Determinants of Environmental Investment: Evidence from Europe

Md. Borhan Uddin Bhuiyan
School of Accountancy
Massey University, Auckland, New Zealand
Email: m.b.u.bhuiyan@massey.ac.nz

Hedy Jiaying Huang
School of Accountancy
Massey University, Auckland, New Zealand
Email: h.j.huang@massey.ac.nz

Charl de Villiers (Corresponding author)
The University of Auckland, Auckland, New Zealand; and University of Pretoria, Pretoria, South Africa
Email: charl.devilliers@auckland.ac.nz

Please cite as:
Bhuiyan, M.B.U., Huang, H.J. & De Villiers, C. 2021. Determinants of Environmental Investment: Evidence from Europe, *Journal of Cleaner Production*, forthcoming.

Highlights

•Corporate governance mechanisms positively affect firms' environmental investment.
•A gender-diverse board engages more in environmental investment.
•Firms with more independent director are likely to invest more in the environment.
•Environmental investment is higher in firms with an environmental sub-committee.
•Bonus plan linked to environmental performance promotes environmental investment.

Abstract

This study investigates the corporate governance determinants of environmental investment in European firms. Using a sample of firms listed on the Bloomberg European Index 500 from 2001 to 2015, this study finds that firms with more independent directors, and female directors, are likely to invest more in the environment. It also finds that environmental investment is likely to be higher in firms with an environmental sub-committee of the board. Finally, this study documents that firms with CEO bonus plans linked to environmental compliance/performance are likely to incur higher environmental investment. The findings are robust to several alternative measures and methods. The findings of this study made a significant contribution to the environmental investment literature by adopting a quantifiable and non-biased monetary measure of environmental investment. Moreover, this study contributes to the literature by providing generalizable empirical evidence for a significantly positive association between a range of corporate governance characteristics and the level of environmental investment. Therefore, the findings of this study have practical implications to institutional investors.

Keyword: *Environmental investment, board independence, female directors, environmental sub-committee.*

JEL Classifications: *G34; M49; Q56*

1. Introduction

This paper examines the corporate governance determinants of environmental investment among European firms. Huang and Watson (2015) define corporate social responsibility (CSR) as firms' efforts to augment mandatory requirements by voluntarily investing in activities that improve social well-being beyond legal compliance and the direct interests of the firm (McWilliams and Siegel, 2001, 2006). Academic research evidences that CSR enhances firm performance (McGuire and Sundgren, 1988), and firm value (Servaes and Tamayo, 2013), and reduces business risk (Jo and Na, 2012), indicating the benefits of CSR activities. Prior literature documents mixed results regarding the costs and economic benefits of environmental performance (Hassel et al., 2005; Albertini, 2014; Koh et al., 2014; Baboukardos, 2018). Few studies focus on the cost of environment-related investment specifically. Huang and Watson (2015), as well as Broadstock et al. (2018), call for research on environmental and social costs. This paper addresses the call for research regarding the cost of firms' environmental activities by identifying the likely corporate governance determinants of environmental investment.

Engaging in environmental investment is a costly exercise, involving the procurement of environmentally friendly machines and equipment, implementing higher quality control standards, new environmental protection systems, and new health and safety programs. This paper clearly defines environment-related investment as the monetary amount reported in firms' annual reports, including the cost of environmental remediation, the cost of pollution prevention, the cost of research and development (R&D), investment in solutions to environmental challenges or environmental product development, the cost of recycling, the cost of implementing an Environmental Management System and so forth. A key feature of environmental investment is that environment-related expenditures may not lead to a quick pay-off and, very often, the benefits are achieved only in the long-term. Also, different from corporate charitable donations and other one-off short-term social payments that are often criticized as being 'window-dressing' or 'green-washing' without any substance, environmental investment requires real expenditure.

Overall, environmental investment requires investing in capital or labor, is likely to involve substantial committed costs and may result in a loss of scale economies (McWilliams and Siegel,

2001). This research is strongly motivated by the important roles corporate governance plays in corporations' level of environmental investment. Chapple et al. (2001) argue that environmental and social investment may be open to diseconomies if the management of a corporation cannot respond quickly to the changing needs of its stakeholders. Existing research indicates that good corporate governance enhances firm reputations, improves competitiveness in capital sourcing, and provides financial advantages (Miles and Covin, 2000). This study echoes the suggestions made by Hopkins (2001), that there is growing advocacy for a more inclusive and broader notion of corporate governance that embraces CSR and, in particular, substantial environmental investment.

Using a sample of the firms listed in the Bloomberg 500 index during 2001 and 2015, this study finds several firm-specific corporate governance indicators linked to environmental investment. The analysis indicates that determinants including board independence, the presence of female directors, a CEO bonus connected to ESG compliance, and the presence of a CSR committee in a corporation are associated positively with the level of environmental investment. These findings are robust, to several sensitivity tests.

This study is unique compared with other studies in this field, as a quantifiable and non-biased monetary measure of environmental investment has been adopted whereas, so far, the literature on CSR engagement has been focused on so-called 'window-dressing' or 'green-washing' measures including CSR disclosure, corporate social performance (CSP score) and corporate philanthropy. Only two prior studies have adopted quantifiable measures of CSR-related investment, however these papers do not examine its corporate governance determinants (Malik et al., 2019; Oyewumi et al., 2018). In addition, Oyewumi et al. (2018) focus on Nigerian banks, while Malik et al. (2019) also use a sample primarily focused on the banking sector. This paper uniquely explores the corporate governance determinants of real CSR-related investments, namely environmental spending.

The findings of this study contribute to the environmental investment literature in several ways. *First*, this study adopts a quantifiable and non-biased monetary measure of environmental investment as a proxy of firms' substantial level of CSR related activities. Thus far, researchers have identified many areas where corporate governance matters, such as with CSR disclosure, performance and compliance, and corporate giving (philanthropy). By drawing on the *stakeholder theory* and the *conflict-resolution rationale*, this study contributes to the CSR literature by providing generalizable empirical evidence for a significant association between a range of corporate governance attributes and the level of environmental investment. These findings, hence,

have practical implications to institutional investors by highlighting the importance of specific corporate governance features for institutional investment decision-making and ownership practices. Professionals and academics recently emphasize and call for research on environmental and social costs (Huang and Watson, 2015; Broadstock et al., 2018). Our research responds to the call by identifying the likely corporate governance determinants of environmental investment.

The remainder of this paper is organized as follows. The following section reviews the existing literature on CSR investment and develops the hypotheses. The sample selection process, measurement of variables, and regression models are described in the third section. The fourth section presents the empirical results. Lastly, section five concludes the paper.

2. Literature and Hypothesis Development

The Corporate Social Responsibility (CSR) agenda comprises various social and environmental notions, such as employee rights and welfare, health and safety, environmental concerns, corporate philanthropy, community relations, human resource management and so forth (Gray et al., 1995). CSR appears to be a multidimensional and complex concept (Friedman, 1970; Carroll, 1979； Huang and Watson, 2015). A handful of competing arguments attempt to explain the rationale behind corporates' CSR engagement and CSR's relation to corporate governance, performance, and stakeholders. *First,* corporate giving (i.e., charitable donations as a component of the CSR) can be attributable to firms' altruistic motivation (Haley, 1991; Choi and Wang, 2007). *Second,* the principal-agent theory (Jensen and Meckling, 1976) suggests that firms engage in CSR activities opportunistically for private gain: e.g., top management's income tax benefits (Yermack, 2009), and controlling shareholders rent-seeking, at the cost of minority shareholders (Cespa and Cestone, 2007; Barnea and Rubin, 2010; Marquis and Lee, 2013; Li et al., 2015; Masulis and Reza, 2015; Tan and Tang, 2014). *Third,* previous literature on the nexus between CSP and corporate financial performance (CFP) draws on the stakeholder and legitimacy theories, and argues that corporate giving and CSR activities help to legitimize firms as good corporate citizens in the eyes of stakeholders (Suchman, 1995; De Villiers, 1999; De Villiers and Van Staden, 2006; De Villiers and Van Staden, 2010; Tilling and Tilt, 2010; Khalil and O'Sullivan, 2017; Kassim et al., 2019). In turn, CSR activities improve organizational performance and, hence, increase shareholder value (Margolis and Walsh, 2003; Lev et al., 2010; Wang and Qian, 2011).

