful political interventions (Davenport, 2014; Kopicki, 2014). Similarly, despite mounting pressures in the form of legal regulations, competitive pressures and public scrutiny to adopt corporate social responsibility measures regarding the environment (Bendell and Kearins, 2005; Pedersen *et al.*, 2013), American businesses have been slow to reduce environmental impacts and to implement corporate environmental strategies. The rise of shareholder power has contributed to a greater focus on short-term profitability over long-term growth and sustainability (Barton, 2011; Barton and Wiseman, 2014).

Because environmental initiatives often require long-term planning, many corporate leaders avoid such efforts in favor of more short-term strategies, leading to charges that American businesses lack 'moral muscle' to tackle environmental decline (Koehn, 2013). Despite a general failure among American corporations to engage with

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environmental sustainability, there are some notable exceptions. CEO Paul Polman of Unilever, for example, has made environmental sustainability a key corporate priority. Polman aims to cut his organization's greenhouse gas impact in half and to ensure full supplier adherence to sustainability practices (Koehn, 2013).

While developing a long-term environmental strategy may appear at odds with maximizing shareholder value in the short term, scholars and environmental advocates increasingly argue that sustainability and profitability are not mutually exclusive (Barton, 2011; Barton and Wiseman, 2014; Bryson and Lombardi, 2009; Martinez-Ferrero and Frias-Aceituno, 2014). In fact, there is mounting evidence that corporate social responsibility generally and responsible environmental management specifically is financially beneficial (Barton, 2011) and that shareholders view such efforts positively (Sparkes and Cowton, 2004). For instance, Al-Najjar and Anfimiadou (2012) found that UK firms that implemented ecologically sustainable practices enjoyed higher market values than firms that did not. Similarly, Boiral *et al.* (2012) found that Canadian firms committed to reducing greenhouse gas emissions experienced stronger financial performance than firms that did not.

Importantly, research also suggests that failure to adopt environmental standards can be costly. A recent study found that media scrutiny of a company's environmental violations can lead to significant share price decline (Xu *et al.*, 2014). In fact, when a firm's environmental record is poor, shareholders become concerned about financial risk in the form of fines and legal liability (Walls *et al.*, 2012). Moreover, in some cases, scholars have documented negative shareholder activism in response to the absence of environmentally sustainable practices (O'Rourke, 2003). Taken together, this evidence suggests that by shifting away from 'quarterly capitalism' toward more sustained growth strategies, organizations can achieve long-term value that will benefit all stakeholders – including shareholders – and protect the environment (Barton, 2011, p. 87).

In light of growing evidence of the compatibility of environmental protection and profitability, scholars have begun to examine the ways in which corporate leadership composition affects corporate strategies with regard to socially responsible practices. Much of this research has focused on CEOs, who are responsible for developing corporate strategy, including strategies regarding environmental policy and practice (Waldman *et al.*, 2006; Waldman and Siegel, 2008). However, there is also evidence that boards play an active role in determining the strategic direction of the company (Westphal and Zajac, 1995). Surveys of board members reveal that a significant majority of board members view their role as determining the strategic direction of the company (Demb and Neubauer, 1992). More recent evidence suggests that directors play a key role in driving corporate social responsibility efforts, such as implementing best practices, developing policies aimed at increasing stakeholder engagement and advancing corporate transparency (Frias-Aceituno *et al.*, 2013).

Given the central importance of the CEO and board of directors (BOD) in shaping environmental strategy, scholarship on leadership has also begun to focus more on the demographic characteristics of corporate leaders to identify the compositional factors that are associated with greater environmental responsibility (Post *et al.*, 2011; Walls *et al.*, 2012). Survey research reveals that, compared with men, women express a stronger commitment to environmental sustainability and are more likely to support environmentally responsible practices even when they require increased personal costs (Hunter *et al.*, 2004; Zahran *et al.*, 2006). In the political sphere, for instance, women politicians are more likely than their male peers to support environmentally sustainable legislation (Mohai and Kershner, 2002). In the corporate sphere, Post and colleagues (2011) found that gender diverse boards were more likely to achieve higher environmental ratings than other firms. Similarly, Webb (2004) tested the effect of gender composition of the board on a range of measures of social responsibility including environmental responsiveness. She found that firms that pursue environmentally responsible practices are more likely than other firms to have gender diverse boards. In more recent work, Walls and her colleagues (2012) analyzed various aspects of firm governance and its effect on environmental performance. They found that boards enjoy significant influence over environmental practices and policies and that more diverse boards are associated with stronger environmental performance. Importantly, though the study did not analyze gender composition of the CEO and board directly, the study reveals interactions between boards and CEOs in terms of environmental performance and strengths.

The current analysis advances this growing body of research on corporate governance and environmental performance by analyzing a variety of gender compositional factors on firms' environmental policies and practices. In this way our study contributes to research on gender diversity and environmental performance in several ways. First, our study tests the effect of leader gender composition on environmental strengths in

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a large-scale dataset of all Fortune 500 firms over a ten-year period. In addition to the large number of data points under analysis, our sample is also inclusive of all industries. This improves on the work of Post *et al.* (2011) in that they only examined 78 firms in two different industries. Second, our data set includes the gender composition of all CEOs and members of the BOD in all firms under study. Within the BOD, we analyze two different aspects of gender diversity: percent women on the board and the number of interlinks women members have with other boards. Analyzing the gender of the CEO and board allows us to examine the direct effects of gender diversity at each level as well as any interactive effects between levels. For example, we examine whether women CEOs are more or less likely to undertake environmental initiatives when women are also well represented on the BOD. Third, rather than examining gender diversity within the broader framework of corporate social responsibility, we examine gender diversity with specific measures of environmental strengths and environmental concerns.

