Corporate Board Characteristics and Environmental Disclosure Quantity: A comparative Analysis of Traditional and Integrated Reporting Evidence

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Abstract: The aim of this study was to compare the influence of corporate board characteristics on the extent of environmental disclosure quantity of listed firms in two leading emerging economies in Africa, South Africa (integrated reporting framework) and Nigeria (traditional reporting framework). **Methods**: The sample was comprised of 303 firms including environmentally sensitive companies purposively selected for content analysis study in South Africa (213) and Nigeria (90). We used both descriptive, multivariate and regression models to comparatively analyze the differences about corporate board characteristics as determinants of the extent of their environmental disclosure quantity. **Results:** The results reveal a more significant positive association between board characteristics and environmental disclosure in South Africa and less relevant association in Nigeria. Also, the results support that board independence arrangement may serve as bonding mechanisms in weak reporting environments, suggesting a substitutive relationship between board independence and the regulatory framework. Quiet revealing a board with environmental committee show a higher tendency to be ecologic transparent in both countries. However, in a traditional reporting framework, the environmental committee is not enough; its effect was insignificant and highly significant in the integrated reporting framework. Further revealed is the significant positive effect of industry membership influence on environmental disclosure. In all estimated models of South Africa sample show that 45% of environmentally sensitive industries significantly influence environmental disclosure, while 51% is environmentally polluting industries in Nigeria show less concern on environmental disclosure. Interestingly, Audit firm size (Big4) positively and statistically significantly associated with overall environmental reporting in both countries. The results are consistent with stakeholder theory, agency theory, institutional and legitimacy theory suggesting that a strong board size, independent members of the board with auditing experience, the active environmental committee in conjunction with solid audit reputation may reduce information asymmetry. Our findings will be helpful for policymakers and other regulators who are interested in environmental impact reporting.

Keywords Corporate board characteristics, environmental disclosure, Traditional and integrated frameworks, South Africa and Nigeria

1.0 Introduction

A call for companies environmental impact assessment and disclosure has assumed enormous dimensions over the decades. This clarion call aimed at providing a sustainable environment that will be conducive to the human and corporate organisation to operate efficiently (Votsi, Kallimanis, & Pantis, 2017). In respect of this, several studies have examined the influence of corporate governance influence on environmental disclosure both at the firm level, country-specific, and cross-country evidence. In respect of firm specific evidence of corporate governance influence on environmental disclosure (Ienciu, Popa, & Ienciu, 2012) country-specific (e.g., Odoemelam & Okafor, 2018; Baboukardos ,2017; Akhbas, 2016; Liao, Luo & Tang 2015; Janggu, Darus, Zain, Yussri, 2014) and cross-country (Halme & Huse, 1997; Khlif, Guidara, & Souissi, 2015). Collectively, these studies show that corporate governance mechanisms are important for corporate environmental reporting.

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However, the studies on cross-country perspective have mostly examined a setting based on a legal framework (e.g. Khlif et al., 2015) and most importantly, the focus has been on companies quoted on common and civil law countries. Nonetheless, these studies neglected the strong and weak reporting framework difference within either common or civil law countries and no empirical study comparing all in one fit and traditional reporting on environmental disclosure. On this note, we intend to fill the gap in knowledge.

We provided evidence on corporate board characteristics influence on environmental disclosure of quoted firms in South Africa and Nigeria. In providing the evidence, we conjecture that board characteristics are more associated with the extent of corporate environmental disclosure quantity in an integrated reporting framework[1] (South Africa) and less in traditional reporting framework[2] (Nigeria). Considering the extant literature on the reporting framework factor as a potential explainable variable for the variation in the extent of environmental disclosure in the annual reports, we divide our sample into two groups. Groups are (1) Integrated reporting framework[1] (2) Traditional reporting framework[2]. Therefore, the group one comprises a sample of listed firms in South Africa that have adopted integrated reporting while group two to consists of a sample of listed firms in Nigeria that are still using traditional reporting method.