Stakeholder theory posits that boards of directors are held responsible for a broader group of stakeholders (Rao and Tilt, 2016). Also, consistent with the agency theory, firms use CSR

activities to mitigate conflict of interests among managers, shareholders and non-investing stakeholders (Calton and Payne, 2003; Scherer et al., 2006). Drawing from prior literature on CSR performance and reporting, this study focuses on examining the following characteristics: board independence (Eng and Mak, 2003; Liao et al, 2015), female directors (Kathyayini et al., 2012), the compensation plan for the chief executive officer (CEO), and the presence of a CSR or environmental committee (Michelon and Parbonetti, 2012). Therefore, four main hypotheses are developed in the following sections and empirically tested.

2.1 Board Independence

A key function of the corporate board is monitoring and advising senior executives to ensure the alignment of their objectives with shareholders and broader groups of stakeholders. Previous studies document that boards with higher levels of independent directors can monitor top management more effectively, because independent directors are external to a firm and do not have financial interests in the firm (Donnelly and Mulcahy, 2008; De Villiers et al., 2011). They also show a higher level of accountability to stakeholders (Wang and Dewhirst, 1992). Thus, their advice regarding a firm's strategic directions and investment decisions tend to be more objective, and long-term focused.

Previous studies provide some mixed findings on the existence of an association between the presence of independent directors and CSR disclosure. Many studies confirm a significant and positive relationship (Barako and Brown, 2008; Prado-Lorenzo et al., 2009; Chau and Gray, 2010; De Villiers et al., 2011; Liao et al., 2015). Nevertheless, other studies find either no significant association (Brammer and Pavelin, 2006; 2008), or a negative relationship[1] (Haniffa and Cooke, 2005). In the environmental investment decision-making process, a more independent board is more inclined to encourage environment-related investment, because they share a diverse and broad range of views and values (Singh et al., 2001), and have high concerns for their reputation, less financial interest and more focus on the long-term growth of corporates. A more independent board will be more inclined to approve environmental investment to mitigate the conflicting interests of divergent stakeholder groups (Wang and Dewhirst, 1992). Hence, the following hypothesis is developed:

> ***H_1:*** *The proportion of independent directors (INDDIR) is associated with the level of environmental investment positively.*

[1] This might be because of the substitution effect which may exist in their research setting, for instance, voluntary disclosure could be substituted by an increased level of monitoring by independent directors (Gul and Leung, 2004).

2.2 Gender Diversity

Board diversity has received a high level of attention in the Corporate Governance research field recently. By definition, board diversity refer to the heterogeneity among board members. It includes multiple perspectives ranging from board members' age to nationality, and from their function to their religious background. Furthermore, it provides for board members with relational skills and with task skills, and for the difference in sexual or political preference (Van Knippenberg et al., 2004). Among the different board diversity features, gender diversity is of growing interest to practitioners and scholars (Carter et al., 2003; Rao and Tilt, 2016). Although a few researchers find that female directors may play an insignificant role in environmental matters owing to sex-based bias (Galbreath, 2011; Hayes, 2001; Rodriguez-Dominguez et al., 2009), many others suggest that women are very often more conscious of social and environmental issues (Mainieri et al., 1997; Wehrmeyer and McNeil, 2000; Diamantopoulos et al., 2003). Thus, female directors are more likely to make an effort to mitigate perceived social and environmental risks (Ibrahim and Angelidis, 1991; Bord and O'Connor, 1997; Fukukawa et al., 2007; Krüger, 2009; Ibrahim and Angelidis, 2011; Bear et al., 2010; Galbreath, 2011; Fernandez-Feijoo et al., 2012; Boulouta, 2013). Female directors could engage with different stakeholder groups more effectively, and resolve conflicts among multiple stakeholders through making more effective environmental investment decisions. Thus the following hypothesis is proposed:

> *H_2: There is a positive association between the level of environmental investment and the presence of female directors on the corporate board.*

2.3 Environmental Sub-Committee

Many corporates now have designated environmental committees to plan, implement and review CSR-related strategies, policies and investment (Michals, 2009; Liao et al., 2015). The role of an environmental sub-committee in planning and reviewing environmental strategy is similar to the role of an audit committee in ensuring accurate and fair disclosures of financial information (Liao et al., 2015). Drawing on the conflict resolution rationale, it is argued that the presence of an environmental sub-committee of the board could balance a firm's sometimes conflicting financial and non-financial goals, given its limited resources. An environmental sub-committee could also mitigate the possible conflicting expectations of stakeholders, who have disparate interests. Thus, it is hypothesized that boards with an environmental sub-committee would improve firms' responsiveness to diverse demands from stakeholders on environmental issues, and that this could result in a higher level of environmental investment.

H_3: Environmental investment will be higher in the presence of an environmental sub-committee (ENVRCOMM).

2.4 ESG-linked CEO Bonus

Agency theory highlights the opportunistic behavior of agents in investing in negative net present value CSR projects that diminish shareholder wealth. Managers may become short-term oriented in making myopic CSR engagement decisions (Narayanan, 1985) and over-investment (Holmstrom and Costa, 1986; Trueman, 1986; Scharfstein and Stein, 1990), owing to their career concerns. Managers are strongly incentivized to engage in social and environmental activities to establish their reputation as good corporate citizens in order to optimise their future careers (Hemingway and Maclagan, 2004; Cespa and Cestone, 2007; Barnea and Rubin, 2010). They might engage in social and environmental activities merely for ceremonial reasons, with the little economic payoff to the firm, but as a means of enhancing their status (Surroca and Tribó, 2008). Drawing on the agency theory, managers would invest in social and environmental activities for good or bad motives. It is anticipated that an ESG-linked compensation plan would exert some positive influence over managers' environment-related investment decisions.

H_4: There is a positive association between environmental investment and CEO compensation linked with ESG compliance (ESG_BONUS_CEO).

In Figure 1, we demonstrate the determinants of environmental investment. This study hypothesizes that corporate board independence, gender diversity, the existence of an active environmental committee and CEO compensation linked to ESG compliance determines firms commitment to environmental investment.

3. Research Method

3.1 Sample

This study selected firms listed on the Bloomberg European Index 500, and started with an initial sample of 7,490 firm-year observations over 2001-2015 taken from Bloomberg. Although the database comprises 7,490 firm-year observations, most of the relevant data fields are missing, which introduces selection bias in the sample selection[2]. The average size (log of the total assets) of the firm-year observations is compared with non-missing with observations that had missing environmental investment data. Un-tabulated results reveal that the former group is significantly

[2] This study conducted Propensity Score Matching (PSM) to address the sample-selection bias and the results are reported in section 4.5.6.

larger (average size is 7.29) than the latter group (average size is 2.51), a difference that is significant p <0.001 (t-statistic 9.22). The former group is also more leveraged than the latter group (t-statistic 3.29, p<0. 01) but with higher growth opportunities (t-statistic 4.71).

However, regression analyses could only be conducted on the non-missing data and, hence, the analyses started with the number of observations with the item listed in Bloomberg. All missing environmental investment observations were deleted because these imply that Bloomberg did not cover these entities or, even if they did, the environmental investment value was missing, either because the firms were not incurring separate environmental investment (a zero should have appeared) or no data was reported (an N/A should have appeared). Bloomberg reported N/A in all those missing data fields. The empirical test began with non-missing environmental investment observations for the sample period 2001-2015, since very few environmental investment observations were available on Bloomberg prior to 2001. Thus, the final sample contains 330 firm-year observations with non-missing and zero environmental investment amounts (recall that a value of 0 means Bloomberg covered these firms, but the firm did not make an environmental investment during that year).

3.2 Variable Measurement

Bloomberg defines environmental investment as: "*... the environmental activities undertaken during the normal course of business activities including the cost of environmental remediation, the cost of pollution prevention, the cost of R&D investment in solutions to environmental challenges/environmental product development, the cost of recycling, the cost of implementing an environmental management system."* Two different proxies are adopted for environmental investment as the dependent variable; the natural logarithm of one plus the environmental investment value (*LN_ENVR*) and a continuous variable for the environmental investment scaled by total assets (*ENVR_TA*). The variables of interest in this study include board independence (*INDDIR*) (+), whether females are represented on the board (*FEMBOD*) (+), and whether the firm has a separate supervisory committee to oversee environmental activities (*ENVRCOMM*) (+). Finally, this study also considers the CEO bonus linked to CSR performance and environmental investment (*ESG_BONUS_CEO*) (+). This study also controls for several firm-specific variables and corporate governance variables. All variable definitions are presented in Appendix A.