Literature Review

Corporate Social Responsibility and Environmental Management

Scholarship on the predictors of corporate social responsibility and environmental performance has analyzed several factors that shape corporate practice (e.g. Walker *et al.*, 2013). This scholarship provides evidence that organizational diversity – particularly among decision makers – enhances corporate social responsibility (CSR) efforts and recognition. In terms of CSR, gender diversity on the BOD is associated with higher levels of commitment to CSR and a greater likelihood that a firm will be recognized for CSR-related initiatives (Bernardi *et al.*, 2006; Larkin *et al.*, 2013; Seto-Pamies, 2013). Women directors are also associated with higher levels of charitable giving and community engagement (Williams, 2003; Terjesen *et al.*, 2009).

Scholarship specific to environmental responsibility confirms that gender diversity among top leaders is associated with a stronger commitment to environmental protection. Ciocirlan and Pettersson (2012) find that Fortune 500 firms that employ more women tend to demonstrate a stronger commitment to environmental sustainability. Similarly, gender diversity in the firm is also associated with greater transparency and the development of integrated reporting systems related to environmental sustainability (Frias-Aceituno *et al.*, 2013). Comparative research confirms this association. Countries with firms with high levels of gender board diversity enjoy higher rates of environmental transparency (Fernandez-Feijoo *et al.*, 2013).

While this scholarship is suggestive of a relationship between gender diversity and environmental practice, the mechanisms that shape this relationship are less well understood. We now develop theoretical predications that link gender diversity among top leaders and corporate environmental outcomes.

Effects of Gender Diversity on Environmental Practices

Feminist scholarship on gender differences in value orientations suggests that socialization differentially encourages and rewards different types of behavior in men and women. Women receive more positive rewards than men for altruistic behavior, including caring and concern for others (Gilligan, 1982). Socialization also leads women to be more other oriented, whereas men are socialized to be more autonomous, individualistic and competitive (Chodrow, 1974; Gilligan, 1982). As a result, women tend to be more aware and concerned than men about the links between environmental harm and personal well-being (Stern *et al.*, 1993). This aligns with the work of Andreoni and Vesterlund (2001) on altruism. They found that, when altruism resulted in high costs, women were more likely than men to be altruistic. Conversely, when altruism resulted in low costs, men were more likely than women to be altruistic.

Scholarship on gender and leadership supports these conclusions and suggests that women and men leaders differ in terms of career trajectory, leadership style and organizational priorities. Men tend to have more leadership experience in large corporate firms, whereas women tend to have more experience in community and service organizations (Hillman *et al.*, 2002; Singh *et al.*, 2008). These differences in career trajectory may lead men to

be more attuned to traditional practices and policies whereas women may be more attuned to policies focusing on outreach and the community. In fact, research has consistently found that women leaders tend to be more innovative and egalitarian in their view of firm strategy (Adams and Funk, 2009; Eagly *et al.*, 2003; Torchia *et al.*, 2011). In contrast to men, women leaders are also more likely to pursue innovative initiatives and less likely to conform to traditional practices (Adams and Funk, 2009; Eagly *et al.*, 2003).

As leaders, women tend to be more stakeholder focused and long-term oriented than men, even at the expense of short-term profits (Matsa and Miller, 2013; Silverman, 2003). For instance, women are better able than men to integrate the interests of multiple stakeholders, including communities, employees, suppliers and customers, with the performance-based interests of shareholders (Brammer *et al.*, 2007; Harrison and Coombs, 2012). In fact, stakeholder-oriented organizations tend to employ a relationship-based management style that places greater importance on building integrated, long-term strategic connections with stakeholders, as opposed to simply economic gains for shareholders (Svendsen, 1998). Stakeholder-focused companies also tend to develop strong relationships with key stakeholders and seek harmony within their environment (De Geus, 2002). Stakeholder-focused leadership is critical to the adoption of pro-environmental practices, because corporate sustainability efforts aim to meet the needs of direct stakeholders, including investors, as well as indirect stakeholders, including clients, political groups and communities (Dyllick and Hockerts, 2002).

Taken together, these findings suggest that men may be more shareholder focused and short-term oriented in their approach to firm strategy, whereas women may be willing to bear the higher costs and focus more broadly on a wide range of stakeholders with a longer-term outlook. Women's socialization and career path may promote a greater emphasis on relationship building and community focus, which may align with the promotion of environmental initiatives. As a result, the gender socialization perspective predicts that women CEOs will be more likely than men to pursue environmental initiatives. Thus, we predict the following.

Hypothesis 1. Firms with women CEOs will be more responsive to environmental initiatives and will experience fewer environmental concerns than firms with men CEOs.

While the gender socialization perspective predicts that women CEOs will be more likely than men CEOs to pursue environmentally friendly policies, there is also evidence to suggest that gender diverse boards will be more amenable to environmentally sustainable practices than non-diverse boards. Gender diversity on the BOD is positively associated with greater transparency in firm governance, the prioritization of long-term strategies, and the acknowledgement of non-financial performance outcomes (Brown *et al.*, 2002). Research has also demonstrated that firms spend more on environmental and corporate social responsibility concerns when there is a critical mass of women on the board (Post *et al.*, 2011; Webb, 2004). Firms that have boards with a greater representation of women are also more likely than other firms to pursue innovation in management strategy, business practices and personnel initiatives (Miller and Triana, 2009; Torchia *et al.*, 2011).

Female directors also tend to be more broadly focused than their male counterparts, a focus that contributes to corporate decisions and strategies that take into account a larger number of interests and stakeholders (Adams and Funk, 2009). Research has found that gender diversity on the board is associated with greater understanding and sensitivity to competing perspectives (Fondas and Salsalos, 2000), a more democratic approach (Rudman and Glick, 2001), and greater consideration for fairness and the needs of others when weighing alternative perspectives (Eagly and Carli, 2007). This style of and approach to leadership may lead women directors to make greater investments in initiatives that are more universally based and beneficial to a large number of stakeholders rather than to only the firm's shareholders.