Unlike Khlif et al., (2015) that investigated the relationship between corporate performance and social and environmental disclosure of South Africa (common law country) and Morocco (civil law country), we chose South Africa and Nigeria (two common law countries). These two African leading economies although have the same legal system, but a reasonable gap exists between the two nations in their corporate reporting framework for quoted firms. South African quoted companies are mandated to submit an integrated annual report as approved by King III report (Rensburg & Botha, 2014; Zhou et al., 2017). While in Nigeria, the traditional corporate annual reporting still a major medium of relating to the stakeholders, which Otu et al., (2015) found to be lacking relevant information concerning the natural capital and other non-financial issues.

Our study contributes to accounting literature in two major respects. First, we extend the literature on the determinants of corporate environmental disclosure (Khlif et al., 2015). For the first time, we provide evidence between two countries of the same legal system but have different reporting mechanisms i.e., integrated annual reporting, which entails capturing financial and nonfinancial events and the traditional annual reporting. The empirical evidence on the determinants of disclosure decisions is largely inconclusive (Beyer, Cohen, Lys, &

[1] Country that has mandated the use of integrated annual reporting as a requirement for listed companies (strong reporting institution)

[2] Country that has not mandated the use of integrated annual reporting as a requirement for listed companies (weak reporting institution)

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Walther, 2010; R Gray, Javad, Power, & Sinclair, 2001; Ott, Schiemann, & Günther, 2017). Prior studies have mainly concentrated on differentiating their sample size with regards to cross-country analysis based on the difference in the legal system (Khlif et al., 2015), i.e., common law and civil law. When prior studies have analyzed the environmental disclosure, they have compared those firms that do operate in civil and common law countries but not considering the tendency of within laws reporting framework. For this environmental disclosure setting, our results allow us to identify the determinants of the differences in the extent of environmental disclosure at the level of the individual firm and its industry while controlling for countries. Interestingly, we reveal that strong board independence arrangements may serve as bonding mechanisms in traditional reporting environments, suggesting a substitutive relationship between corporate governance and the reporting framework. Furthermore, we extend current research by demonstrating that a board with environmental committee shows a higher tendency to be ecologic transparent in both reporting frameworks. In addition to the environmental committee, the effectiveness of the reporting framework is necessary. i.e., traditional framework, the environmental committee is not enough; its effect was insignificant and highly significant in integrated reporting framework.

Second, we contribute to a fundamental issue in environmental accounting research by further revealing the effect of traditional reporting framework on environmentally polluting industries attitude towards environmental disclosure. In all estimated models of Nigeria sample (having a higher percentage of environmentally sensitive industries) points to reporting perspective suggests a negative relationship which is inconsistent with both the voluntary disclosure perspective and the legitimacy perspective (Ott et al., 2017). Whereas the South Africa sample (having a lower percentage of environmentally polluting industries) points to legitimacy and reporting perspectives suggests a significant positive relationship. Prior empirical research on audit firm size influence on environmental disclosure provides mixed results on both the existence and direction of this relationship (Copley, 1991; Wang et al., 2008; Houqe et al., 2015; Braam & Borghans 2014; El Ghoul et al., 2016; Ernstberger and Gruning, 2013).

The rest of this paper is organized as follows. Section 2 the theoretical framework, literature review and hypotheses development. Section 3 discuss the research methodology and section 4 explains results and discussion. Finally, section 5 conclusions and limitations as well as directions for future studies.

2. Theoretical framework, literature review and hypotheses development Review

In this section, the study reviewed both underpinning theories and empirical evidence of corporate governance influence and extent of corporate environmental disclosure.