The following regression specifications have been constructed to examine the possible determinants of environmental investment decisions by the listed firms on the Bloomberg European Index 500:

$$ENVINV_t = \gamma_0 + \gamma_1 INDDIR + \gamma_2 FEMBOD + \gamma_3 ENVCOMM + \gamma_4 BODSIZE + \gamma_5 BODMEET + \gamma_6 CEODUAL + \gamma_7 INDCHAIR + \gamma_8 ESG_{BONUS_{CEO}} + \gamma_9 LOGASSET + \gamma_{10} ROA + \gamma_{11} LEV + Industry + Year + \varepsilon_t \ldots \ldots (1)$$

4. Results

4.1 Descriptive Analysis

Table 2, Panel A, presents descriptive statistics for all the variables used in this research. Descriptive statistics reveal that the average environmental investment for firms is 1% of total assets. The average of independent directors in a board (*INDDIR*) is 53% with a significant variation among sample observations, as is evident from the high standard deviation (0.30). A total of 12% of firms has at least one female director on the board. Also, the sample indicates that the average percentage of firms having an operational environmental sub-committee (*ENVRCOMM*) is 22% with a standard deviation of 0.42. The average board meeting frequency is 9 times (mean = 9.16) in a financial year, and the mean board size of 13 directors indicates that sample firms are relatively large and have a relatively complex operational environment. Figure 2A presents the country-wise environmental investment, which shows that firms in the Netherlands spend the most on environmental investment. Figure 2B shows yearly environmental investments, being the highest in the year 2011, followed by 2012.

Table 2, Panel B, reports the results of bivariate correlation analysis. Multicollinearity is unlikely to be a concern, as the correlation between the independent variables does not exceed 0.80. The highest correlation between independent variables is 0.47 ($p<0.01$) between *BODSIZE* and *INDDIR*.

Table 2, Panel C, reports differences in variables between firms having environmental investments greater than average *(ENVR_TA=1)* and those in the lesser environmental investment *(ENVR_TA=0)* category (Mean-difference test). Twenty-two percent of the sample firms have more than the average environmental investment in a firm-year. The mean differences for most variables other than *CEODUAL* are also statistically significant at $p<0.10$ or lower. VIFs are also below the threshold of 10, as can be seen in the Table 2, Panel C.

4.2 Regression Results

Table 3 reports the results for Equation (1), where regression has been conducted using measures of environmental investment (*CSR_INV*) on several possible determinants hypothesized to affect environmental investment. The regression results for environmental investment (dependent variable = *LN_ENVR*) on each of the separate firm-specific measures are reported in Table 3, columns (1) to (4), while a more comprehensive model result (including all the independent variables in a single regression) is presented in column (5). A similar procedure has been followed for the alternative environmental investment proxy (dependent variable = *ENVR_TA*), and the results are presented in columns (6) to (10).

In **H_1**, it is hypothesized that firms having relatively more independent directors (*INDDIR*) are more likely to incur high environmental investment compared with firms having few independent directors. As is consistent with that hypothesis, this study finds a positive coefficient on *INDDIR* for both the proxies of environmental investment, supporting **H_1** (coefficient = 0.671 and 0.0115; t-statistic = 2.93 and 4.759; $p<0.01$ for both). The finding is consistent with the beneficial effect of good corporate governance, since an environmental investment is viewed as a positive economic decision when good corporate governance exists. In **H_2**, this study hypothesizes that a firm will invest more in environmental activities in the presence of a female director on the corporate board. Concerning **H_2**, a significantly positive association has been found between the environmental investments proxies and the presence of female directors on the board *FEMBOD* (coefficient = 2.264 and 0.0161, t-statistic = 5.619 and 3.628, $p<0.01$ for both). Again, this finding is consistent with **H_2**. These findings are consistent with the previous findings indicating that, compared to male directors who are more interested in economic performance, female directors exhibit a strong orientation towards corporate social responsibilities. The **H_3** hypothesizes that environmental investment will be greater in the presence of an environmental sub-committee (*ENVRCOMM*). The results reveal that a firm with an operational environmental sub-committee (*ENVRCOMM)* has a positive association with the environmental investment proxies (coefficient = 0.438 and 0.004; t-statistic = 4.96 and 1.99, $p<0.01$ and 0.05 respectively). The results are consistent with existing research suggesting that a separate and dedicated supervisory environmental sub-committee can raise environmental commitment among stakeholders and may encourage greater environmental investment. Finally, the **H_4** hypothesizes that environmental investment is higher when the CEO bonus is linked to CSR performance. These findings are consistent with the predicted hypothesis, that is, the environmental investment proxies are positive and statistically significant (coefficient = 0.474 and 0.003; t-statistic = 5.74 and 1.89 respectively),

indicating that CSR-linked compensation policy firms are likely to engage in more environmental investment. To summarize, the overall results confirm the main hypothesis on the positive associations between environmental investment and four corporate governance attributes including board independence (*INDDIR*), presence of female directors (*FEMBOD*), presence of an environmental sub-committee (*ENVRCOMM*) and, finally, the existence of a CEO bonus linked to CSR performance (*ESG_BONUS_CEO*).

4.3 Additional analysis

This section addresses a wide range of alternative explanations of the results and test the robustness of the regression models in the following contexts.

4.3.1 Change of environmental investment over the years

This study also tests the effect of changes in environmental investment owing to the changes in corporate governance attributes such as *INDDIR*, *FEMBOD*, *ENVRCOMM,* and *ESG_BONUS_CEO*. The changes of environmental investment (deflated by current year total asset) compared to the previous year has been calculated and a sub-sample of 260 firm-year observations is prepared. The OLS regression analysis has been re-run and it is found that changes in environmental investment are associated positively with the changes in independent director numbers *INDDIR* (coefficient = 0.0120, t-statistic = 1.936, $p<0.10$). Similarly, *FEMBOD, ENVRCOMM, and ESG_BONUS_CEO* are also associated positively with environmental investment (coefficients are at $p<0.10$ or lower). Thus, all hypotheses in this study are supported.

4.3.2 Non-profitable firms and environmental investment

This study examines whether non-profitable firms tend to invest in environmental activities. Anecdotal evidence suggests that profitable firms are pioneers in environmental compliance and investment compared with non-profitable firms. A total of 11.52% of firm-year observations is identified as non-profitable during the sample years. Then the regression model is implemented using the sub-sample. Results reveal that the coefficients (*FEMBOD* and *ESG_BONUS_CEO*) are positive and consistent (coefficient = 1.756 and 0.337, t-statistic = 4.256 and 4.074, $p<0.01$ respectively) with the preliminary findings implying that environmental investment is influenced more by the presence of female directors and CEO compensation policy than by firm profitability.

4.3.3 Alternative measures of female directorships and environmental investment

A continuous variable has been used to measure female director presence on the board during the primary analysis. An alternative measure of female directors (*FEMBOD*) is adopted to examine the robustness of the findings. In the robustness test, the actual number of female directors is used as a measure of *FEMBOD* and the environmental investment regression has been rerun, including all control variables. The findings are consistent with the preliminary results, that environmental investment and the female director's existence are associated positively (coefficient = 2.655, t-statistic = 3.313, $p<0.01$) and statistically significant at 1% level.

4.3.4 Tokenism and environmental investment

Gender diversity research is often argued from the perspective of "tokenism" and, therefore, it is understood that this may bias this research. It may happen that firms recruit the minimum of female directors in order to comply with corporate governance best practice guidelines, and for a 'tick-the-box' compliance. Therefore, the regression is re-run within a sub-sample ($n=76$) having firm-year observations with more than two female directors. The findings reveal that the association (coefficient 0.149, t-statistic = 3.374, $p<0.01$) between environmental investment and female director existence is positive and statistically significant at the 1% level. Moreover, a sample within the sub-sample where a firm-year observation has less than 2 female directors is also used to re-run the regression (results are not reported for the sake of brevity), and the findings are consistent, indicating that this sample has no bias of tokenism.

