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The Relationship between Environmental Reporting and Corporate Governance: Empirical Evidence from Pakistan

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Abstract

The main purpose of the present research is to empirically scrutinize the relationship between corporate governance (CG) characteristics and environmental reporting (ER) (a component of corporate social responsibility) of firms in Pakistan, through the lens of stakeholder and agency theory. The annual reports of 50 non-financial companies listed on Pakistan Stock Exchange (PSX) for the years 2014–2015 are content analyzed to compute the companies' environmental reporting practices. A multifactor model comprising of six elements of CG, i.e. board size, board independence, CEO duality, audit committee independence, proportion of female directors on board and institutional investors is used to assess the impact of CG elements on companies' environmental reporting initiatives. The results revealed that larger board size, higher proportion of independent non-executive directors on the board, partition of the dual role of chairman and CEO and institutional ownership is associated with greater environmental reporting. The results are valuable to both academics and policy makers in Pakistan.

Keywords: corporate governance, corporate social responsibility, environmental reporting, agency theory, stakeholder theory, Pakistan

1. Introduction

There is an increasing tendency for organizations worldwide to disseminate information regarding their social and environmental measures [1]. The concept of corporate environmental responsibility has gained considerable attention as a result of growing concern of public over the sustainability of natural environment. This concern has become particularly

noticeable over the past four decades [2]. In addition the concept of Triple Bottom Line Reporting (i.e. reporting regarding economic, environmental and social activities) introduced by Elkington [3] during the mid-1990s and global reporting initiative in 2002 gained substantial attention and has recommended certain guidelines on three dimensions of corporate accountability and responsibility, i.e. economic responsibility, social responsibility and environmental responsibility.

Parallel to this, corporate governance has enormously engrossed attention in recent years. It is generally emphasized that sound corporate governance is associated with enhanced transparency, accountability and plausible disclosure [4–7]. Agency theory and other corporate governance guidelines recommend a sound corporate governance structure for an effective and transparent disclosure mechanism about the corporations.

Moreover, the notion of sustainable development stipulates firms to be accountable not only financially or economically but to be sound and reliable socially and environmentally [8]. The strong connection between corporate governance mechanisms and the level of voluntary disclosure has been reported by the authors in [9–17]. Likewise, the authors in [18–22] documented a significant connection between corporate social responsibility disclosure and determinants of corporate governance. Whereas the authors in [2, 23–26] have acknowledged that sound corporate governance is associated with enhanced environmental disclosure practices.

The literature suggests diverging views regarding association between corporate governance and information disclosure. Studies conducted by the authors in [21, 22, 25, 27] suggested that larger board leads to more efficient reporting system. On the contrary, the authors in [19, 23] found a lack of association between board size and environmental reporting. In addition, the authors in [10, 17] suggested a need for a separate leadership structure for enhanced transparency and disclosure whereas, Ho and Wong [9] found a lack of relationship between the nondual leadership structure and the level of corporate reporting.

The authors in [14, 20, 25] found a positive association between board independence and environmental reporting. Likewise, the authors in [22, 25] endorsed that female directors exhibit socially responsible behavior and firms with more female directors tend to disclose more information.

Audit committee independence is also documented to be positively associated with corporate disclosure practices by Oscar and Juliet [26]. On the other hand, Alhazaimah et al. [16] found no link between audit committee independence and voluntary disclosure. For institutional ownership, the authors in [12, 25] reported a positive relationship between institutional ownership and environmental reporting. On the contrary, Alhazaimah et al. [16] argued that effectiveness of board is reduced due to the presence of institutional investors.

CSR has been well examined in Pakistan. The prior studies support the notion that sound CSR practices improve the financial performance of firm [28–32] and corporate image [33–35]. Likewise, studies conducted by the authors in [20–22] documented a substantial association between CG and level of corporate disclosure, but so far limited empirical work has been carried out to analyze whether this also relates to environmental reporting. The key motivation

of the current study is to fill up the gap by investigating the impact of corporate governance elements on the environmental information disclosure of the companies listed on Pakistan Stock Exchange (PSX). The present study is expected to make noteworthy contribution to the existing accounting literature by imparting updated information on the extent of environmental reporting practices in Pakistan and by presenting empirical evidence on the relationship between corporate governance characteristics and environmental reporting in the annual reports of 50 companies listed on PSX.

The findings suggest a positive association between board size and environmental reporting as larger board characterized by more qualified individuals acquires an efficient reporting system including ER. It is also found that independent directors effectively monitor board activities, stimulate autonomy within board and are positively associated with environmental disclosure practices. Likewise, separate leadership structure enhances the efficiency of board in monitoring management activities and ensures high level of transparency. Finally the study proves that institutional investors actively voice their concern over the firm's strategies and board governance and compel management to reveal more information regarding environmental activities.

After the introduction, the rest of this chapter is arranged as follows. Section 2 discusses the corporate governance and environmental reporting nexus. Section 3 presents the literature review and explains the hypotheses development. Section 4 shows in detail the research methodology followed by the results of the empirical analysis to test the stated hypotheses in Section 5. Finally, Section 6 presents the conclusion, implications, limitations and areas for future research.