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2.1Underpinning Theory

2.1.1 Agency theory

Agency theory by Jensen & Meckling (1976) provides a framework for the link between the corporate governance variables influence on the extent of corporate environmental disclosure (Allegrini & Greco, 2011; Ienciu et al., 2012). Agency theory views the firm as an interrelated set of contracting relationship among individuals. The theory assumes that both parties to the contractual relationship will act to maximize their utilities by using information available to them (Holtz & Sarlo Neto, 2014). This theory is essential in this study because of its relevance in proffering solution to agency problems. In this setting of our study, corporate governance is seen as an important and the only credible mechanism to protect shareholders and may substitute for the weak legal framework in dealing with the agency problems (Ernstberger & Grüning, (2013). The issue of information asymmetry exacerbates agency conflict. The theory predicts that in the presence of information asymmetry, the manager is exposed to some privileged information regarding the firm, a situation which induces opportunistic tendencies (Ahmed *et al*., 2014). The separation of ownership, control, and globalization of business redefine the relationship that exists between the owners and the managers to that of an agent and principal. Being the agent, the manager is expected not to pursue goals that are geared towards the achievement of his selfish interest at the expense of the shareholders. In other words, the uncertainty resulting from information asymmetry between the management (i.e. agent) or the firm and the outside equity and debt holders (i.e. principal) leads to the agency costs in the organization (Jensen & Meckling, 1976).

2.1.2 Legitimacy Theory

Greiling & Grüb (2014) stresses that an organization must be accountable for its actions. Legitimacy theory is perceived as a possible reason for the recent upsurge in environmental disclosure as corporate entities strive to be greenish in their operations (Braam et al., 2016; Lan et al., 2013; Lyton et al.,2013; Prasad et al., 2016). This perception will be correct when the rule of law is strictly adhered to, and investors and citizen's right to a healthy environment is enshrined in the Constitution.

2.1.3 Stakeholder theory

Stakeholder theory is also seen as an explainable theory for corporate environmental accounting (Deegan and Blomquist, 2006; Depoers et al., 2016; Liao et al., 2015). The stakeholder theory perspective takes cognizance of the environment of the firm, including customers, suppliers, employees and other segments of the society. These stakeholders of the enterprise and lobbying decisions of these individuals are determined by the stakeholders who possess power, urgency, and legitimacy (Ahmad, 2015).

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We conclude that legitimacy theory, stakeholder theory, and agency theory are a group of theories explaining reasons for corporate governance concerns towards the environment and the extent of corporate environmental impact disclosure.

2.2 Empirical Evidence

A good number of researchers have provided empirical evidence on the relationship between the extent of environmental disclosure and corporate governance. Mostly corporate governance mechanism is used as an independent variable and environmental disclosure as a dependent variable. In this section, we review some of the existing empirical studies as supported by underpinning theories.

2.2.1 *Environmental Disclosure Quantity*

Otu et al., (2015) from Nigeria provided evidence that the level of environmental information reported by sample companies listed in the Nigeria Stock Exchange was 7%. The study used a sample of 40 companies across eight sectors and data from two-year 2013-2014 was analyzed using descriptive statistics, correlation, and linear regression. The study desperately calls for integrated reporting in Nigeria. Otu et al.,(2015) sample size based on the firm-level study is limited regarding generalizing the result of the survey.

In South Africa, KPMG (2013) reported that companies that prepare environmental report increased from 45% in 2008 to 98% in 2013. Mandatory integrated annual reporting, enhanced governance structure, and a strong legal environment could be factors to this upsurge. Ahmed & Anifowose (2017) confirmed a significant rise in the overall corporate disclosure because of the adoption of integrated reporting in South Africa. This increase may be attributed to public pressure (Darrell & Schwartz, 1997). The current study focused on investigating and providing empirical evidence of the relationship between the extent of various categories of environmental disclosure and corporate board characteristics of listed companies in Nigeria and South Africa taking cognizance of both firm attribute in one hand and reporting framework of individual country.

H1 Environmental Disclosure Quantity is more in the integrated reporting framework country (South Africa) and less in the traditional reporting framework country (Nigeria).

2.2.2 Corporate Governance

Recent scandals that ravaged some companies have awakened a good number of studies on how entities are governed**.** Beekes et al., (2016) in a cross-country study involving 23 countries confirmed: “the belief that better-governed firms make more frequent disclosures to the market” also corroborated by Ntim, (2016) and (Rupley, Brown, & Marshall, 2012). That often happens in common law countries (Beekes et al., 2016) while national

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culture is said to be capable of explaining variations in firm-level and country-level in corporate governance (Duong, Kang, & Salter, 2016) and carbon disclosure (Luo & Tang, 2016). When the institution is weak, it affects the effectiveness of corporate governance (Kumar & Zattoni, 2016). Also, competent corporate governance is capable of reducing information asymmetry (Kanagaretnam, Lobo, & Whalen, 2007). A good number of measures have been taken to strengthen corporate governance in both Nigeria and South Africa. In South Africa ranging from King report on corporate governance in 1994 (Rossouw, Van der Watt, & Malan, 2002; Vaughn & Ryan, 2006), to King III report (King Committee on Corporate Governance, 2009). In Nigeria, in 2003, the Artedo Peterside committee set up by the Securities and Exchange Commission (SEC), developed a code of best practice for public companies in Nigeria.