4.3.5 Industry sensitivity and environmental investment

To test the sensitivity of environmental investment, the industry category has been re-classified to ensure it is consistent with the CSR-related literature (for instance, Halme and Huse, 1997; Patten, 2002; Cho and Patten, 2007). A dummy variable approach is used, and a total of 148 firm-years are identified as industry-sensitive firms. The regression is re-run and consistent evidence aligning with the preliminary findings has been documented. The coefficient on *INDSENS* (coefficient = 0.400, t-statistic 5.637, $p<0.01$) is positive and statistically significant at the 1% level, indicating that industry sensitive firms are more likely to engage in higher environmental investment. In all cases, the hypotheses are supported.

4.3.6 Propensity Score Matching

This study uses the propensity score matching (PSM) methodology to control self-selection bias. To conduct the PSM test, this study compares the environmental investment between the treatment group (firms that have an operational environmental committee) and the control group (firms that do not have an operational environmental committee). The control and treatment groups are matched based on a number of firm-specific characteristics, such as firm size, performance, and leverage. The matching, once successful, often reduces the available sample substantially. Then a test is conducted to examine whether there is a statistically significant difference for the firm-specific variables between firms in the treatment group and those in the control group. Table 5 presents the findings of propensity score matching. Consistent with the primary evidence, robust evidence has been found that environmental investment is significantly higher for the firms when an environmental committee is operational. It is noteworthy that PSM techniques are useful to reasonably estimate the causal effect of a treatment group by removing selection bias (Shipman, Swanquist and Whited, 2017). However, PSM is not free from limitation as it only accounts for observed and observable covariates. Therefore, hidden bias may remain following the matching. PSM requires a large sample, with substantial overlap between treatment and control groups.

4.3.7 Does introducing an ESG-related bonus to the executive compensation (or installing an environmental committee) affect environmental investment?

This study also examines whether introducing an ESG related bonus to executive compensation (or installing an environmental committee) for the first time has a direct impact on environmental investment. A lead-lag approach is used to equation 1 and to measure environmental investment in year *t+1, (*$ENVINV_{(t+1)}$*)* to examine the impact of introducing an ESG-bonus (*ESG_BONUS_CEO*) or installing an environmental committee (*ENVRCOMM*). Table 5 presents the findings. Findings reveal that both *ESG_BONUS_CEO* and *ENVRCOMM* show a positive association with $ENVINV_{(t+1),}$ which indicates that a firm incurs more environmental investment when it introduces CEO compensation relating to ESG performance, or install an environmental committee for the first time. Therefore, these empirical results provide robust evidence to support the hypothesis that both ESG related compensation plans and environmental sub-committees increase the levels of firms' environmental investment significantly.

5. Conclusion

This research examines the likely determinants of environmental investment in the European context. These corporate governance determinants are examined empirically using the Bloomberg European 500 Index-listed firms from 2001–2015. The findings provide strong empirical support that board independence, the presence of female directors, the existence of an environmental sub-committee, and CEO compensation policy linked to CSR performance, are likely to determine the level of environmental investment.

Seven additional tests have been conducted to address alternative explanations of the results and to test the robustness of the results. First, the results remain robust to alternative measures of female directorship and environmental investment. Second, tests have been conducted on sub-samples to deal with the possible bias of "tokenism" in gender diversity research. Third, a regression is conducted on a sub-sample of non-profitable firms, and significantly positive coefficients are found on the presence of female directors and CEO bonuses linked to CSR performance. Fourth, this study further tests for industry-sensitivity of environmental investment. These results still hold and remain statistically significant. Fifth, the results remain when the effect of changes in environmental investment are examined in the main regression as a result of changes in corporate governance attributes. Moreover, the self-selection bias are addressed by conducting propensity score matching (PSM) methodology with respect to the association between level of environmental investment and the existence of an environmental sub-committee. Consistent results supporting the primary findings are documented. Lastly, this study also tests the effect of first-time adoption of an ESG-related bonus scheme for executive compensation (or first-time introduction of an environmental sub-committee) on the level of environmental investment. The results provide robust evidence for a significantly positive causal relationship between the ESG-linked bonus scheme (or environmental sub-committee) and environmental investment. Overall, the results suggest that several corporate governance characteristics are associated positively with environmental investment. With the rising global awareness of the importance of promoting a CSR agenda, the findings of this paper offer useful insights to institutional investors in their screening and appraisals of socially responsible investing (Doh et al., 2010).

References

Albertini, E., 2014. A descriptive analysis of environmental disclosure: A longitudinal study of French companies. J. Bus. Ethics. 121(2), 233-254.

Baboukardos, D., 2018. The valuation relevance of environmental performance revisited: The moderating role of environmental provisions. Brit. Acc. Rev. 50(1), 32-47.

Barako, D. G., Brown, A. M., 2008. Corporate social reporting and board representation: evidence from the Kenyan banking sector. J. Manag. Gov.12(4), 309–324.

Barnea, A., Rubin, A., 2010. Corporate social responsibility as a conflict between shareholders. J. Bus. Ethics. 97(1), 71-86.

Barnea, A., Rubin, A., 2010. Corporate social responsibility as a conflict between shareholders. J. Bus. Ethics. 97(1), 71–86.

Bord, R. J., O'Connor, R. E., 1997. The gender gap in environmental attitudes: the case of perceived vulnerability to risk: research on the environment. Soc. Sci. Quart. 78(4), 830–840.

Boulouta, I., 2013. Hidden connections: the link between board gender diversity and corporate social performance. J. Bus. Ethics. 113 (2), 185-197.

Brammer, S., Pavelin, S., 2006. Voluntary environmental disclosures by large UK companies. J. Bus. Finan. Account. 33(7–8), 1168–1188.

Brammer, S., Pavelin, S., 2008. Factors influencing the quality of corporate environmental disclosure. Bus. Strateg. Environ. 17(2), 120– 136.

Broadstock, D. C., Collins, A., Hunt, L. C., Vergos, K., 2018. Voluntary disclosure, greenhouse gas emissions and business performance: Assessing the first decade of reporting. Brit. Acc. Rev. 50(1), 48-59.

Brown, W. O., Helland, E., Smith, J. K., 2006. Corporate philanthropic practices. J. Corp. Financ.12(5), 855–877.

Bryman, A., Hardy, M., 2004. Handbook of Data Analysis. Sage, New York, NY.

Calton, J., Payne, S., 2003. Coping with Paradox', Bus. Soc., 42, 7-42.

Carroll, A., 1979. A three-dimensional conceptual model of corporate performance. Acad. Manag. Rev. 4(4), 497–505.

Carter, D. A., Simkins, B. J., Simpson, W. G., 2003. Corporate governance, board diversity, and firm value. Financ. Rev. 38(1), 33-53.

Castelo Branco, M., & Lima Rodrigues, L., 2006. Corporate social responsibility and resource-based perspectives. J. Bus. Ethics. 69, 111–132.

Cespa, G., Cestone, G: 2007. Corporate Social Responsibility and Managerial Entrenchment. J. Econ. Manag. Strat. 16, 741-771.

Chau, G., Gray, S. J., 2010. Family ownership, board independence and voluntary disclosure: evidence from Hong Kong. J. Int. Account. Audit. Tax. 19(2), 93–109.

Chapple, W., Cooke, A., Galt, V., Paton, D., 2001. The determinants of voluntary investment decisions. Manage. Decis. Econ. 22(8), 453-463.

Choi, J., Wang, H., 2007. The promise of a managerial values approach to corporate philanthropy. J. Bus. Ethics. 75(4), 345–359.

Cho, C. H., Patten, D. M., 2007. The role of environmental disclosures as tools of legitimacy: A research note. Account. Org. Soc. 32(7-8), 639-647.

De Villiers, C. J., 1999. The Decision by Management to Disclose Environmental Information: A research note based on interviews. Meditari Account. Res. 7, 33-48.

De Villiers, C. J., Lubbe, D. S., 2001. Industry differences in Corporate Environmental Reporting in South Africa. Meditari Account. Res. 9(1), 81-91.