2. Corporate governance and environmental reporting

"Environment Reporting" offers an opportunity for firms to apprise stakeholders that their corporate operations and efforts are environmental friendly. Environmental reporting should be embraced by corporation as an opportunity rather than an impediment to the growth of business. However, it is a real challenge in a country like Pakistan, where pervasive control and command systems invade the governance of country. Regulatory framework often tends to target the disciplinary behavior of corporations, instead of providing them with a facilitating environment for better compliance on ecological and social standards. Sustainability reporting also known as triple bottom-line reporting, corporate social responsibility reporting or non-financial reporting addresses the ability of organizations to formally reveal information about their economic, social and environmental operations [36]. In this perspective, sustainable approach, i.e. to fulfill the requirements of current generation without compromising the capacity of upcoming generations to fulfill their requirements is an emerging concern among the global community. In Pakistan, sustainability reporting of which environment reporting is a significant category is in its infancy but gradually growing.

Globalization is the process of economic integration of multinational and national companies. These include listing of companies at international and national stock exchanges. This cross

listing provides investors with opportunities to invest and earn economic gains originating from versatile interactions because of higher level of brain storming skills [37].

“Environmental reporting” has been described broadly as reporting by corporations regarding the environmental implications of their activities [38]. Environmental disclosure expands the responsibility of the firms beyond the conventional role of imparting financial information assuming the broad environmental responsibilities of the firms [39]. Manifesting effective corporate governance practices and maintaining sound environmental performance are among the key challenges faced by the organization to ensure its sustainability. In this context, environmental reporting can be reckoned as means of ascertaining effective corporate governance practices that incorporate transparency in its environmental practices. This rigorous operationalization of information disclosure in the environmental sphere is also attributed as “governance-by-disclosure” [40]. Companies in Pakistan and globally are under more public scrutiny than ever before and are obliged to disclose information regarding their environmental operations. Disclosure on environmental performance helps firms to gain stakeholder’s confidence, to evaluate potential risks involved in performing such activities and to moderate the impact of these activities on the environment. It considers impact of their operations on the surrounding environment and to reveal the results to multiple stakeholders such as employees, consumers, community, regulators, the media and shareholders which become critical for the long-lasting sustainability of the organizations [41].

Despite the variations in theoretical frameworks being endorsed, pertinent former literature from a broader spectrum has recognized that sound corporate governance is affiliated with enhanced level of transparency and plausible reporting [4]. Therefore, sound corporate governance practices are considered as accountability catalysts, reducing information asymmetry by ascertaining the disclosure needed for meeting the informational requirements of diverse stakeholders. The existing literature on disclosure of information provides evidence of number of theories supporting the disclosure of information by corporations. However, agency theory [42] and stakeholder theory [43] have dominated the explanation of corporate governance. Jensen and Meckling [42] described agency relationship as an agreement where one person (the agent) renders some services on behalf of the other party (the principal) and safeguards their interest. Certain decision making power may be delegated to agent as a reward of these services.

Stakeholder theory has a comprehensive dimension as compared to agency theory as it broadens the notion of principal to all concerned parties rather than just shareholders. This theory basically deals with the identification and appreciation of the association between the firm’s actions and its influence on various stakeholders [44]. With respect to stakeholder theory, the authors in [19, 45] argued that good corporate governance practices enhanced firm–stakeholder relationship by fostering corporate sustainability. Consistent with the stakeholder concept, environmental disclosure serves as a part of the discourse between the company and its stakeholders concerning various environmental dimensions [8, 44]. On the basis of above discussion and in the context of agency and stakeholder theory, the study asserts that level of satisfaction of stakeholders regarding environmental information is associated with greater accountability and transparency of the top management.

3. Literature review and development of hypotheses

The previous studies investigating the extent of corporate voluntary reporting practices are of the view that environmental reporting is a significant phenomenon employed by corporations and is influenced by many corporate governance and firm specific attributes. The present review is an endeavor to encircle the multiple determinants of environmental reporting and its relationship with corporate governance characteristics. Corporate governance characteristics are manifested and categorized into: (1) board characteristics namely the size of board, board composition, role duality and proportion of female directors; (2) board committee's characteristics computed by audit committee independence and (3) ownership structure computed by the percentage of institutional investors. Control variables employed in the present study are size of the firm, leverage and profitability. In the sub-sections below, we develop hypotheses relevant for CG characteristics.

3.1. Board size and environmental reporting

Board size plays a significant role in monitoring firm performance and is taken into consideration mainly from the perspective of agency theory. Agency theory advocates for the smaller board size and it is anticipated that smaller board enhances efficiency, results in better coordination and effectively monitors the management decisions concerning the information disclosure [46]. Prado-Lorenzo and Garcia-Sanchez [47] asserted that larger board is detrimental to governance efficiency. The literature also shows contrary school of thought regarding association between board size and information disclosure. According to Xie et al. [48] larger board is characterized by more qualified and knowledgeable individuals and acquires a more effective reporting procedure and enhanced level of voluntary disclosure including the environmental disclosure.