Finally, in undefined situations, women are more likely than men to act ethically (Smith and Rogers, 2000). Given the lack of stringent environmental regulations in the United States, compliance by firms beyond the minimum necessary is a gray and undefined area. As such, women directors may be more likely to be proactive in addressing environmental concerns than men directors. Further, research demonstrates that women have an attachment to and wish to protect the environment to a greater extent than men (Bord and O'Connor, 1997; Diamantopoulos *et al.*, 2003). Taken together, this evidence suggests that women board members will be more likely than men board members to view protection of the environment as ethical and necessary, despite the costs of doing so. Therefore, we predict the following.

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Hypothesis 2. *Firms that have governing boards with a greater percentage of women will be more responsive to environmental initiatives and experience fewer environmental concerns than firms with fewer women on the board.*

When a board member of one organization also serves as a board member of another organization, it is considered an interlink (Mizruchi, 1996). Scholars of board composition have found that interlinked members provide a valuable source of industry information and can be a vital source of organizational innovation (Chen *et al.*, 2009; Haunschild, 1993; Shropshire, 2010). According to Shropshire (2010, p. 246), interlinked directors provide firms with 'a way to manage environmental uncertainty, gain access to diverse skills and resources, facilitate communication across firms, and provide legitimacy for the focal firm'. In this way, interlocked board members provide social network resources to firms through which trusted information about industry practices can flow (Mizruchi, 1996). Moreover, interlinked board members can serve as an important mechanism for 'mimetic pressures' that can facilitate that transfer of innovative practices from one firm to another (DiMaggio and Powell, 1983).

Scholars have documented several benefits to firms from the presence of interlinked directors. For instance, interlinked board members are more effective than others in monitoring firm behavior (Ferris *et al.*, 2003). Interlinked board members also tend to be outsiders – board members not already employed as executives in the focal firm. Outside board members are associated with a greater degree of monitoring of firm practice and are more likely to initiate innovation in strategic planning (Westphal and Fredrickson, 2001). Importantly, outside directors are also associated with greater board independence (Westphal and Zajac, 1995), which is in turn associated with stronger monitoring of firm practices, more effective governance and a stronger commitment to social responsibility (Howton *et al.*, 2001; Ibrahim *et al.*, 2003; John and Senbet, 1998; Webb, 2004).

Research specific to the effect of interlinked directors on corporate social responsibility and environmental policy confirms the importance of interlinks on corporate practice. Legitimate and trustworthy information that flows through network links is particularly important to the adoption of environmentally sustainable practices, because the adoption of these practices requires significant investments and has uncertain returns (Walls and Hoffman, 2013). Indeed, Webb (2004) found that firms that were known to be socially responsible tended to have more interlinked board members than non-socially-responsible firms. In their study of US electric firms, Ortiz-de-Mandojana *et al.* (2012) found that the presence of interlocked board members significantly increased the likelihood that a firm would adopt environmentally responsible practices.

To understand this relationship, recent scholarship by Papagiannakis *et al.* (2014) revealed that environmental investment decisions often reflect a longitudinal learning process, whereby earlier successful experiments lead to more advanced investments. Importantly, firms that adopt environmentally sustainable practices often model their practices on other firms in the field (Bansal and Clelland, 2004). Because interlinked board members are more likely to have served on firms where successful environmental strategies were pursued, they can serve as conduits of information about successful investment strategies and opportunities, thereby lowering the risk and uncertainty of policy innovation (Ortiz-de-Mandojana and Aragon-Correa, 2014).

Importantly, women board members are more likely than men to serve on multiple boards and thus enjoy a greater number of interlinks (Sealy *et al.*, 2007). Moreover, diverse boards are more receptive to the transfer of knowledge and resources of interlocked directors (Shropshire, 2010). Women directors' experience on other boards likely provides them with information about a variety of innovative environmental practices as well as about the risks related to a lack of environmental engagement. This experience will lead women board members to be more proactive in advocating for pro-environment practices and policies.

Despite the evidence that interlinked board members are important sources of innovation, there is also evidence that, under certain conditions, interlinked directors can cause damage to the reputation of the focal firm. For instance, Kang (2008) found that interlinked directors with ties to firms with negative reputations may cause negative reputational spillover effects for other firms. Interlinked directors with ties to firms accused of fraud increased the risk that the firm where they served as an outside director would experience negative reputational backlash. This suggests that, while interlocked directors can be a valuable resource, under certain conditions they can serve as conduits for negative reputations and declines in market value.

However, what Kang measures is reputational effects of interlinked directors among shareholders, not the impact of interlinked directors on firm practice or policy. Negative reputational spillovers do not necessarily impact the quality of information, innovation and influence that interlinked directors can have on firm policy and practice.

For instance, an interlinked director with ties to a firm that has experienced sanctions for environmental practices may be a strong advocate for the focal firm about ways to avoid such sanctions. Indeed, past experience is an important mechanism that guides board members' insight on a range of issues (Tuggle *et al.*, 2010). In fact, in their study of the impact of interlinked directors on corporate audits, Johansen and Pettersson (2013) find that interlinked directors can provide useful information to firms about how best to navigate the auditing process. That is, interlinked members with experience with audits at another company brought useful and trustworthy insights to the focal firm to assist the firm in navigating this process successfully. The authors concluded that board interlinks 'constitute an important mechanism that mitigates the audit market failure' (p. 287). A recent study of the influence of board members' experience on focal firm outcomes confirms that board members' past experience with environmental issues significantly increases the focal firm's likelihood of adopting positive environmental practices (Walls and Hoffman, 2013).

Taken together, this evidence suggests that interlinked board members can serve as an important mechanism for environmental innovation. Moreover, given our prediction that women board members are more likely to advocate for environmental sustainability, women board members who have interlinks to other firms will be even stronger advocates, given their influence and ability to supply trustworthy information about practices at other firms. Thus, we predict the following.