De Villiers, C., Van Staden, C. J., 2006. Can less environmental disclosure have a legitimising effect? Evidence from Africa. Account. Org. Soc. 31(8), 763-781.

De Villiers, C., Naiker, V., Van Staden, C. J., 2011. The effect of board characteristics on firm environmental performance. J. Manag. 37(6), 1636–1663.

Diamantopoulos, A., Schlegelmilch, B. B., Sinkovics, R. R., Bohlen, G. M., 2003. Can socio-demographics still play a role in profiling green consumers? A review of the evidence and an empirical investigation. J. Bus. Res. 56(6), 465–480.

Doh, J. P., Howton, S. D., Howton, S. W., Siegel, D. S., 2010. Does the market respond to an endorsement of social responsibility? The role of institutions, information, and legitimacy. J. Manag. 36(6), 1461-1485.

Donnelly, R., Mulcahy, M., 2008. Board structure, ownership, and voluntary disclosure in Ireland. Corp. Gov. Int. Rev. 16(5), 416–429.

Eng, L. L., Mak, Y. T., 2003. Corporate governance and voluntary disclosure. J. Account. Public Policy. 22(4), 325-345.

Fernandez-Feijoo, B., Romero, S., Ruiz, S., 2012. Does Board Gender Composition affect Corporate Social Responsibility Reporting? Int. J. Bus. Soc. Sci. 3(1), 31-38.

Friedman, M., 1970. The social responsibility of business is to increase its profits. The New York Times Magazine [13 September].
Fukukawa, K., Shafer, W. E., Lee, G. M., 2007. Values and attitudes toward social and environmental accountability: a study of MBA students. J. Bus. Ethics. 71(4), 381–394.
Galbreath, J., 2011. Are there gender-related influences on corporate sustainability? A study of women on boards of directors. J. Manag. Org. 17(1), 17–38.
García-Meca, E., Sánchez-Ballesta, J. P., 2010. The association of board independence and ownership concentration with voluntary disclosure: a meta-analysis. Europ. Account. Rev. 19(3), 603–627.
Gul, F. A., Leung, S., 2004. Board leadership, outside directors' expertise and voluntary corporate disclosures. J. Account. Public Policy. 23(5), 351–379.
Gray, R., Kouhy, R., Lavers, S., 1995. Corporate social and environmental reporting: a review of the literature and a longitudinal study of UK disclosure. Account. Audit. Accoun. J. 8(2), 47-77.
Haniffa, R., Cooke, T., 2005. The impact of culture and governance on corporate social reporting. J. Account. Public Policy. 24(5), 391–430.
Haley, U. C. V., 1991. Corporate contributions as managerial masques: Reframing corporate contributions as strategies to influence society. J. Manag. Stud. 28(5), 485–510.
Halme, M., Huse, M., 1997. The influence of corporate governance, industry and country factors on environmental reporting. Scandinavian J. Manag. 13(2), 137–157.
Hassel, L., Nilsson, H., Nyquist, S., 2005. The value relevance of environmental performance. Europ. Account. Rev. 14(1), 41-61.
Hayes, B. C., 2001. Gender, scientific knowledge, and attitudes toward the environment: a cross-national analysis. Polit. Res. Quart. 54(3), 657–671.
Hemingway, C. A., Maclagan, P. W., 2004. Managers' personal values as drivers of corporate social responsibility. J. Bus. Ethics. 50(1), 33-44.
Holmstrom, B., Costa, J. R. I., 1986. Managerial incentives and capital management. Quart. J. Econ. 101(4), 835-860.
Hopkins, M., 2001. What, If Any, is the Relation Between Corporate Governance and Corporate Social Responsibility? World Bank Monthly Report January.
Huang, X., Watson, L., 2015. Corporate social responsibility research in accounting, J. Account. Lit. 34, 1-16.
Ibrahim, N. A., Angelidis, J. P., 2011. Effect of board members gender on corporate social responsiveness orientation. J. Appl. Bus. Res. 10(1), 35-40.
Ibrahim, N., Angelidis, J., 1991. Effects of board members gender on level of involvement in strategic management and corporate social responsiveness orientation. Paper presented at Proceedings of the Northeast Decision Sciences Institute, New York, NY.
Jehn, K. A., Northcraft, G. B., Neale, M. A., 1999. Why differences make a difference: a field study of diversity, conflict and performance in workgroups. Admin. Sci. Quart. 44(4), 741–763.
Jensen, M., Meckling, W., 1976. Theory of Firm: Managerial Behavior, Agency costs, and Capital Structure. J. Financ. Econ. 3, 305-360.
Jo, H., Na, H., 2012. Does CSR reduce firm risk? Evidence from controversial industry sectors. J. Bus. Ethics. 110(4), 441-456.
Kassim, C. K. H. C. K., Ahmad, S., Nasir, N. E. M., Nori, W. M. N. W. M., Arifin, N. N. M., 2019. Environmental reporting by the Malaysian local governments. Meditari Account. Res. 27(4), 633-651.
Khalil, S., O'sullivan, P., 2017. Corporate social responsibility: Internet social and environmental reporting by banks. Meditari Account. Res. 25(3), 414-446.
Koh, P., Qian, C., Wang, H., 2014. Firm litigation risk and the insurance value of corporate social performance. Strat. Manag. J. 35(10), 1464-1482.
KPMG, 2013. The KPMG survey of corporate responsibility reporting. Available at: www.kpmg.com/sustainability
Krüger, P., 2009. Corporate social responsibility and the board of directors. Job Market Paper, Toulouse School of Economics, Toulouse.
Lev, B., Petrovits, C., Radhakrishnan, S., 2010. Is doing good 'good' for you? How corporate charitable contributions enhance revenue growth. Strat. Manag. J. 31(2), 182–200.
Li, S., Wu, H., Song, X., 2015. Principal-principal conflicts and corporate philanthropy: Evidence from Chinese private firms. J. Bus. Ethics. 141(3), 605-620.
Liao, L., Luo, L., Tang, Q., 2015. Gender diversity, board independence, environmental committee and greenhouse gas disclosure. Brit. Acc. Rev. 47(4), 409-424.
Mainieri, T., Barnett, E. G., Valdero, T. R., Unipan, J. B., Oskamp, S., 1997. Green buying: the influence of environmental concern on consumer behavior. J. Soc. Psychol. 137(2), 189–204.
Malik, M., Al Mamun, M., Amin, A., 2019. Peer pressure, CSR spending, and long-term financial performance. Asia-Pa. J. Account. Econ. 26(3), 241-260.
Margolis, J. D., Walsh, J. P., 2003. Misery Loves Companies: Rethinking Social Initiatives by Business. Admin. Sci. Quart. 48, 268–305.