The authors in [49, 50] argued that larger boards are expected to be dominated by the CEO, result in poor communication, ineffective coordination and less decision-making. They suggested that boards having more than seven or eight representatives are likely to be ineffective. Yoshikawa and Phan [51] also emphasized that numerous hidden interactions and divergence of interest among board members made the larger boards less cohesive resulting in weak coordination. In addition, they elaborated that sometimes larger boards are purposely formed by CEOs to disperse the power in the boardroom by making the CEO a dominant figure and thus reduces the likelihood of integrated actions by board members. Parallel to the theoretical expectations the study conducted by Byard et al. [52] using a sample of 1279 firms over the years 2000–2002 found a negative association between board size and environmental reporting. Hence, from the perspective of agency theory it is hypothesized that the relationship between board size and environmental disclosure would be negative:

H₁: *The level of environmental reporting is negatively related to the board size.*

3.2. Board independence and environmental reporting

According to the agency theory [53] the presence of independent non-executive directors on the board effectively monitors the activities of company, stimulating objectivity and autonomy

within the board. Furthermore, the board independence reduces the conflicts of interests among the multiple shareholders and the management thus leading to the minimization of agency costs [19]. From the perspective of stakeholder theory, independent directors are seen as accountability mechanism [18], as they have responsibility for a wider variety of stakeholders [45, 47]. The 2013 Corporate Governance Code issued by Securities & Exchange Commission of Pakistan (SECP) requires all listed companies to have majority of independent non-executive directors on their board, thus facilitating the board to discharge its duties and responsibilities appropriately. Regarding the association between independence of board and CSR reporting [13–15, 21, 22, 54] empirically found a significant impact of the existence of non-executive independent managers on CSR disclosure.

According to Refs. [24, 25, 55] boards having more independent non-executive directors compel managers to take favorable decisions regarding the firm's environmental performance. Moreover, the firms demonstrating active environmental concern proved to have more independent directors on their boards. Therefore, we hypothesize a significant positive relationship between the proportion of independent non-executive directors on the board and the extent of environmental reporting:

H₂: *The level of environmental reporting is positively associated with the proportion of independent non-executive directors on the board.*

3.3. Practice of separation between the chief executive officer and chairman of the board and environmental reporting

Role of CEO has been incorporated as one of the significant factor influencing the corporate environmental and social reporting by Adams [56]. It is believed that the "CEO duality" or "dominant personality phenomenon", i.e. the positions of CEO and the chairman held by the same person can lessen the efficiency of the board in screening the management activities [10, 57]. The 2013 Corporate Governance Code released by the SECP also recommends the separate role between the CEO and chairman of the board. The authors in [42, 58, 59] proposed discrete leadership structure on the basis of agency theory. Hence, it could be assumed that the board independence attained by separate leadership framework will direct to a better and effective environmental and social reporting about the companies, thus protecting interest of the shareholders.

The literature shows contrary results with regard to the practice of separation between the executive manager and the chairman of the board and the level of reporting. Furthermore, the authors in [9, 19, 60] found no substantial association between the separate leadership structure and the level of reporting. Florackis and Ozkan [50] argued that the dual role endorses CEO entrenchment by decreasing monitoring efficacy of board. Haniffa and Cooke [10] found that role duality is linked with lesser voluntary disclosure. Consistent with the arguments, the authors in [17, 45, 52, 61] found a positive association between disclosure and separate leadership framework. Finally, it is anticipated that separate leadership structure will enhance the extent of environmental reporting by the firm:

H₃: *The level of environmental reporting is positively related to the practice of separation between the Chief Executive Officer (CEO) and chairman of the board.*

3.4. Proportion of female directors on the board and environmental reporting

Board diversity in terms of proportion of women on the board has been documented as having a substantial effect on firm performance and disclosure of both financial and nonfinancial matters [62]. Female directors are more diligent, committed, philanthropically driven and make effective contribution to the firm performance [25]. Ballesteros et al. [63] also documented a positive relationship between the proportion of female directors and level of CSR disclosure. Female directors exhibit more philanthropic concern as compared to men [22, 64] enhancing information transparency and accountability [65].

In line with stakeholder theory, the authors in [66, 67] endorsed the view that women are socially oriented than men, develop effective stakeholder management and increase the board independence and thus social responsible behavior [45]. Furthermore, higher percentage of female directors on the board leads to the board independence and thus increases the probability of providing enhanced corporate environmental reporting [25]. On the basis of the above arguments about the monitoring potential of female directors and rationale offered by stakeholder theory, it can be asserted that female director's commitment, independence, thoughtfulness and other attributes enable them to actively participate in corporate decision making concerning disclosure practices. Therefore, we hypothesized a significant positive relationship between the proportion of female directors on the board and the level of environmental reporting:

H₄: *The level of environmental reporting is positively related to the proportion of female directors on the board.*

3.5. Audit committee independence and environmental reporting

The main purpose of board committees is to monitor the audit process, the auditor's independence, the internal control and accounting system, the nomination and remuneration of the board directors, thus ensuring a continuous communication between the external auditor and the company's board [68]. Agency theory advocates the audit committee as an instrument of mitigating agency costs.

According to Ref. [69], the existence of an audit committee offers an ancillary internal control mechanism, likely to enhance the performance of a firm. More appreciably, audit committee with independent members empowers the committee to discharge its responsibilities impartially and thus substantially contribute to the committee's effectiveness [9]. According to the 2013 Corporate Governance Code issued by the SECP, all listed companies in Pakistan are required to have an independent director as the chairman of board audit committee. There is dearth of empirical support regarding the relationship between environmental reporting practices of firms and independence of audit committee.