Hypothesis 3. Firms that have women with multiple interlinks on their governing board will be more environmentally friendly and experience fewer environmental concerns than firms without those interlinks.

Effects of Gender Homophily on Environmental Practices

We now consider the ways in which the demographic composition of the CEO and the BOD interact to influence organizational practices. Although the CEO is the primary driver of organizational strategy, there is growing evidence that corporate boards also have a significant impact on organizational practices and policies (Matsa and Miller, 2013; Shropshire, 2010; Westphal and Milton, 2000). Moreover, as noted above, scholars have found that boards play a significant role in shaping organizations' environmental stance (e.g. Walls *et al.*, 2012). Given that firm strategy is directed by both CEOs and the BOD, the ways in which gender diversity at both levels (together and separately) affect firm outcomes must be understood.

There is a great deal of scholarship on the contextual factors that shape CEO–board relationships. In a survey of CEOs, Westphal (1999) found that social ties between CEOs and board members enhanced the degree and quality of advice and guidance that CEOs receive on business strategy. This study suggests that social ties between and among CEOs and boards facilitate a more active role of the board in firm outcomes. In firms where CEOs and boards enjoy close professional ties, boards are more likely to enjoy a role beyond monitoring that includes strategic corporate governance. Westphal and Milton (2000) also find that women board members with experience on boards of other firms are more influential over strategy decisions. Moreover, as confirmed in the previous study, women directors with stronger social network ties to other leaders in the firm tend to be more influential over firm outcomes. The implications of this research for the current study are that the stronger the social ties between the CEO and individual board members, the greater the board's involvement over strategic decision making and the greater the collaboration between top leaders. Indeed, further evidence suggests that shared experiences among decision makers facilitate a more efficient flow of information between and among decision making bodies (Carpenter and Westphal, 2001). More recent evidence suggests, in fact, that CEOs prefer to appoint members to the board who are similar to them across a variety of characteristics (Zhu and Westphal, 2013).

The extant research on the conditions under which board members exert greater control over firm policy suggests that stronger network ties as well as a higher degree of social similarity between the CEO and board members enhance the ability of the board to shape firm outcomes. This evidence suggests that leadership homophily, defined as the demographic similarity between or among members of a group, may impact the ability and willingness of minority leaders to influence organizational outcomes. Because they are often viewed as socially dissimilar to the majority, solo or token leaders face significant challenges within leadership teams (Kanter, 1977). Tokens are

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individuals who represent a numerical minority in their organization (Kanter, 1977). For instance, women token leaders experience a lower social and professional status than men and, as a result, may be denied the required resources necessary to initiate organizational change (Acker, 2006; Eagly and Karau, 2002). Further, because tokens experience heightened scrutiny and performance pressures, many respond by conforming or assimilating to the organization's status quo (Nesbitt, 1997). As a result, token leaders may be less willing to pursue bold or novel initiatives (Bradshaw and Wicks, 2000). Compared with their male peers, token or solo women leaders are also less likely to benefit from social network ties to other leaders within the organization (Davies-Netzley, 1998; McGuire, 2002).

As a result of these challenges, the benefits of women's leadership may not be realized in the absence of homophily. In the current study, we define gender homophily as the presence of a woman CEO and a critical mass of women on the BOD. Homophily is associated with increased trust, coordination and communication among work groups (Reagans and Zuckerman, 2001). Research on similarity and trust among leaders supports these findings. The greater the similarity within the leadership team, the greater the influence of boards over organizational strategy and the more the CEO trusts the board to shape organizational direction (Fondas and Salsalos, 2000; Golden and Zajac, 2001; Westphal, 1999).

Gender integration of the leadership team is likely to lessen gender stereotypes and lead to more favorable evaluations of women as leaders (Ely, 1995; Ely and Thomas, 2001). By reducing the salience of gender, women leaders will be less likely to be subject to gender bias and stereotypes and, as a result, will have more authority and discretion over firm decisions (Konrad and Kramer, 2006; Konrad *et al.*, 2008). As a result, we predict that gender homophily within the leadership team will significantly and positively affect a firm's responsiveness to environmental issues.

Hypothesis 4. Firms with women CEOs and gender diversity on the board will be more responsive to environmental initiatives and experience fewer environmental concerns than other firms.

Data and Methods

Procedure

To examine our research questions, we merged two datasets. For the predictor and control variables we use an author-constructed dataset of all Fortune 500 firms over a ten-year period, and for the outcome variables we use the Kinder, Lydenberg, Domini (KLD) dataset. The first dataset comprises all CEOs and BODs of the Fortune 500 firms for the years 2001–2010. The list of all Fortune 500 firms was collected from CNN's money website (money.cnn.com/magazines/fortune/fortune500). The names, gender and ages of the CEOs and BODs were obtained using several reference websites from Business Week, Forbes, Edgar and others. Websites of the companies were also used to collect biographical information. Compustat, a database available through the Wharton Research Data Services (WRDS), was used for firm information of assets, debt ratio, profit margin and return on equity. The second dataset, also available through WRDS, is KLD Stats, and it offers annual data of publicly traded companies focused on social responsibility issues. As noted in prior research (Walls *et al.*, 2012), KLD data are gathered for and used by investors and are not based on self-report measures. Therefore, bias of social desirability is minimized. All variables used in the analyses are objective in nature and the information was easily paired between the two datasets.

BOD and CEO information was collected for each year. As such, we are able to account for changes within the composition of the board during the tenure of the CEO. This allows us to better determine if any interaction effect is occurring between the CEO and the BOD with regard to our outcome variables. In addition, the CEO has been excluded from the determination of board composition. This lessens the overestimation of women in the governing bodies, and, given the interaction effects being examined, it helps the analysis to not be inflated.