In cognizance of the theoretical and empirical evidence on the relationship between board characteristics and the extent of overall environmental disclosure, we focused on board size, board independence audit committee independence, and Environmental Committee

2.2.2.1Board Size

The large composition of the board is perceived to be capable of influencing the extent to which corporate entities disclose their activities in any environment (Ntim & Osei, 2011; Haniffa & Cooke, 2002). Bhagat & Bolton (2008) supported by agency theory (John & Senbet, 1998) due to the diversity of expertise of members (Allegrini & Greco, 2011; Nan et al.,2010; Welford, 2007; Xie et al., 2003). Some of the studies conducted in both developed and developing countries revealed a positive association between board size and environmental impact disclosures (Andrikopoulos & Kriklani, 2013; Cormier et al. 2011; Khlif et al., 2015) while some showed negative relationship Uwuigbe et al., (2011) and others insignificant result (Cheng & Courtenay, 2006; Michelon & Parbonetti, 2010; Halme & Huse, 1997). Recent empirical evidence from an emerging economy by Trireksani & Djajadikerta (2016) examined the relationship between corporate governance variables and the extent of environmental disclosure. The study focused only on mining companies listed in Indonesia Stock Exchange and employed content analysis of the annual reports and documents a significant positive association between the board size and the extent of environmental disclosure. Osazuwa et al., (2016) utilized a cross-section data of sample size of 116 firms in Nigeria and provided evidence that board size positively relates to the level of environmental disclosure. Concerned about the quality of climate change disclosure, Ben-Amar & McIlkenny (2015) result from Canada showed a positive association between board effectiveness and the firm's decision to answer the CDP questionnaire as well as its carbon disclosure quality. Bridging the gap in knowledge about the relationship between corporate governance and corporate social responsibility (CSR) in the banking sector of US,

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Jizi et al., (2013) found a significant positive association between board size and CRS. Samaha, Jizi et al. (2015) used meta-analysis to a sample of 64 empirical studies to identify possible determinants to the relationship between board, audit committee characteristics and voluntary disclosure. The study acknowledged that board size has a significant positive effect on voluntary disclosure. We expect a significant positive relationship between environmental disclosure variables and corporate board size.

H2: Board Size is more associated with the extent of corporate environmental disclosure in the integrated reporting framework (South Africa) and less in the traditional reporting framework (Nigeria).

2.2.2.2 Board Independence

The stakeholder's theory buttress the importance of having independent directors in board composition aimed at protecting the interest of the investors (Arayssi, Dah, & Jizi, 2016; Gul & Leung, 2004; Jizi et al., 2013). The board independence is grounded in the agency theory. Liao et al., (2015) showed evidence of a positive association between significant independent directors and extensive disclosure of GHG information from a UK sample of 329 largest companies using both univariate and regression models. García-Meca & Sánchez-Ballesta (2010) adopted a meta-analysis approach to a sample of 27 empirical studies to explain the association of corporate governance structure with voluntary disclosure. The study document *"that positive association between board independence and voluntary disclosure only occurs in those countries with high investor protection rights."* Jizi et al., (2013) stated that there exists a positive relationship between the upper level of CSR disclosure and more independent boards of directors. The study was based on a sample of large US commercial banks. Eberhardt-Toth (2017) also supported having more independent executive administrators on the board. Post et al., (2014) empirically investigated the association between board structure and company environmental performance using sustainability-themed alliances as a moderating variable and the whole public oil and gas companies as a sample. They found among others that the sustainability-themed alliances moderate dependent and independent variables. A higher percentage of independent nonexecutive directors on the board are expected to relate to extensive environmental impact disclosure significantly.