Aburaya [70] found a positive relationship association between audit committee independence and the reporting quality of certain environmental specific categories such as policies concerning environment, adherence with environmental legislations and other environmental information. Nevertheless, in the context of voluntary disclosure [9, 12, 55, 71–73] documented the presence of a positive link between audit committee and the incurring independence and the extent of voluntary reporting exhibited by the companies. They argued that board committees determine good corporate disclosure of information. In conclusion, the existence and independence of audit committee improves the transparency of corporate boards and is expected to guarantee that a company fulfills its social commitment including the environmental commitment. Hence, it is hypothesized that the relationship between the presence and independence of audit committee and environmental disclosure will be positive:

H₅: *The level of environmental reporting is positively related to the existence and independence of audit committee.*

3.6. Institutional ownership (ownership concentration) and environmental reporting

Ownership structure whether it is dispersed or concentrated is considered to be an important attribute of corporate governance [74]. Institutional ownership is the form of ownership concentration computed as the percentage of shares held by institutional shareholders comprising banks, pension funds, endowment funds, mutual funds and insurance companies, etc. [75]. It is generally argued that the efficacy and effectiveness of board is reduced due to the presence of institutional investors. Jensen and Meckling [42] argued that separation of ownership and control result in increasing demand of information disclosure by firms. Hence, it could be assumed that institutional shareholding decreases the probability of providing enhanced corporate environmental reporting.

Investors having larger stake in the firm confine the decision making power of the board, which reduces the board autonomy and activism [42, 75] whereas, the authors in [14, 54, 61, 73] found no substantial association between the institutional ownership and the level of reporting. Some studies have found a negative association between institutional ownership and corporate disclosures [74, 16]. According to the agency theory, institutional investors have strong incentives to monitor corporate disclosure practices and influence corporate values [12]. Consistent with the stakeholder theory, institutional investors demand more accountability and transparency and are positively associated with corporate voluntary disclosure practices including environmental disclosure [76]. In line with the theoretical expectations, Rao et al. [25] documented a positive association between institutional ownership and environmental reporting. They suggested that institutional investors are active owners and influence management and corporate value due to their large ownership stake in the firms. Based on the above discussion and rationale provided by agency and stakeholder theory, it could be anticipated that institutional shareholdings increase the likelihood of providing enhanced corporate environmental disclosure.

H₆: *The level of environmental reporting is positively related to the ownership concentration.*

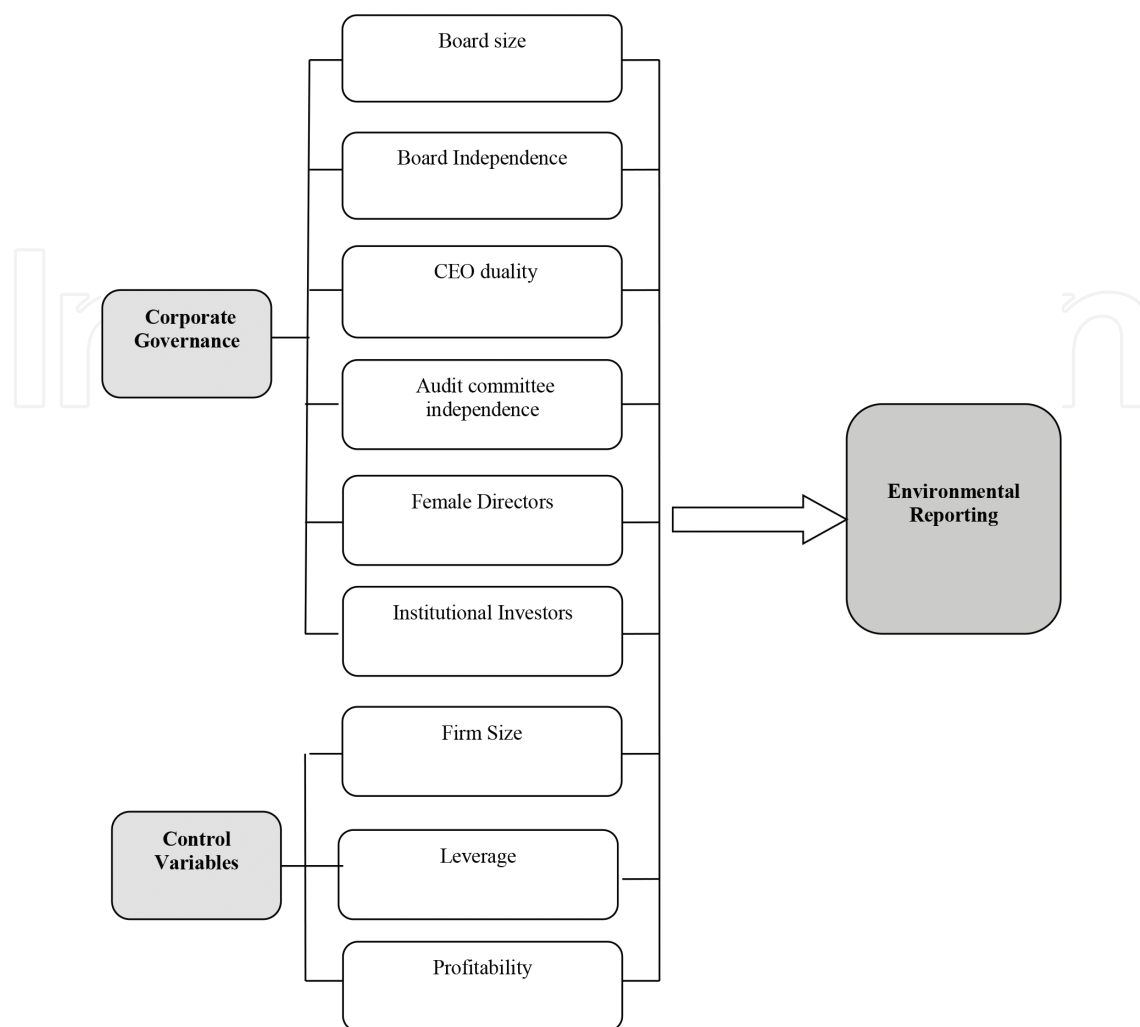


Figure 1. Conceptual framework.