Measures

Dependent Variables

As suggested in prior research (Walls *et al.*, 2012), KLD Stats measures of environmental strengths and environmental weaknesses should be assessed separately. Walls and her colleagues (2012) state that 'KLD strengths and concerns measures are theoretically and empirically distinct and represent two independent constructs' (Walls *et al.*, 2012, p. 892). Environmental strengths focus on strategic initiatives and plans developed by the firm to enhance environmental awareness and response. Environmental concerns, on the other hand, do not measure lack of strategic initiatives but rather assess issues such as compliance violations and pollution levels. For further information regarding the outcome variables, refer to *Getting Started with KLD STATS and KLD's Ratings Definitions* (KLD, 2006).

Independent Variables

Gender of the CEO, percent women on the board and number of board interlinks for the women on the board are our predictor variables. Gender of the CEO is a dichotomous variable that is noted as one if the CEO is a woman. If there was a leadership change during the year, the CEO in place for the majority of the year was used as the CEO for the year. The percentage of women serving on the board was calculated as the total number of women (less the CEO if applicable) on the board divided by the total number of board members. Our predictor variable of interlinks was determined by the total number of other board connections for each woman on the BOD.

Control Variables

In addition to testing a fixed-effects model that controls for unobservable variable for each firm, we also controlled for the firm-level measures of total assets, return on equity, debt-to-assets ratio and profit margin. For the CEO-level measures, we controlled for the age of the CEO and if the CEO also served as the chair of the board, and the board-level measure controlled was the average age of the members.

Analyses

We analyzed our hypotheses with negative binomial regression with fixed effects. This method appropriately addresses both the repeated firm observations in our panel data and our count data dependent variables (Allison, 2009). Additionally, negative binomial regression, rather than a Poisson model, has been found to be an appropriate method to account for overdispersion in the data (Allison, 2009; Ismail and Jemain, 2007). By using a fixed effects model, it allows us to control unobservable variables that are likely constant over time for each firm, yet may be factors that influence the relationship between the predictor and outcome variables. An example of an unobserved variable that likely remains constant but is potentially influential would be a firm's culture. By removing these variables from the analysis, the fixed-effects model provides a more accurate picture of the predictor variable's true effect (Allison, 2009). To determine the appropriateness of using a fixed- rather than a random-effects model, we conducted a Hausman test. Our results affirmed the use of a fixed-effects model and suggested that the unobserved variables for each firm were not significantly correlated with those of the other firms in the sample. For our interaction graphs, we followed the guidelines prescribed by Dawson (2014) for graphing interactions from a negative binomial model. Moreover, given the small number of women CEOs in the sample, we also conducted split file analyses in order to better understand how the predictor variables impact the outcome variables under a male or female CEO.

Results

Our hypotheses examine two primary questions: first whether women in top leadership positions for a firm, specifically the CEO and the BOD, positively impact environmental outcomes, and second whether gender homophily within that firm's leadership team positively impacts environmental outcomes. Correlations and descriptive statistics are presented in Table 1.

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Variable	<i>n</i>	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11
1. CEO gender	4549	0.02	0.13	–										
2. Percent women BOD	4727	0.14	0.10	0.10**	–									
3. Number of interlinks on BOD	4425	1.61	2.14	0.14**	0.48**	–								
4. Assets (in millions)	4378	52 842	172 073	–0.03	0.09**	0.21**	–							
5. Return on equity	4420	0.19	7.7	–0.02	0.00	0.02	0.00	–						
6. Debt ratio	3912	0.66	0.109	0.06**	0.05**	0.11**	0.25**	0.02	–					
7. Profit margin	4417	0.05	0.14	–0.01	0.03	0.03	0.03	–0.01	–0.21**	–				
8. Average age on BOD	4727	59.98	3.62	–0.05**	0.02	0.08**	0.12**	0.01	0.03	0.09**	–			
9. CEO age	4626	56.32	7.23	–0.08**	–0.02	–0.03	0.04*	0.01	–0.01	0.01	0.29**	–		
10. CEO also chair	4147	0.72	0.45	–0.02	0.04*	0.11**	0.01	–0.02	0.09**	0.07**	0.05**	0.24**	–	
11. Environmental strengths	4016	0.55	0.99	0.06**	0.11**	0.16**	0.05**	0.01	–0.03*	0.08**	0.19**	0.04*	0.05**	–
12. Environmental concerns	4016	0.73	1.15	–0.02	–0.02	0.02	0.00	0.02	0.02	0.02	0.22**	0.09**	0.11**	0.30**

Table 1. Descriptives and correlations

* $p < 0.05$; ** $p < 0.01$.

Hypothesis 1 predicts that a firm having a woman CEO will be positively related to the firm's environmental strengths and negatively related to the firm's environmental concerns. Results do not support this hypothesis. In the correlations table (refer to Table 1), women CEOs are indeed significantly and positively associated with environmental strengths of the firm; however, once the fixed-effect model was tested with the other variables of

IVs	Environmental strengths					
	Direct effects			Interaction effects		
	B	SE	IRR	B	SE	IRR
<i>Control variables</i>						
Total assets	0.00	(0.00)	1.00	0.00	(0.00)	1.00
ROE	0.00*	(0.00)	1.00	0.00*	(0.00)	1.00
Debt ratio	–0.01	(0.00)	1.00	–0.01	(0.00)	1.00
Profit margin	0.58	(0.44)	1.78	0.58	(0.45)	1.79
Average board age	0.13***	(0.02)	1.13	0.13***	(0.02)	1.13
CEO age	–0.01	(0.01)	0.99	–0.01	(0.01)	0.99
CEO also chair	0.14	(0.12)	1.15	0.14	(0.12)	1.15
<i>Predictor – direct effects</i>						
CEO gender	0.33	(0.25)	1.39	1.05*	(0.43)	2.86
Percent women BOD	1.13<	(0.59)	3.09	1.34*	(0.61)	3.83
BOD interlinks	0.08**	(0.03)	1.08	0.07**	(0.03)	1.08
<i>Predictor – interaction effects</i>						
CEO × BOD percent	–	–	–	–4.33***	(0.98)	0.01
CEO × BOD links	–	–	–	.06	(0.06)	1.06
Constant	–7.80***	(0.97)	0.00	–7.83***	(0.97)	0.00

Table 2. Negative binomial regression with fixed effects for panel data

$N = 473$ firm units with 3420 observations.