H3: *Board Independence is more associated with the extent of corporate environmental integrated reporting framework (South Africa) and less in the traditional reporting framework (Nigeria).*

2.2.2.3Audit Committee Independence

Audit committee independence is among the dimensions of measuring audit committee effectiveness (Pincus, Rusbarsky, & Wong, 1989). This committee is part of corporate governance structure (Cohen et al., 2002; Cohen et al., 2014; Vera-Muñoz, 2005; Yasin & Nelson, 2013) that helps in overcoming agency related problems

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(Aburaya, 2010; Ho & Wong, 2001; Islam, 2010) as well as carrying out oversight function (Beasley, Carcello, Hermanson, & Neal, 2009; Rahim, Johari, & Takril, 2015) must be independent (Vera-Muñoz, 2005). Based on this important role of audit committee in achieving objectives of corporate governance (Ho and Wong, 2001; Khan et al., 2013; Said et al., 2009), required a good number of independent members for its effectiveness (Akhtaruddin & Haron, 2010; Bouaziz, 2012; Carcello & Neal, 2000; DeZoort, Hermanson, Archambeault, & Reed, 2002; Ghafran & O'Sullivan, 2013; Mohamad & Sulong, 2010). Some empirical evidence has emerged about the degree of number of the independent members in positively influencing what, how and when to disclose information that will help stakeholders to make an informed decision. Madi et al., (2014) in a study of 146 Malaysian listed firms for the year 2009 provided evidence that audit committee independence is positively related to voluntary corporate disclosure. The study used a content analysis method. Madi et al. (2014) is a confirmation of Iatridis (2013). Also, Samaha et al. (2015) reported a positive relationship between the level of voluntary disclosure and the percentage of independent directors on the audit committee.

H4: Audit Committee Independence is more associated with the extent of corporate environmental disclosure in the integrated reporting framework (South Africa) and less in the traditional reporting framework (Nigeria).

2.2.2.4 Board Meetings

Vafeas (1999) revealed that "board activity, measured by board meeting frequency, is an important dimension of board operations" which helps to overcome agency conflicts (Xie, Davidson, & Dadalt, 2003). Ntim & Osei, (2011) study the impact of corporate board meetings on corporate performance of 169 listed companies in South Africa and found a positive relationship. On the other hand, Kantudu & Samaila (2015) reported negative association based on the study of the impact of monitoring characteristics on financial reporting quality of the Nigerian listed oil marketing firms. While in Nigeria, Osazuwa et al., (2016) Investigated the relationship between board characteristics and the extent of environmental disclosures. The study used cross-sectional data and quantitative design method and documents a negative relationship between board meetings and environmental disclosure.

H5: Board Meetings is more associated with the extent of corporate environmental disclosure in the integrated reporting framework (South Africa) and less in the traditional reporting framework (Nigeria).

2.2.2.5 Environmental Committee

The environmental committee is saddled with the responsibility of assessing the natural capital (Council on Social Work Education, 2015; Pryor, Bierbaum, & Melillo, 1998; Rockwell, 1991; Sánchez & McIvor, 2007; Sano & Kawai, 1996; Stewart, 2004). An advisory committee (Vasseur et al., 1997) that has shown a high-level

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transparency towards the environment (Liao et al., 2015). However, the words of Berrone & Gomez-Mejia (2009) that *"…environmental committee do not reward environmental strategies more than those without such structures, suggesting that these mechanisms play a merely symbolic role,"* call for more evidence on the relationship between the environmental committee and corporate environmental disclosure practices. Dixon-Fowler et al., (2017) found a positive association between board environmental committees and corporate environmental performance. In agreement with agency theory, such committee will be proactive and not reactive in handling environmental issues and actions help companies gain environmental legitimacy (Berrone, Fosfuri, & Gelabert, 2015; Hummel & Schlick, 2016) and firm value (Clarkson, Fang, Li, & Richardson, 2013; Plumlee, Brown, Hayes, & Marshall, 2015) as well as beneficial to shareholders (Griffin & Sun, 2013). The Peter & Romi (2011) view was confirmed later by evidence from greenhouse gas emission accounting as Peters & Romi (2013) reported a positive association between the environmental committee and environmental disclosure. We expect a positive relationship between environmental disclosure and environmental committee.