The conceptual framework for the study shows the role of internal, external and control variables in affecting environmental reporting practices in the firm (**Figure 1**).

4. Methodology

The sample consists of 50 nonfinancial firms listed at Pakistan Stock Exchange that may affect the environment; forestry; the extractive and manufacture industry; food industry; construction industry; automobile industry; chemical industry; production and distribution of electricity, oil, gas and water; engineering and transport and storage. Fifty companies are selected, using proportionate stratified random sampling technique from 19 sectors.

The annual report is the main source of data being utilized in the recent study to analyze the environmental reporting practices of firms listed on Pakistan Stock Exchange covering a period of 2014–2015. The selected time span is not an independent period compared to systematic factors in the economy (for details see Appendix 2 showing the major macro-economic

factors) and no major economic event took place during this period. The reports have been used as the fundamental medium of reporting social and environmental activities of firms as evident from prior studies performed by the authors in [54, 61, 73].

4.1. Variables relevant for the study

4.1.1. Dependent variable (environmental reporting index (ERI))

The dependent variable, environmental reporting is computed by employing content analysis of the annual reports of the firms listed at PSX. Content analysis of environmental disclosure requires the development of categorization pattern and then deciding a set of rules for coding process, estimating and documenting the information being analyzed. First, a preliminary checklist containing anticipated environmental information items is organized. The checklist is then attuned to fit with the operational measures as documented by the guiding principles on environmental performance indicators and implication of the Global Reporting Initiative (GRI) that assist ascertaining environmental reporting in the annual reports.

Consequently, the final checklist is reckoned viable and rigorous in portraying environmental reporting practices in the annual and sustainability reports of Pakistani firms. The final checklist comprises of 60 environmental information items classified into seven broadly identified categories, namely: (1) Environmental philosophy and strategy (7 items); (2) Environmental summary (6 items); (3) Initiatives concerning environmental reporting (6 items); (4) Governance structure and management system (6 item); (5) Credibility (9 items); (6) Environmental performance Indicators (16 items) and (7) Environmental spending (10 items). Then, a coding method is used to allocate environmental information items in the annual reports to that of the scoring sheet/checklist employing premeditated decision rules.

Unweighted disclosure index technique is employed to compute the level of environmental reporting where the reporting of an item in the annual reports is coded (1) and non-disclosure is coded as (0). The disclosure model (unweighted environmental disclosure) thus computes the total disclosure (TD) score for a company as additive as follows:

$$ERI = \sum_{i=1}^{60} di/nj \tag{1}$$

where di is 1 if item is disclosed and 0 if item is not disclosed and nj is the maximum number of items for firms ($nj \leq 60$). To compute specific firm score, total score awarded to a firm is divided by the highest possible score and then multiplied by 100 to get the percentage scores. The maximum possible score that a firm could get is 60 because the numbers of reporting items incorporating all the seven broad categories form a total score of 60. The average score is calculated as the percentage of the number of firms reporting a specific item to the total number of items.

4.1.2. Independent variables

Table 1 represents the details about the independent and control variables employed in the current study and techniques used for their operationalization.

Variables	Operational definitions	Symbol	Expected sign
<i>Independent variables</i>			
Board size	Total number of directors on the board	BS	–ive
Board independence	Percentage of independent non-executive directors to the total directors	BI	+ive
CEO duality	Dummy variable equal to 1 if CEO is also the chairman, 0 if not	DUAL	–ive
Audit committee independence	Proportion of independent non-executive directors on the audit committee	ACI	+ive
Female directors	Proportion of female directors on the board	FEMDIR	+ive
Institutional ownership	Percentage of total shares held by institutional investors	INSINV	+ive
<i>Control variables</i>			
Firm size	Natural logarithm of total assets	SIZE	+ive
Leverage	Ratio of total debt to total equity	LEV	+ive
Profitability	Return on asset	ROA	+ive

Table 1. Details relevant for the independent variables used in this study.

5. Results and discussion

To test the nature of the relationships proposed in this study, following sets of analyses are performed. These include descriptive statistics, correlation analyses, multiple regression analyses, robustness tests including multicollinearity test and incremental regression analysis. The details of these tests are presented as follows.

5.1. Descriptive statistics and the correlation matrix

Table 2 depicts the descriptive statistics of different corporate governance attributes along with control variables investigated to analyze their impact on corporate environmental reporting system. The mean value for board independence which is computed by the percentage of independent non-executive directors to total number of directors on the board is 40%, demonstrating that 40% of the total board members are independent non-executive, aligned with the SECP Corporate Governance Code (2013). The mean value for board size is 8.58 reflecting that larger board has been a conventional practice among Pakistani firms. Moreover, the mean value for independence is 91.2% for the audit committee, imparting the relatively high degree of independence in audit committee. Meanwhile, the mean value for women representation on the board is only 6% with the maximum representation of around 33%. This shows that the firm's board does not comprise of many female members. Concerning the structure of ownership, it can be observed that the mean value for institutional ownership is 58% exhibiting the fact that institutional ownership represents the major form of block holdings. On the other hand, mean value for leverage and profitability ratio is 2.16 and 4.58% respectively.