< $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

interest controlled, the significant relationship disappeared. As noted in Table 2 for environmental strengths and Table 3 for environmental concerns, trends are present that suggest women CEOs are positively related to environmental strengths and negatively related to environmental concerns, but these relationships are merely trends and do not reach a level of statistical significance (refer to Table 2 and Table 3).

Results for Hypothesis 2, which predicts that a greater percentage of women on the board will be positively related to the firm's environmental strengths and negatively related to the firm's environmental concerns, provide only very limited support. In the negative binomial regression analysis, findings suggest a marginally significant relationship ($p < 0.10$) of increased firm environmental strengths as the number of women on the board increases (refer to Table 2), and a trend only of decreased environmental concerns as the number of women on the board increases. Hypothesis 3 predicts that the number of interlinks for the women on the board will be positively related to the firm's environmental strengths and negatively related to the firm's environmental concerns. We find mixed support for Hypothesis 3. The analysis affirms that the number of interlinks is positively and significantly related to environmental strengths of the firm ($p < 0.01$); however, there is no significant relationship with environmental concerns and the number of interlinks for women board members (refer to Table 3).

Hypothesis 4 suggests that gender homophily within the leadership team (CEO and BOD) will improve environmental strengths and lessen environmental concerns. As shown in Table 2 with regard to environmental strengths, there is a significant interaction occurring between the gender of the CEO and the percentage of women on the BOD ($p < 0.001$). Referring to the graph in Figure 1, however, the interaction is slightly different than hypothesized. Men CEOs, rather than women CEOs, are more likely to have increased environmental strengths as a result of an increased number of women on the board (refer to Figure 1). This finding was also supported in our split-file analysis. The percent of women on the board was significantly related to environmental strengths with men CEOs, but not with women CEOs. Combined, this suggests that as the number of women on the board increase, greater benefits toward environmental strengths will be realized for men rather than women CEOs.

IVs	Environmental concerns					
	Direct effects			Interaction effects		
	B	SE	IRR	B	SE	IRR
<i>Control variables</i>						
Total assets	0.00	(0.00)	1.00	0.00	(0.00)	1.00
ROE	0.00***	(0.00)	1.00	0.00***	(0.00)	1.00
Debt ratio	0.00	(0.00)	1.00	0.00	(0.00)	1.00
Profit margin	-0.10	(0.36)	0.90	-0.11	(0.37)	0.90
Average board age	0.13***	(0.02)	1.13	0.13***	(0.02)	1.13
CEO age	0.00	(0.01)	1.00	0.00	(0.01)	1.00
CEO also chair	0.38**	(0.14)	1.46	0.38**	(0.14)	1.47
<i>Predictor – direct effects</i>						
CEO gender	-0.16	(0.44)	0.85	1.11<	(0.57)	3.02
Percent women BOD	-0.97	(0.67)	0.38	-0.92	(0.68)	0.40
BOD interlinks	0.03	(0.03)	1.03	0.04	(0.03)	1.04
<i>Predictor – interaction effects</i>						
CEO × BOD percent	–	–	–	-3.62	(2.77)	0.03
CEO × BOD links	–	–	–	-0.15<	(0.09)	0.86
Constant	-8.08***	(1.12)	0.00	-8.11***	(1.12)	0.00

Table 3. Negative binomial regression with fixed effects for panel data

$N = 473$ firm units with 3420 observations.

< $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

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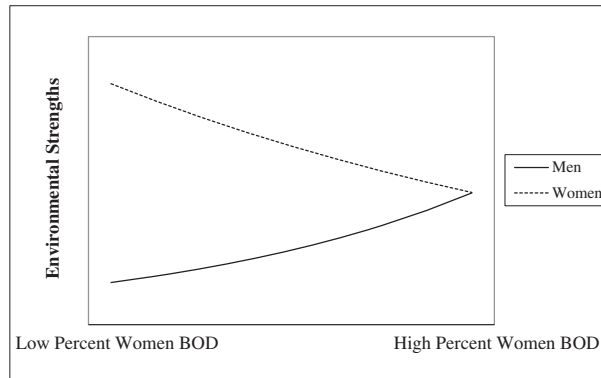


Figure 1. Two-way negative binomial interaction

Under both men and women CEOs, though, the number of network interlinks for women on the board is positively and significantly ($p < 0.01$) related to environmental strengths of the firm (refer to Table 4). In addition to the benefits realized for environmental strengths, the number of interlinks, under women CEOs, is also negatively related to environmental concerns and marginally significant ($p < 0.10$; refer to Table 5). This finding is consistent across the split-file analysis and the interaction results. As shown in Table 3, the interaction between CEO gender and the number of interlinks for women board members is also marginally significant at $p < 0.10$. Through further examination of the interaction graph (refer to Figure 2), the results show that, as the number of interlinks for women board members increase, environmental concerns decrease with women CEOs. These results affirm the importance of board connections in enhancing a firm's environmental strengths, and are suggestive of board connections reducing a firm's environmental concerns.