Marquis, C., Lee, M., 2013. Who is governing whom? Executives, governance, and the structure of generosity in large U.S. firms. Strat. Manag. J. 34(4), 483–497.
Masulis, R. W., Reza, S. W., 2015. Agency problems of corporate philanthropy. Rev. Financ. Stud. 28(2), 592–636.
McGuire, J. B., Sundgren, A., Schneeweis, T., 1988. Corporate social responsibility and firm financial performance. Acad. Manag. J. 31(4), 854-872.
McWilliams, A., Siegel, D., 2001. Corporate social responsibility: A theory of the firm perspective. Acad. Manag. Rev. 26(1), 117–127.
McWilliams, A., Siegel, D., 2006. Corporate social responsibility: Strategic implications. J. Manag. Stud.43(1), 1-18.
Michals, G., 2009. The boardroom's climate is changing: More companies are designating specific committees for environmental issues to help inform the board of potential problems - Directorship Boardroom Intelligence.
Michelon, G., Parbonetti, A., 2012. The effect of corporate governance on sustainability disclosure. J. Manag. Gov.16(3), 477-509.
Miles, M. P., Covin, J. G., 2000. Environmental marketing: A source of reputational, competitive, and financial advantage. J. Bus. Ethics. 23(3), 299-311.
Narayanan, M., 1985. Managerial incentives for short-term results. J. Finan. 40(5), 1469-1484.
Oyewumi, O. R., Ogunmeru, O. A., Oboh, C. S., 2018. Investment in corporate social responsibility, disclosure practices, and financial performance of banks in Nigeria. Future Bus. J. 4(2), 195-205.
Patten, D. M., 2002. The relation between environmental performance and environmental disclosure: a research note. Account. Org. Soc. 27(8), 763-773.
Pfeffer, J., Salancik, G.R., 1978. The External Control of Organisations: A Resource Dependence Perspective. Harper and Row, New York, NY.
Prado-Lorenzo, J.-M., Garcia-Sanchez, I.-M., 2010. The role of the board of directors in disseminating relevant information on greenhouse gases. J. Bus. Ethics. 97(3), 391–424.
Rankin, M., Windsor, C., Wahyuni, D., 2011. An investigation of voluntary corporate greenhouse gas emissions reporting in a market governance system: Australian evidence. Account. Audit. Accoun. J. 24(8), 1037–1070.
Rao, K., Tilt, C., 2016. Board diversity and CSR reporting: an Australian study. Meditari Account. Res. 24(2), 182-210
Rodriguez-Dominguez, L., Gallego-Alvarez, I., Garcia-Sanchez, I. M., 2009. Corporate governance and codes of ethics. J. Bus. Ethics. 90(2), 187–202.
Servaes, H., Tamayo, A., 2013. The impact of corporate social responsibility on firm value: The role of customer awareness. Manag. Sci. 59(5), 1045-1061.
Scharfstein, D. S., Stein, J. C., 1990. Herd behavior and investment. The American Economic Review, 465-479.
Scherer, A., Palazzo, G., Baumann, D., 2006. Global Rules and Private Actors, Toward a New Role of the TNC in Global Governance. Bus. Ethics. Quart. 16, 502-532.
Shipman, J. E., Swanquist, Q. T., & Whited, R. L. (2017). Propensity score matching in accounting research. *The Accounting Review*, *92*(1), 213-244.
Singh, V., Vinnicombe, S., Johnson, P., 2001. Women directors on top UK boards. Corp. Gov. Int. Rev. 9(3), 206–216.
Suchman, M. C., 1995. Managing legitimacy: Strategic and institutional approaches. Acad. Manag. J. 20(3), 571-610.
Surroca J, Tribó J. A, Waddock S., 2010. Corporate responsibility and financial performance: The role of intangible resources. Strat. Manag. J. 31, 463-490
Tan, J., Tang, Y., 2016. Donate money, but whose? An empirical study of ultimate control rights, agency problems, and corporate philanthropy in China. J. Bus. Ethics. 134, 593–610.
Tilling, M. V., Tilt, C. A., 2010. The edge of legitimacy - Voluntary social and environmental reporting in Rothmans' 1956-1999 annual reports. Account. Audit. Accoun. J. 23(1), 55-81.
Trueman, B., 1986. The relationship between the level of capital expenditures and firm value. J. Financ. Quant. Anal. 21(2), 115-129.
Van Knippenberg, D., De Dreu, C. K. W., Homan, A. C., 2004. Workgroup diversity and group performance: an integrative model and research agenda. J. Appl. Psychol. 89(6), 1008.
Waddock, S. A., Graves, S. B., 1997. The corporate social performance-financial performance link. Strat. Manag. J. 18(4), 303–319.
Wang, H., Qian, C., 2011. Corporate philanthropy and corporate financial performance: The roles of stakeholder response and political access. Acad. Manag. J. 54(6), 1159–1181.
Wang, J., Dewhirst, H. D., 1992. Boards of directors and stakeholder orientation. J. Bus. Ethics. 11(2), 115–123.
Wehrmeyer, W., McNeil, M., 2000. Activists, pragmatists, technophiles and tree-huggers? Gender differences in employees' environmental attitudes. J. Bus. Ethics. 28(3), 211–222.
Yermack, D., 2009. CEOs donating their own stock to their own family foundations. J. Financ. Econ. 94(1), 107–123.

Appendix A: Variable Definitions

Variable	Definition
Dependent Variable: Environmental Investment	
LN_ENVR	The natural logarithm of environmental investment value
ENVR_TA	A continuous variable for the environmental investment scaled by total assets
Independent Variables (expected signs are in parentheses)	
INDDIR (+)	Percentage of independent directors in the board measured using the total number of independent directors divided by the total number of board members.
FEMBOD (+)	Dummy variable equals 1 if At least one female executive is operational in the board, and otherwise 0.
ENVRCOMM (+)	Dummy variable equals 1 if the firm has a separate supervisory committee to oversee CSR activities (i.e., an operational environmental sub-committee), and otherwise 0.
ESG_BONUS_CEO (+)	Dummy variable equals 1 if CEO bonus linked to CSR performance and environmental investment, and otherwise 0.
Control Variables (expected signs are in parentheses)	
LOGASSET (+)	Natural logarithm of total assets (Liao, et al., 2015).
ROA (+)	Firm's profitability measured by net income to total assets (Waddock and Graves, 1997).
LEV (-)	Firm's leverage measured by total liability to total assets (Brown et al., 2006).
BODSIZE (+)	The total number of directors serving on the board (Rao and Tilt, 2016).
BODMEET (+)	The total number of board meetings during the year (Gul and Leung, 2004).
CEODUAL (-)	Dummy variable equals 1 if the company operates with the same person as CEO and chairman at the same time, and otherwise 0 (Gul and Leung, 2004).
INDCHAIR (+)	Dummy variable equals 1 if the Chairman of the board is an independent director, and 0 otherwise (Gul and Leung, 2004).
INDSENS (+/-)	Dummy variable equals 1 for industry-sensitive firms and 0 otherwise. Industry-sensitive SIC codes in the samples as 1,000-1,099 (Metal Mining), 1,200-1,399 (Coal Mining and Oil and Gas Exploration), 2,600-2,699 (Paper and Pulp mill), 2,810-3,099 (Chemical, Pharmaceuticals and Plastic Manufacturing), 3,300-3,350 (Iron and Steel Manufacturing) and 4,910-4,999 (Electricity, Gas and Waste Water), and 0 otherwise.

Table 1: Sample Selection

Initial Sample (Year 2001 - 2015)	7, 490
Less: Missing Financial Accounting and Corporate Governance information	7,160
Total available firm-year observations for analysis	330

Table 2: Panel A: Descriptive Statistics

Variable	***n***	***Mean***	***S.D.***	***Min***	***0.25***	***Mdn***	***0.75***	***Max***
LN_ENVR	330	1.42	0.76	0	0.88	1.46	1.97	3.42
ENVR_TA	330	0.01	0.02	0	0.01	0.03	0.04	0.07
INDDIR	330	0.53	0.30	0	0.36	0.56	0.75	1
FEMBOD	330	0.12	0.10	0	0	0.13	0.2	0.44
ENVRCOMM	330	0.22	0.42	0	0	0	0	1
BODSIZE	330	13.12	4.25	5	10	12	16	33
BODMEET	330	9.16	3.74	3	6	8	11	26
CEODUAL	330	0.22	0.42	0	0	0	0	1
INDCHAIR	330	0.35	0.48	0	0	0	1	1
ESG_BONUS_CEO	330	0.22	0.42	0	0	0	0	1
LOGASSET	330	4.37	0.69	0	3.91	4.33	4.79	6.54
ROA	330	0.05	0.05	-0.38	0.02	0.04	0.06	0.27
LEV	330	0.31	0.15	0	0.20	0.30	0.40	0.70

Table 2: Panel B: Correlation Matrix

	LN_ENVR	*ENVR_TA*	*INDDIR*	*FEMBOD*	*CSRCOMM*	*BODSIZE*	*BODMEET*	*CEODUAL*	*INDCHAIR*	*ESG_BONUS*	*LOGASSET*	*ROA*	*LEV*
LN_ENVR	1												
ENVR_TA	0.46***	1											
INDDIR	0.09**	0.04**	1										
FEMBOD	0.39***	0.20***	0.17***	1									
ENVRCOMM	0.35***	0.13***	0.02	0.09*	1								
BODSIZE	0.13***	0.04**	-0.47***	-0.21***	0.09**	1							
BODMEET	-0.13***	-0.08**	0.33***	-0.03*	0.07	-0.23***	1						
CEODUAL	-0.02	-0.05	-0.02	-0.02	0.14***	0.12***	0.04	1					
INDCHAIR	-0.02	-0.05	0.48***	0.16***	-0.04	-0.31***	0.04	-0.44***	1				
ESG_BONUS_CEO	0.39***	0.12***	-0.03	0.22***	0.24***	0.06	-0.09**	-0.06	0.03	1			
LOGASSET	0.35***	-0.09**	0.02	0.06*	0.22***	0.45***	0.15***	0.06*	-0.12**	0.17***	1		
ROA	0.07***	0.02**	0.01	0.07*	-0.06*	-0.20***	-0.05	-0.08**	0.18***	-0.13***	-0.28***	1	
LEV	0.02*	-0.09**	0.00	-0.06	0.05	0.02	0.14***	0.20***	-0.19***	0.01	0.08***	-0.22***	1