H6: Environmental Committee is more associated with the extent of corporate environmental disclosure in the integrated reporting framework (South Africa) and less in the traditional reporting framework (Nigeria)

2.3 Corporate Attributes (Control Variable)

Roberts (1992) pointed out the importance of company characteristics in investigating the level of corporate environmental disclosure. In this current study, the firm attribute is used as control variables as previously done by (e.g., Akbas, 2016). Therefore, we consider only three attributes- company size, industry membership and auditor type.

2.3.1 Industry Membership

The industry a company belongs is perceived to be a determinant factor of the quantity of environmental impact disclosure to the stakeholders. In a study by Halkos & Skouloudis (2016) using a disclosure index, investigate the level of disclosure practices of the largest 100 firms operating in Greece, document among others that working in environmentally sensitive sectors has a positive association with climate change disclosure. The study used a logit regression method. This evidence supported earlier study by Galani et al., (2012). On the contrary, Ong et al., (2016) found that less environmentally sensitive industry disclosed more and higher quality of environmental disclosure than ecologically sensitive industries of Malaysia. The finding is not unconnected to the poor and weak legal environment as it relates to the environment (Ong et al., 2016).In Jordan, Ismail et al., (2008) on the overall, found no significant relationship between industry type and the level of social and environmental disclosure. From the United Kingdom, Brammer & Pavelin, (2008) provided evidence to support that industry class relate to the

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extent of corporate disclosure of environmental information using a sample of 450 conglomerates selected from different sectors.

H7: Industry Membership is more associated with the extent of corporate environmental disclosure in the integrated reporting framework (South Africa) and less in the traditional reporting framework (Nigeria).

2.3.2 Firm Size

Large companies exhibit higher disclosure as they have financial 'muscle' to bear the cost. Various studies provided the empirical result relating the size of a company and the level of environmental disclosure. In China, Lu & Abeysekera (2014a); Lu & Abeysekera (2014b); Zeng et al., (2010) documented positive significant relationship. Greek evidence shows that size is a strong determinant of environmental ratings (Galani et al., 2012). Adhikari & Tondkar (1992) examined the relationship between selected environmental factors and stock exchange disclosure requirements of 35 stock exchanges in different countries and found that the size of the equity market significantly explained the variation. Chek et al., (2013) used content analysis and Pearson correlation methodology and found the size of 154 companies in consumer and plantation industries of Malaysia to correlate with level disclosure. Having the desire to fill the gap in knowledge, Ismail & Ibrahim (2008) provided evidence from Jordan a developing country, Using a sample of 60 companies in the manufacturing and service sectors, content analysis was employed. The study equally found a positive association between company size and level of environmental disclosure. Also from Thailand, Suttipun & Stanton (2012) found a positive association. Evidence from developed country US showed a different result when company size and industry type were used as a control variable to determine the relationship between performance and disclosure for the 131 companies (Patten, 1992). Canadian experience as documented by Cormier & Magnan (1999) showed that firm size significantly explain environmental disclosure. Also in U.k, Brammer & Pavelin (2008) reported a positive association.

H8: *Firm size is more associated with the extent of corporate environmental disclosure in the integrated reporting framework (South Africa) and less in the traditional reporting framework (Nigeria)*

2.3.3 Audit firm size

The reputation of an engaged external auditor is perceived to be an influencing factor in corporate environmental disclosure practices. As such complete disclosure enhances the audit firms reputation (Copley, 1991). Anchoring on this perception, Wang et al., (2008) provided evidence from China. The study showed that voluntary disclosure is related to the reputation of the auditor. Braam & Borghans (2014) sees the interlock ties between the board and the external auditor as a catalyst for voluntary corporate disclosure. From the point of ethical values, Houqe et al.,

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(2015) stated thus entities "from countries where 'high corporate moral values' prevail are more likely to hire a Big four auditor." By extension, we expect "Big 4" auditor type to influence extensive corporate environmental disclosure in a strong legal environment, investor protection and disclosure standards (El Ghoul et al., 2016; Ernstberger & Grüning, 2013).