Variables	Mean	Minimum	Maximum	Standard deviation
ERI	43.4	0.00	95.0	27.2
BS	8.58	6.00	15.0	1.93
BI	40.0	25.0	85.1	8.63
DUAL	0.08	0.00	1.00	0.27
ACI	91.2	33.3	100	15.1
FEMDIR	6.22	0.00	33.3	9.05
INSINV	58.1	0.02	100	32.8
LEV	2.16	0.05	7.79	1.94
ROA	4.58	-20.2	24.9	9.70

Table 2. Descriptive statistics.

Variables	ER1
BS	0.49**
BI	0.292*
DUAL	-0.284*
ACI	-0.027
FEMDIR	-0.06
INSINV	0.507**
LEV	0.316*
ROA	0.324*

*5% significance.

**1% significance.

Table 3. Pairwise correlation.

Some exploratory details about the components of the ERI and relevant score by each company are presented in Appendix 1.

5.2. Correlation analysis

Pairwise correlation coefficients exhibit relationship of corporate environmental reporting to all corporate governance attributes and firm specific variables used in the study and are presented in **Table 3**. Results indicate a positive association between the extent of environmental reporting and each of board size, independence of board, leverage, profitability and percentage of institutional investors whereas the CEO duality is negatively associated with the level of environmental reporting.

Variables	Predicted sign	Coefficients	t-statistics	Probability	VIF
C		-0.7616	-1.9955	0.0528	
BS	—	0.0324	1.8593	0.0703	1.34
BI	+	0.8537	2.6796	0.0106	1.13
DUAL	—	-0.1811	-1.8038	0.0788	1.13
ACI	+	-0.0401	-0.2231	0.8245	1.11
FEMDIR	+	0.1144	0.3795	0.7063	1.11
INSINV	—	0.3612	4.3243	0.0001	1.12
SIZE	+	0.0414	0.9315	0.3572	1.29
LEV	+	0.0334	2.2527	0.0298	1.25
ROA	+	0.0078	2.7889	0.0081	1.12
R ²	0.6369				
Adjusted R ²	0.5552				
D-W statistics	2.0229				
F-statistics	7.7963 & p = 0.000002				

Table 4. Multiple regression results using (ERI) as the dependent variable.

5.3. Multiple regressions analysis

The results by using multiple regression analysis presented in **Table 4** are explained as follows.

5.3.1. Environmental reporting and board size

The first hypothesis (H_1) proposed that board size is negatively related to the environmental reporting. Contrary to H_1 , the findings revealed a positive relationship between environmental reporting and the size of a board ($p = 0.070$). Hence H_1 is not sustained. The finding is coherent with various studies [21, 22, 25, 27, 61] who deduced a direct connection between the size of a board and the level of environmental reporting, advocating that larger board acquires the needed skills and incurs more efficient reporting system to ensure sound environmental disclosure.

The result implies that management of the firms needs to have an optimal board size having variety of members from national and multinational organization so that environmental reporting in these firms is sustained. The greater number of board members leads to have rigorous brainstorming and interchange of more ideas which results in economic integration of companies leading to higher globalization.

5.3.2. Environmental reporting and board independence

The second hypothesis (H_2) implies that the proportion of independent non-executive directors is positively and significantly linked with the extent of environmental reporting. The

results revealed a positive and substantial linkage between environmental reporting and board independence ($p = 0.010$). Therefore, H_2 is supported.

The results are in line with the stakeholder and agency theory argument that voluntary disclosure practices of the firms are more likely to improve with an increase in the percentage of independent non-executive directors. The outcome is in harmony with the inferences of many prior studies [20, 45, 63].

The result implies that the board independence (higher number of independent directors) from national and international organizations lead to independent thinking and incorporation of environmental friendly provisions in the firms. The management of the firms needs to have a higher number of independent directors resulting in higher financial integration and cross investment in the company leading to higher globalization and value for shareholders.

5.3.3. Environmental reporting and CEO duality

The third hypothesis (H_3) suggests a negative relationship between the level of environmental reporting and role duality. Outcome of the H_3 is in harmony with the agency theory ($p = 0.078$), endorsing that separate headship will bring about an improved social and environmental reporting related to the firms. The results of the study are in consonance with the stakeholder-agency theory stating that the separate leadership structure is liable to offer requisite checks and balances and can enhance the efficacy of the board in controlling the management's actions [58]. This reduces the probability of restraining information outflow and deterring unfavorable information/news from spreading to stakeholders. The result is coherent with [17, 45, 61].

The result implies that a single person holding both the positions is detrimental to the environmental friendly practices and its reporting in the firm. The management of the firms needs to use nondual leadership structure to improve on the environmental reporting as the single dominant person does not let the board members think properly leading to less economic integration and globalization.

5.3.4. Environmental reporting and proportion of female directors

The fourth hypothesis (H_4) suggests a positive association between the proportion of female directors on the board and the level of environmental reporting. Contrary to the expectation, the results of the model revealed the lack of any significant association among these variables ($p = 0.7063$).

5.3.5. Environmental reporting and audit committee independence

The fifth hypothesis (H_5) recommends a positive and a significant association between independence of audit committee and the level of environmental reporting. The audit committee independence appeared to have no significant association with environmental reporting ($p = 0.8245$) leading to the rejection of H_5 . The result is in line with previous evidence provided by the authors in [16, 24].