IVs	Environmental strengths					
	Women CEOs			Men CEOs		
	B	SE	IRR	B	SE	IRR
<i>Control variables</i>						
Total assets	0.00	(0.00)	1.00	0.00	(0.00)	1.00
ROE	0.02 ^{***}	(0.01)	1.02	0.00 ^{<}	(0.00)	1.00
Debt ratio	-0.03 [*]	(0.01)	0.97	0.00	(0.00)	1.00
Profit margin	-0.24	(1.10)	0.79	0.64	(0.46)	1.89
Average board age	0.39 ^{***}	(0.07)	1.47	0.12 ^{***}	(0.02)	1.13
CEO age	0.00	(0.04)	1.00	-0.01	(0.01)	0.99
CEO also chair	0.16	(0.53)	1.18	0.12	(0.12)	1.13
<i>Predictor – direct effects</i>						
Percent women BOD	-0.26	(1.52)	0.77	1.32 [*]	(0.61)	3.73
BOD interlinks	0.11 ^{**}	(0.04)	1.12	0.07 ^{**}	(0.03)	1.08
Constant	-21.89 ^{***}	(3.43)	0.00	-7.65 ^{***}	(0.99)	0.00

Table 4. Split file. Negative binomial regression with fixed effects for panel data

$N = 468$ examined units, 3349 observations for men CEOs; $N = 17$ examined units, 71 observations for women CEOs.

[<] $p < 0.10$; ^{*} $p < 0.05$; ^{**} $p < 0.01$; ^{***} $p < 0.001$.

IVs	Environmental concerns					
	Women CEOs			Men CEOs		
	B	SE	IRR	B	SE	IRR
<i>Control variables</i>						
Total assets	0.00	(0.00)	1.00	0.00	(0.00)	1.00
ROE	0.02 ^{***}	(0.00)	1.02	0.00 ^{***}	(0.00)	1.00
Debt ratio	-0.04	(0.03)	0.97	0.00	(0.00)	1.00
Profit margin	-0.39	(1.27)	0.67	-0.10	(0.37)	0.91
Average board age	0.38 ^{**}	(0.11)	1.47	0.12 ^{***}	(0.02)	1.13
CEO age	0.25 [*]	(0.11)	1.28	0.00	(0.01)	1.00
CEO also chair	1.30	(1.86)	3.66	0.37 ^{**}	(0.14)	1.45
<i>Predictor – direct effects</i>						
Percent women BOD	1.45	(4.75)	4.25	-0.93	(0.68)	0.40
BOD interlinks	-0.23 ^{<}	(0.12)	0.79	0.04	(0.03)	1.04
Constant	-35.34 ^{***}	(6.38)	0.00	-8.03 ^{**}	(1.12)	0.00

Table 5. Split file. Negative binomial regression with fixed effects for panel data
N = 468 examined units, 3349 observations for men CEOs; *N* = 17 examined units, 71 observations for women CEOs.
[<]*p* < 0.10 **p* < 0.05 ***p* < 0.01 ****p* < 0.001

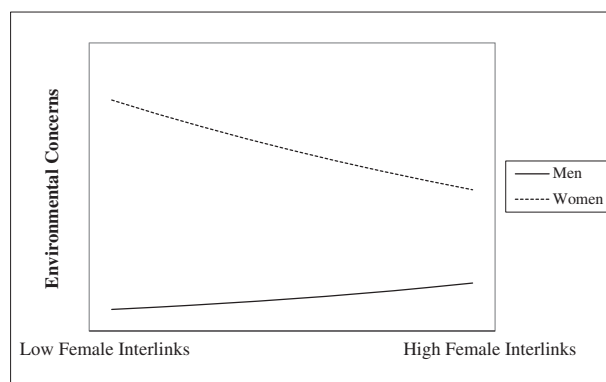


Figure 2. Two-way negative binomial interaction

Discussion and Conclusion

This study contributes to research on corporate governance and environmental performance by showing how the gender composition of leaders affects corporate environmental practice. Using a data set of the environmental record of Fortune 500 companies over a ten-year period, we tested several hypotheses regarding the effect of gender diversity among top leaders on organizational environmental outcomes. Our findings reveal that the effects of gender diversity on environmental practice are nuanced and context dependent. First, we find no significant effect of women CEOs on environmental practice. Despite previous research indicating that women leaders are more likely than men to champion environmentally sustainable practices, we find no evidence that, net of other factors, women CEOs are more likely than men CEOs to strengthen the environmental practices of the firm. Firms with gender diverse boards fare only slightly better. Gender diversity on the board is associated with only a small positive effect on a firm's likelihood of supporting positive environmental initiatives. Thus, although neither women CEOs nor gender diverse boards are associated with environmental concerns, neither are they associated strongly with environmental strengths.

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By contrast, we do find that women board members with interlinks to other firms are strongly and significantly associated with stronger environmental practices. Irrespective of the gender of the CEO, women board members who also serve on the boards of other firms are associated with better environmental practices in the focal firm. This supports our hypothesis that interlinked board members serve as a critical conduit for 'mimetic pressure' in the realm of environmental practice.

In addition to testing the effect of gender diversity at the CEO and board levels separately, we also tested the interaction between gender diversity at each level. Specifically, we tested the gender homophily perspective, which predicted that firms led by women CEOs would demonstrate even stronger environmental records when they enjoy the support of gender diverse boards. Not only was this hypothesis not supported by our analysis but our findings reveal instead that men CEOs with gender diverse boards are more likely than other firms to enjoy a strong environmental record. In other words, rather than strengthening the environmental record of firms led by women, gender diverse boards are critical in firms led by men. These findings suggest that board diversity is critical to environmental engagement, particularly in firms with men CEOs. Some degree of support for the homophily perspective is provided by the interaction between CEO gender and the presence of women interlinked board members, however. Firms with women CEOs and women interlinked board members are less likely than other firms to suffer from environmental concerns.