H9: Audit Firm size is more associated with the extent of corporate environmental disclosure in integrated reporting framework (South Africa) and less in the traditional reporting framework (Nigeria)

Table 1 summarises the hypotheses and indicates whether we expect the independent's variables to be associated more with categories and overall environmental disclosure in South Africa and less in Nigeria.

Table 1: Hypotheses overview

Hypothesis	Independent variables			Dependent	variables			
		EP	PPEI	CELS	EA	SUS	OERI	OED
		SA Ng.	SA Ng.	SA Ng.	SA Ng.	SA Ng.	SA Ng.	SA Ng.
H1 →	**EDQ**	+>	+ >	+>	+ >	+>	+>	+>
Board	**Characteristics**							
H2 →	BSize	+>	+ >	+>	+ >	+>	+>	+>
H3 →	BoInd	+>	+ >	+>	+ >	+>	+>	+>
H4 →	BoMe	+>	+ >	+>	+ >	+>	+>	+>
H5 →	Auinde	+>	+ >	+>	+ >	+>	+>	+>
H6 →	EnviCom	+>	+ >	+>	+ >	+>	+>	+>
Company	**Attributes**	+>	+ >	+>	+ >	+>	+>	+>
H7 →	IndMe	+>	+ >	+>	+ >	+>	+>	+>
H8 →	FiSi	+>	+ >	+>	+ >	+>	+>	+>
H9 →	Audit firm size	+>	+ >	+>	+ >	+>	+>	+>

SA= South Africa; NG=Nigeria; +positive; > greater than; EP=Environmental Policies; PPEI= Product and Process-related Environmental Issues; CELS= Compliance with Environmental Laws and Standards; EA=

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Environmental Auditing; SUS= Sustainability; OERI= Other Environmental Related Information; OED= Overall Environmental Disclosure

3. Research method

This current study used an archive data which call for ex-post facto research design to enable us to investigate the relationship between corporate board characteristics and environmental disclosure practices of listed companies in South Africa and Nigeria. The population of the study is listed companies of Nigeria Stock Exchange (NSE) and Johannesburg Stock Exchange (JSE). This population comprises of 188 and 360 companies listed on NSE and JSE respectively. We eliminated companies that are either suspended or unavailability of the annual report for the year 2015. The 303 (Nigeria 90 and South Africa 213) companies formed the sample size for the study. Table 2 shows the distribution of the sample from South Africa and Nigeria. The sample is made up of large and industrially diverse companies for possible generalization of the findings (Aburaya, 2010; Brammer & Pavelin, 2006).

The study employed content analysis of annual reports which has been widely used by previous studies to investigate the extent of environmental disclosure by corporate entities (Akbas, 2016; Fallan, 2016; Hackston & Milne, 1996; Hughes, Anderson, & Golden, 2001; Khlif et al., 2015; Niskala & Pretes, 1995; Nor, Bahari, Adnan, Kamal, & Ali, 2016; Ong et al., 2016). In line with prior studies (Aburaya, 2010; Clarkson et al., 2008; Cormier et al.,2011; Hackston & Milne, 1996), we developed a checklist categorizing corporate environmental disclosure into six (6) categories (Aburaya, 2010; Odoemelam & Okafor, 2018). These are 1) environmental policies 2) product and process-related environmental issues 3) environmental auditing 4) sustainability 5) compliance with environmental laws and standards 6) other environmental related information. Based on the classification, we added one item (rehabilitation) i.e., 35 checklist items were used to measuring the extent of disclosure by the sample companies (Appendix A).

The annual report of the sample companies for the year 2015 was used for the investigation. This is the most recent data based on the annual reports which are the secondary source (Hussey & Hussey, 1997) of data collection that is widely accepted as credible (Al-Tuwaijri et al., 2004; Neu et al., 1998;Tilt & Symes, 1999; Tilt, 2001).