Notes: t-statistics in parentheses and *** p<0.01, ** p<0.05, * p<0.1

Table 2: Panel C:
Mean-difference Test

Variables	ENVR = 1 N = 250	ENVR = 0 N = 80	Mean difference (t-statistic)
INDDIR	0.55	0.48	0.06*** (3.54)
FEMBOD	0.17	0.11	0.06*** (4.12)
ENVRCOMM	0.28	0.16	0.12*** (3.51)
BODSIZE	15.51	9.21	6.30*** (7.94)
BODMEET	9.15	7.85	1.30** (1.99)
CEODUAL	0.26	0.21	0.05 (0.99)
INDCHAIR	0.39	0.31	0.08* (1.71)
ESG_BONUS_CEO	0.59	0.20	0.39*** (7.42)
LOGASSET	4.72	4.29	0.47*** (6.13)
ROA	0.04	0.02	0.02* (1.87)
LEV	30.12	27.02	3.09* (1.77)

Notes: t-statistics in parentheses and *** p<0.01, ** p<0.05, * p<0.1

Variance Inflation Factor (VIF) Test

Variable	VIF	1/VIF
INDDIR	3.55	0.28
FEMBOD	1.74	0.58
ENVRCOMM	1.65	0.61
BODSIZE	3.80	0.26
BODMEET	2.37	0.42
CEODUAL	2.69	0.37
INDCHAIR	3.49	0.29
ESG_BONUS_CEO	1.73	0.58
LOGASSET	3.03	0.33
ROA	2.55	0.39
LEV	2.04	0.49

Table 3: Regression Results

VARIABLES	(1) *LN_ENVR*	(2) *LN_ENVR*	(3) *LN_ENVR*	(4) *LN_ENVR*	(5) *LN_ENVR*	(6) *ENVR_TA*	(7) *ENVR_TA*	(8) *ENVR_TA*	(9) *ENVR_TA*	(10) *ENVR_TA*
INDDIR	0.671***				0.710***	0.0115***				0.010***
	(2.93)				(3.25)	(4.759)				(4.26)
FEMBOD		2.264***			1.959***		0.016***			0.011**
		(5.619)			(4.91)		(3.628)			(2.67)
ENVRCOMM			0.438***		0.270***			0.004**		0.004**
			(4.96)		(3.25)			(1.96)		(2.01)
ESG_BONUS_CEO				0.474***	0.395***				0.003*	0.002*
				(5.74)	(4.93)				(1.89)	(1.73)
BODSIZE	-0.019	-0.0131	-0.038**	-0.025*	0.002	0.002	0.001	-0.001	-0.003	0.002*
	(-1.15)	(-0.905)	(-2.49)	(-1.69)	(0.10)	(1.10)	(0.69)	(-0.55)	(-0.21)	(1.70)
BODMEET	-0.032**	-0.0191	-0.033**	-0.026**	-0.018	0.004	0.002	0.001	0.001	0.001
	(-2.40)	(-1.533)	(-2.51)	(-2.01)	(-1.49)	(0.657)	(0.84)	(0.20)	(0.31)	(0.80)
CEODUAL	0.145	0.106	0.023	0.111	0.046	0.001	0.002	0.002	0.003	0.002
	(1.31)	(1.048)	(0.21)	(1.04)	(0.47)	(0.435)	(0.33)	(0.109)	(0.34)	(0.26)
INDCHAIR	0.0435*	0.205**	0.161	0.196*	0.059	-0.002*	0.003	0.001	-0.001	-0.002
	(1.953)	(2.039)	(1.49)	(1.85)	(0.59)	(-1.69)	(0.09)	(-0.01)	(-0.11)	(-1.44)
LOGASSET	0.436***	0.366***	0.441***	0.444***	0.254***	-0.003***	-0.002***	-0.002**	-0.003***	-0.004***
	(5.69)	(5.677)	(6.28)	(6.48)	(3.60)	(-4.295)	(-3.26)	(-2.13)	(-3.74)	(-4.94)
ROA	-0.282	-0.524	0.006	-0.251	-0.375	0.012	-0.004	0.01	0.009	0.009
	(-0.31)	(-0.633)	(0.02)	(-0.27)	(-0.42)	(1.26)	(-0.45)	(1.06)	(0.95)	(1.02)
LEV	0.003	0.00513*	0.005	0.006**	0.003	-0.001	-1.602	-0.001	-0.001	-0.001
	(0.93)	(1.879)	(1.28)	(2.01)	(1.20)	(-1.48)	(-0.69)	(-0.74)	(-0.52)	(-1.42)
Constant	0.993	1.020	1.197*	1.27*	0.693	0.070***	0.089***	0.206***	0.157**	0.017***
	(1.480)	(1.562)	(1.786)	(1.85)	(1.09)	(3.38)	(3.14)	(2.99)	(2.20)	(2.38)
YEAR	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*
INDUSTRY	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*
COUNTRY	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*
Observations	330	330	330	330	330	330	330	330	330	330
R-squared	0.479	0.592	0.503	0.583	0.592	0.226	0.218	0.288	0.296	0.253

Notes: t-statistics in parentheses and *** p<0.01, ** p<0.05, * p<0.1

Table 4: Additional Analyses

	Change Analysis	***Non-profitable firm***	***An alternative measure of a female director***	***Tokenism***	***Industry sensitivity***
VARIABLES	ENVRCHNG_TA	LN_ENVR	LN_ENVR *FEMBOD = # of female directors on a board*	LN_ENVR *FEMBOD>= 2 female directors on a board*	LN_ENVR
INDDIR	0.0120*	0.665	-	-	0.623***
	(1.936)	(1.183)			(3.022)
FEMBOD	0.0194**	1.756***	2.655***	0.149***	2.078***
	(2.297)	(4.256)	(3.313)	(3.374)	(5.049)
ENVRCOMM	1.6705*	0.298	-	-	0.244***
	(1.7397)	(1.496)			(2.989)
ESG_BONUS_CEO	0.00785*	0.337***	-	-	0.460***
	(1.922)	(4.074)			(5.643)
BODSIZE	9.1905	-0.0411	-0.0031	-0.0034	0.0599
	(1.144)	(-0.274)	(-0.139)	(-0.152)	(0.0429)
BODMEET	6.9805	-0.0171	-0.0342*	-0.0257	-0.0142
	(1.101)	(-1.309)	(-1.798)	(-1.52)	(-1.263)
CEODUAL	-0.0439	0.0826	0.1577	0.0471	0.154
	(-0.869)	(0.811)	(1.121)	(0.342)	(1.629)
INDCHAIR	0.00499	0.0971	0.2218*	-0.044	-0.0753
	(0.887)	(0.900)	(1.699)	(-0.329)	(-0.769)
LOGASSET	-0.0454	0.295***	0.4567***	0.2441**	0.216***
	(-1.070)	(3.571)	(4.291)	(2.415)	(3.330)
ROA	0.0286	-1.453	-0.3267	-0.617	-0.0494
	(0.648)	(-1.355)	(-0.23)	(-0.451)	(-0.706)
LEV	4.7906	0.0250	0.0246	-0.0037	0.0178
	(0.339)	(0.873)	(0.363)	(-0.105)	(0.782)
INDSENS	-	-	-	-	0.400***
					(5.637)
Constant	-0.0591	0.768	0.3082	0.7945	0.126
	(-0.178)	(1.158)	(0.361)	(1.009)	(0.194)
YEAR	*YES*	*NO*	*YES*	*YES*	*YES*
INDUSTRY	*YES*	*NO*	*YES*	*YES*	-
COUNTRY	*YES*	*NO*	*YES*	*NO*	*YES*
Observations	260	38	330	76	330
R-squared	0.105	0.469	0.548	0.593	0.570