5.3.6. Environmental reporting and institutional ownership

The final result depicts that institutional investors have a positive and significant impact on environmental reporting ($p = 0.0001$) leading to the acceptance of H_6 . The finding is consistent with various studies [12, 25] who deduced a direct connection among institutional ownership and that of environmental reporting, advocating that institutional investors are active owners and influence management and corporate value due to their large ownership stake in the firms. The result shows a positive and constructive role by the blockholders leading to higher level of environmental reporting and economic freedom and globalization. The management of the firm needs to have a healthy relationship with the institutional shareholding so the level of environmental reporting in the firm is improved. The summary of the results for the hypotheses testing are presented in **Table 5**.

The results for the control variables suggest a considerable positive connection among environmental reporting and each of leverage and profitability. The positive connection between leverage and environmental reporting is reported by the authors in [12, 55]. The profitability is significant at 1% level of significance advocating that highly profitable firms disclose additional information regarding environmental activities in their annual reports. Results are consistent with the studies of [4, 10, 18] who deduced a significant positive connection between environmental reporting and profitability.

As discussed before, the robustness tests for the study include multicollinearity and incremental regression analysis. The values of VIF vary from 1.11 to 1.34 showing a lack of substantial multicollinearity problem in our analysis [77]. The results for the incremental regression suggest that removal of the institutional investors' fraction leads to substantial fall in the value for the R-Squared (from 63 to 46%). The outcome shows that percentage of institutional investors is the most significant independent variable in affecting the level of environmental disclosure. The other diagnostics of the model show that the value for the R-Squared is 0.636 which reveals that 63.6% of the variations in the dependent variable are explained by the independent variables included in the model.

Hypotheses	Status
H_1 : Board size negatively impacts the level of ER.	Rejected
H_2 : Board independence positively impacts the level of ER.	Accepted
H_3 : CEO duality negatively impacts the level of ER.	Accepted
H_4 : Higher percentage of women on the board positively impacts the level of ER.	Rejected
H_5 : Audit committee independence positively impacts the level of ER.	Rejected
H_6 : Institutional ownership positively impacts the level of ER.	Accepted

Table 5. Results for the hypotheses testing.

6. Concluding remarks, limitations and further scope of the study

The study primarily intends to scrutinize the association among the certain attributes of corporate governance and the environmental reporting practices of companies in Pakistan for a period of 2014–2015. The findings depicted a substantial connection among environmental reporting practices and attributes of corporate governance. The results highlighted that larger board size, higher proportion of nonexecutive independent directors, partition of the twin positions of the CEO & chairman and institutional ownership (ownership concentration) is related with enhanced environmental disclosure in Pakistan. The overall results supported the corresponding theoretical contention of agency theory and stakeholder theory that sound corporate governance practices serve as monitoring and accountability catalyst and eventually result in more environmental disclosure.

The results of the study suggest that the firms should use the highlighted instruments as powerful tools and be encouraged to produce climate change policy and environmental reports on regular basis to manifest their commitment to sustainable development. The limitations of the study suggest that a longitudinal research with large sample size and a relative analysis of Pakistan with developed market would offer more insights regarding the role of corporate governance practices in affecting environmental reporting.

A. Appendix 1

Overall extent of environmental reporting of firms.

S#		Number of firms reported	Percentage
A. Vision and strategy			
1	A declaration of firm environmental performance in CEO's message	31	62
2	A description of environmental philosophy, values, policies and environmental ethics	38	76
3	A narration of a proper managerial systems for environmental operations and risk	19	38
4	A declaration of the regular reviews and assessment of firm's environmental performance	17	34
5	Environmental standards or targets	37	74
6	An announcement of the measurable objectives regarding future environmental performance	25	50
7	An indication of specific innovations or latest technologies regarding environment	19	38

S#		Number of firms reported	Percentage
B. Environmental profile			
8	A comment regarding the firm's adherence with particular environmental principles or targets	26	52
9	Performance against environmental targets	25	50
10	Measures taken to monitor compliance with policy statement	21	42
11	A brief summary of the impact of firm's activities on environment	31	62
12	A review of how the firm's activities or products effect the surrounding environment	20	40
13	A comparative analysis of the environmental performance to the other industries	13	26
C. Environmental initiatives			
14	A proper statement of employees training sessions to create awareness on environmental issues	29	58
15	A response plan in emergency actions	39	78
16	Internal awards as recognition of environmental performance	8	16
17	Internal audits of firm's environmental actions	18	36
18	Environmental certification by internal body	18	36
19	Community participation or environmental donations	42	84
D. Governance structure & management systems			
20	Department or managerial position for environmental management or controlling pollution	21	42
21	Presence of CSR or environmental committee on the board	14	28
22	A set of principles for suppliers or customers concerning environmental practices	13	26
23	Stakeholder participation in deciding environmental strategies	25	50
24	Executive reward is allied with environmental conduct	0	0
25	Training sessions for raising environmental awareness	34	68
E. Credibility			
26	A declaration of an environmental/ sustainability report	16	32
27	Adherence GRI guiding principles	23	46
28	Independent and regular audits on environmental operations or environmental certification by third party	18	36
29	Certification of products in connection with environmental influence	27	54