Overall our findings reveal a very nuanced picture of the role of gender diversity in advancing environmental practices among corporations. While women may be more supportive of environmental practices in general, women CEOs are no more likely to advance innovative environmental policies than men CEOs. Similarly, gender diverse boards are only marginally associated with positive environmental outcomes compared with boards without gender diversity. However, our findings also reveal that gender diversity is critical in at least three ways. First, women interlinked board members are associated with stronger environmental outcomes. This confirms that women board members with ties to other firms may be more influential and better able than others to successfully advocate for innovation in environmental policies and practices.

Second, gender diverse boards are critical for advancing environmental strengths in firms led by men CEOs. This suggests that, contrary to the homophily perspective, diversity among and between leadership teams is critical. Previous research suggests that, while social similarity may increase trust and reduce conflict, it may also limit adaptability, creativity and innovation (Reagans and McEvily, 2003; Pelled *et al.*, 1999). Indeed, social similarity may be least effective among teams, such as corporate leadership teams, that are required to integrate complex information (van Knippenberg *et al.*, 2004). Our findings support these conclusions in that it appears that, in the case of environmental practice, demographic heterogeneity rather than homogeneity may be more effective at advancing environmental policy innovation.

Finally, women CEOs who enjoy the support of women interlinked board members are less likely to struggle with environmental concerns. As other scholars have noted, interlinked board members may enjoy more influence and power over firm outcomes and are more likely to have relevant and trustworthy information about the practices at other firms (Shropshire, 2010; Walls and Hoffman, 2013). Perhaps women CEOs who enjoy the support of influential and knowledgeable women board members are better able to navigate around environmentally risky practices. In fact, recent work by Johansen and Pettersson (2013) suggests that interlinked board members may be critical to firms in terms of avoiding negative sanctions and navigating through uncertain regulatory environments. For women CEOs, the presence of women interlinked board members appears to provide an important source of protection against risk in the environmental domain.

Our findings have important implications for policy and practice. There is mounting evidence that environmentally responsible practices are consistent with – even beneficial for – firm performance (Al-Najjar and Anfimiadou, 2012; Boiral *et al.*, 2012; Xu *et al.*, 2014). Moreover, our analysis suggests that, under certain conditions, gender diversity among top leaders is crucial to environmental innovation and avoiding environmental sanction. This suggests that companies committed to optimizing their environmental policies and practices should prioritize the appointment of women to top leadership positions, particularly influential women board members in firms headed by men CEOs and women CEOs.

Our findings also have implications for public policy approaches to increasing firms' environmental accountability. There is an ongoing debate about the degree of legal regulation that should be imposed on corporations. Yet increasingly scholars find that allowing companies greater flexibility in crafting their own environmental policies

may allow for greater innovation and creativity than a one-size-fits-all regulatory model (e.g. Walker *et al.*, 2013). This evidence suggests that the role of public policy may lie in providing incentives to companies, rather than quotas or mandates, that encourage, recognize and reward companies for gender diversity *and* environmental practice. For instance, the UN Sustainable Stock Exchange Initiative aims to provide incentives to companies to enhance corporate transparency and support sustainability through investment (SSE, 2014). This initiative and others like it seek to link the interests of investors, regulators and corporate leaders in terms of advancing best practices. Rather than forcing companies' hands through strict regulation, the stock exchange initiative encourages innovation and, in fact, seeks to create and impose competitive pressures for companies to adopt best practices.

In their influential article on sustainability, Dyllick and Hockerts (2002) argue that sustainable development applied to business organizations implies economic as well as social and environmental sustainability. While companies must continue to pursue profitability and market competitiveness, they must also seek to optimize their human capital and protect the environment. In other words, financial performance, diversity and environmental protection are not just compatible but interdependent goals. Our study reaffirms this model, namely that promoting diversity and responsible environmental practices are mutually reinforcing goals. However, Dyllick and Hockerts (2002) also argue that, to achieve social and environmental sustainability, companies must develop innovative approaches in a way that multiple stakeholders, including shareholders, can understand and support. Thus, it is incumbent on companies to clearly articulate to investors the performance and business-related motivations for advancing women into leadership positions and pursuing environmentally sustainable practices.

While our findings provide a provocative and nuanced analysis of the effect of gender diversity on environmental outcomes, future research could build on the current study in at least three ways. First, future research could consider the role of other types of diversity on organizational policy and practice related to the environment. Though much less scholarship has considered the effect of racial/ethnic diversity as compared with gender diversity on organizational practice, scholarship on that topic suggests that racial/ethnic minority leaders bring diverse professional experiences and perspectives to leadership positions (Bell and Nkomo, 2001; Collins, 1997). Analyzing the effect of racial/ethnic minority leaders on environmental outcomes could reveal whether and how this diversity may impact organizational practice. Second, future research could explore the effect of gender diversity on other types of organizational practice, including diversity outcomes, business practices and managerial styles. Previous research suggests that gender diversity among leaders impacts a variety of organizational outcomes, including segregation, the gender gap in wages and the mobility opportunities of other women (Cohen and Huffman, 2007; Cohen *et al.*, 1998; Gorman, 2005). However, much less research has considered the ways in which women leaders may shape a range of specific organizational policies. Our study suggests that women leaders may enact leadership in very different ways and bring a diverse set of priorities to the organization. Analyzing effects beyond environmental practice would illuminate these potential impacts.

Finally, our findings reveal that interlinked directors exert a significant influence on environmental policy and practice. This finding supports previous research on the influence of interlinked board members on corporate practice more generally (e.g. Shropshire, 2010). However, while the current study does not disaggregate among interlinked board members in terms of their previous experiences with environmental practice at other firms, future research could further develop this analysis. For instance, as noted above, Kang's (2008) study of negative spillover effects disaggregated interlinked directors who had experience at firms that had been accused of fraud and those who did not. In terms of further analyzing the effect of board interlinks on environmental practice, future research could compare the influence of interlinked directors with experience at firms with negative versus positive environmental records to determine whether one type of experience is more or less influential over the policy and practice of the focal firm.

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