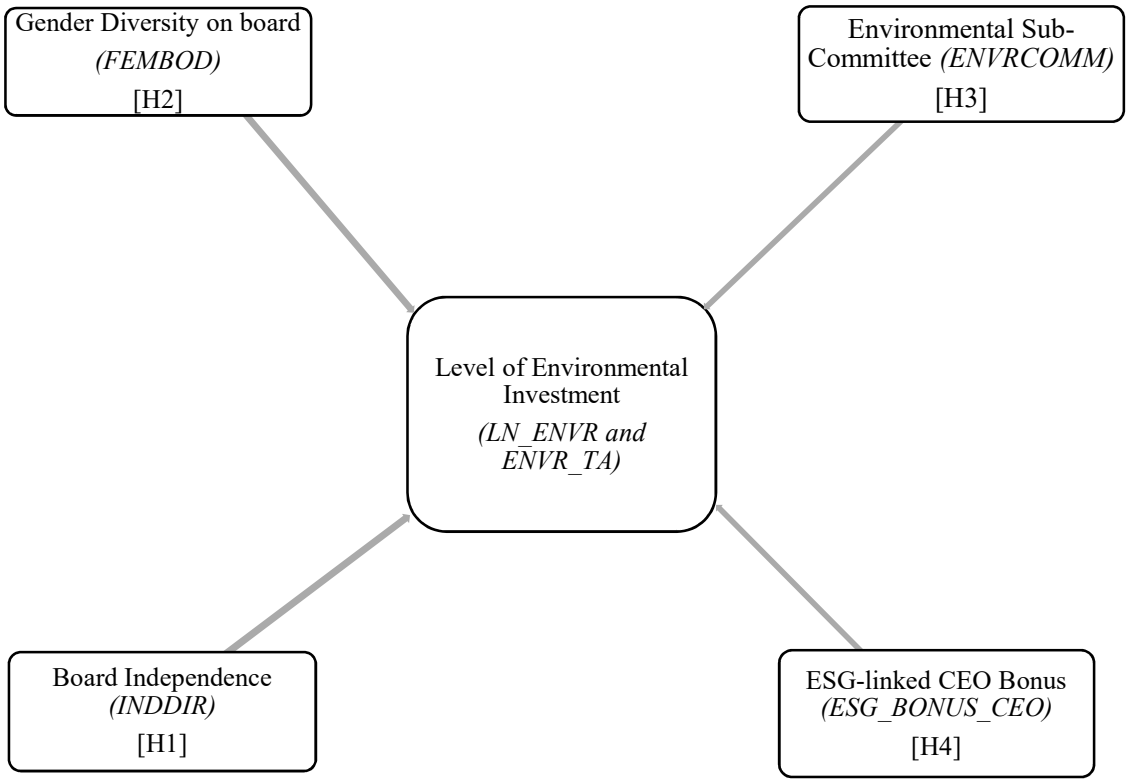
Notes: t-statistics in parentheses and *** p<0.01, ** p<0.05, * p<0.10

Table 5: Additional Analyses

	Propensity Score Matching		***Consequences of ESG bonus***		***Consequences of forming ENVRCOMM***	
VARIABLES	*LN_ENVR*	*ENVR_TA*	*LN_ENVR$_{(t+1)}$*	*ENVR_TA$_{(t+1)}$*	*LN_ENVR$_{(t+1)}$*	*ENVR_TA$_{(t+1)}$*
INDDIR	0.321***	0.011***	-	-		-
	(2.99)	(3.15)				
FEMBOD	1.534**	0.009*	-	-		-
	(2.54)	(1.86)				
ENVRCOMM	0.364*	0.041***	-	-	0.469***	0.031***
	(1.93)	(3.36)			(4.76)	(3.29)
ESG_BONUS_CEO	0.169*	0.003**	0.449***	0.004**	-	-
	(1.84)	(2.25)	(4.77)	(2.17)		
BODSIZE	0.002	-0.002	-0.025**	-0.009	-0.032**	-0.001
	(1.01)	(-1.47)	(-2.00)	(-1.56)	(-2.36)	(-0.55)
BODMEET	0.9805	-0.035	-0.023**	-0.008	-0.347***	0.001
	(1.101)	(-0.77)	(-2.12)	(-1.15)	(-3.54)	(0.09)
CEODUAL	-0.074	-0.002**	0.127	0.067*	0.118*	0.002
	(-1.247)	(-2.01)	(1.49)	(1.81)	(1.69)	(0.58)
INDCHAIR	-0.325*	-0.005**	-0.009	-0.001*	0.022	0.012
	(-1.91)	(-2.39)	(-0.12)	(1.89)	(0.26)	(1.10)
LOGASSET	0.198**	0.213***	0.489***	0.051***	0.518***	0.013**
	(2.46)	(4.99)	(7.87)	(3.14)	(8.52)	(2.08)
ROA	0.087**	0.052	-0.563**	0.024	-0.931	-0.008
	(2.79)	(3.40)	(-2.98)	(1.45)	(-1.13)	(-1.02)
LEV	-0.014**	0.025***	0.004	0.006	0.002	-0.004*
	(-2.00)	(4.26)	(1.31)	(0.78)	(0.59)	(-1.68)
Constant	-0.0215	0.164	0.97	0.941	1.00	0.091
	(-0.142)	(1.151)	(1.47)	(1.38)	(1.14)	(1.42)
YEAR	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*
INDUSTRY	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*
COUNTRY	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*
Observations	140	140	244	244	244	244
R-squared	0.453	0.424	0.432	0.164	0.492	0.174

Notes: t-statistics in parentheses and *** p<0.01, ** p<0.05, * p<0.10

Figure 1: Corporate Governance Components and Environmental Investment



Control for Firm-level characteristics and corporate governance features: Firm size (*LOGASSET*), return on assets (*ROA*), size of board (*BODSIZE*), board meeting frequency (*BODMEET*), CEO duality (*CEODUAL*), independent Chair on board (*INDCHAIR*), industry, year

Figure 2A: Country-wise Environmental Investment

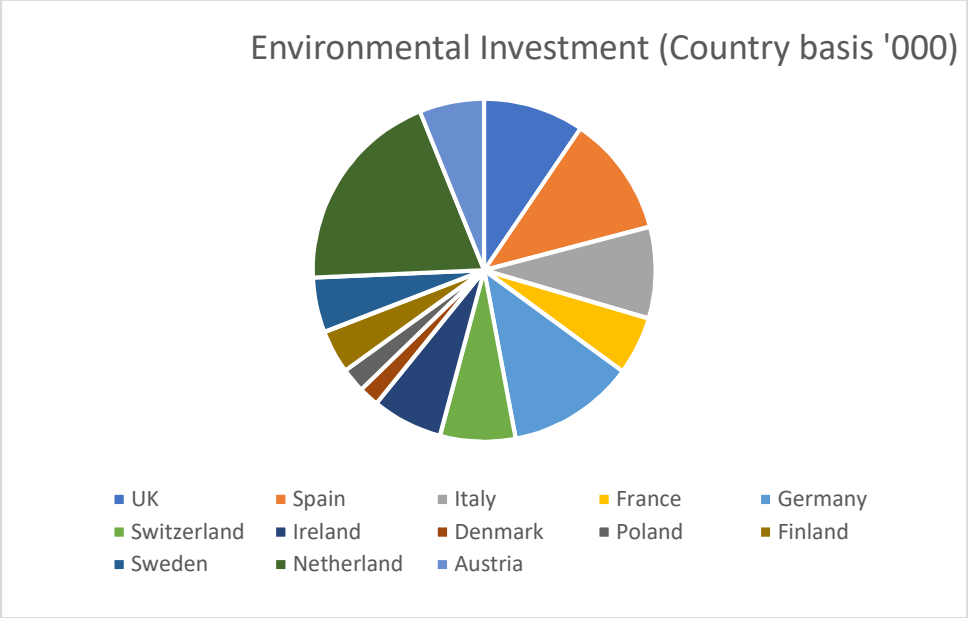


Figure 2B: Yearly Environmental Investment