S#		Number of firms reported	Percentage
30	Environmental recognition awards by external body or nomination in a sustainability catalog	19	38
31	Stakeholders participation in environmental reporting process	20	40
32	Involvement in voluntary activities regarding environment	43	86
33	Involvement in the operations of specific industry to enhance environmental performance	22	44
34	Involvement in other organizations to enhance environmental performance	31	62
F. Environmental performance indicators			
35	EPI regarding energy consumption or efficiency	34	68
36	EPI regarding water consumption or efficiency	24	48
37	EPI regarding greenhouse discharge	22	44
38	EPI regarding air discharge other than green house	23	46
39	EPI regarding toxic release inventory	19	38
40	EPI regarding additional discharges or emissions	15	30
41	EPI regarding waste management	34	68
42	EPI regarding biodiversity and resource conservation	30	60
43	EPI regarding impacts of industrial products on environment	20	40
44	EPI regarding compliance with environmental targets	13	26
45	Equipment for waste water treatment	25	50
46	Recycling of waste material	28	56
47	Land renovation and forestation plans	19	38
48	Pollution management of industrial operations	36	72
49	Preservation Anti-litter operations	20	40
50	Introduction of new production techniques to lessen pollution	24	48
G. Environmental spending			
51	A review of monetary savings from environment programs	0	0
52	Environmental Policy	7	14
53	Previous and current spending on effluence control facilities and apparatus	16	32
54	Previous and current operating expenses on effluence control apparatus and facilities	8	16

S#		Number of firms reported	Percentage
55	Future assessment of expense for effluence control apparatus and facilities	5	10
56	Funding for effluence control apparatus or facilities	34	68
57	Estimated pattern of potential environmental spending	7	14
58	Estimation of contingent obligations	0	0
59	Expenditure on R& D, technologies or innovations to improve environmental efficiency	24	48
60	Penalties regarding environmental concerns	0	0

Environmental reporting items not reported by any sample company.

SI no.	Environmental reporting items
24	Executive reward is allied with environmental conduct
51	A review of monetary savings from environment program
58	Estimation of contingent obligations
60	Penalties regarding environmental affairs

Ranking of companies on the basis of environmental disclosure scores.

S#	Company name	No. of items disclosed	%	Ranking
1	K-Electric Limited	57	95.00	1
2	I.C.I. Pakistan Limited	53	88.33	2
3	Murree Brewery Company Limited	51	85.00	3
4	Atlas Honda Limited	50	83.33	4
5	Fauji Fertilizer Company Limited	49	81.67	5
6	Engro Fertilizers Limited	48	80.00	6
7	Siemens Pakistan Engineering Co. Limited	47	78.33	7
8	GlaxoSmithKline (Pakistan) Limited	46	76.67	8
9	Pakistan Refinery Limited	45	75.00	9

S#	Company name	No. of items disclosed	%	Ranking
10	Pakistan International Airlines Corporation	45	75.00	9
11	Unilever Pakistan Foods Limited	44	73.33	11
12	Pakistan Tobacco Company Limited	43	71.67	12
13	Nestle Pakistan Limited	42	70.00	13
14	Sui Northern Gas Pipelines Limited	40	66.67	14
15	Engro Foods Limited	40	66.67	14
16	Hub Power Company Limited	36	60.00	16
17	Pakistan National Shipping Corporation Limited	34	56.67	17
18	Maple Leaf Cement Factory Limited	32	53.33	18
19	Fecto Cement Limited	31	51.67	19
20	Service Industries Limited	30	50.00	20
21	Treet Corporation Limited	29	48.33	21
22	Kohinoor Industries Limited	28	46.67	22
23	Gul Ahmed Textile Mills Limited	27	45.00	23
24	Nishat Mills Limited	26	43.33	24
25	Pakistan Cables Limited	25	41.67	25
26	Bata Pakistan Limited	24	40.00	26
27	Bannu Woolen Mills Limited	23	38.33	27
28	Millat Tractors Limited	23	38.33	27
29	Oil and Gas Development Company Limited	42	70.00	29
30	Dawood Hercules Corporation Limited	21	35.00	30
31	Pakistan Services Limited	20	33.33	31
32	National Foods Limited	19	31.67	32
33	Cherat Packaging Limited	18	30.00	33
34	Aisha Steel Mills Limited	17	28.33	34
35	Berger Paints Pakistan Limited	16	26.67	35
36	Pakistan Paper Products Limited	13	21.67	36
37	Rupali Polyester Limited	12	20.00	37
38	Shabbir Tiles and Ceramics Limited	11	18.33	38

S#	Company name	No. of items disclosed	%	Ranking
39	Mitchells Fruit Farms Limited	10	16.67	39
40	Dewan Farooque Motors Limited	9	15.00	40
41	Pakistan Telecommunication Company Limited	8	13.33	41
42	Adam Sugar Mills Limited	8	13.33	41
43	Jubilee Spinning and Weaving Mills Limited	7	11.67	43
44	Gadoon Textile Mills Limited	6	10.00	44
45	Dewan Cement Limited	5	8.33	45
46	Shield Corporation Limited	5	8.33	45
47	Dawood Lawrancepur Limited	4	6.67	47
48	Dewan Textile Mills Limited	3	5.00	48
49	Bilal Fibers Limited	2	3.33	49
50	Olympia Textile Mills Limited	0	0.00	50

B. Appendix 2

Years	Inflation rate%	GDP (annual growth rate)%	Interest rate %
2012	9.73	3.8	7.98
2013	7.68	3.71	7.17
2014	7.23	4.1	7.26
2015	2.53	4.1	5.97
2016	3.76	4.5	4.83

Source: Economic Survey and other web sources.

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