Coding of the items to generate a data set is in line with, e.g.Gray et al., (1995); (Aburaya, 2010) based on a measure of disclosure volume by scoring system. Despite the criticism that un-weighted index (dichotomous scores) of the 1 if the item is disclosed and 0, if not disclosed, negate the possibility that all the elements are not equally important (Barako, Hancock, & Izan, 2006). The unweighted index is accepted for measuring quantity of entities environmental disclosure (Bozzolan, Trombetta, & Beretta, 2009) and previous studies have used dichotomous score (eg. Aburaya (2010); Haniffa & Cooke (2005); Chau & Gray, (2002). Hence, we adopt the formula by Aburaya (2010) and Odoemelam & Okafor (2018) for calculating the quantity of environmental disclosure by the sample companies in 2015 annual report.

Corporate Environmental Disclosure Quantity Index for each company is computed according to the following equation:

$$\text{OED Quantity} = \sum_{i=1}^{n} \frac{\text{Quantity}}{\text{MAX Quantity } i}$$

Where:

CED Quantity = Corporate Environmental Disclosure Quantity Index,

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Quantity*i* = 1 if item *i* is disclosed; 0 if item *i* is not disclosed,

MAX Quantity = maximum applicable disclosure quantity score,

n = number of items disclosed.

The formula is also applicable to each disclosure category in the checklist. The study tests the hypothesis using cross-sectional sample of companies (Cho, Roberts, & Patten, 2010) listed across South African and Nigerian stock exchange (www.jse.co.za and www.nse.com.ng)

Table 2 shows measurement and explanation of variables

DEPENDENT	**ABB**R.	
Environmental Policies	EP	1= Companies that disclose EP information in their annual report 0= Otherwise
Product and process Environmental Issues	PPEI	1= Companies that disclose EP information in their annual report 0= Otherwise
Environmental Auditing	EA	1= Companies that disclose EP information in their annual report 0= Otherwise
Sustainability	SUS	1= Companies that disclose EP information in their annual report 0= Otherwise
Other Environmental Related Information	OERI	1= Companies that disclose EP information in their annual report 0= Otherwise
Compliance with Environmental Laws and Standards	CELS	1= Companies that disclose EP information in their annual report 0= Otherwise
Overall Environmental Disclosure	OED	EP+PPEI+EA+SUS+OERI+CELS
INDEPENDENT		
Board Size	B SIZE	Total number of directors on the board of a company
Board Independence	BIND	The percentage of independent directors of the total number of directors on the board of a company
Board Meeting	BOMET	The total number of meeting held by the board of a company
Audit Committee Independence	ACOINDE	The percentage of independent directors of the total number of directors on the audit committee of a company
Environmental Committee	ENVICOM	Dummy variable 1= company has environmental committee, 0= Otherwise
CONTROL VARIABLES		
Company Size	FS	The natural logarithm of total assets at the end of the fiscal year 2015
Industry Membership	INDM	Dummy variable= 1 if the company operates in an environmentally sensitive industry and 0 otherwise.
Auditor Type	Afs	Dummy variable= 1 if the company is audited by one of the "Big 4" and 0 otherwise

3.2 MODEL SPECIFICATION

To achieve the purpose of examining the relationship between board characteristics and the extent of environmental disclosure, the model used to test the association is ordinary least square (OLS) with cross-sectional data and as well as panel data technique. Therefore, the models for the study are specified thus:

$EP_i=\alpha_0+\beta_1BSIZE+\beta_2BIND+\beta_3BOMET+\beta_4ACOINDE+\beta_5ENVICOM+B_6SIZE+\beta_7INDM+\beta_8AFS+\varepsilon_i$.....(1)

$PPEI_i=\alpha_0+\beta_1BSIZE+\beta_2BIND+\beta_3BOMET+\beta_4ACOINDE+\beta_5ENVICOM+B_6SIZE+\beta_7INDM+\beta_8AFS+\varepsilon_i$.....(2)

$CELS_i=\alpha_0+\beta_1BSIZE+\beta_2BIND+\beta_3BOMET+\beta_4ACOINDE+\beta_5ENVICOM+B_6SIZE+\beta_7INDM+\beta_8AFS+\varepsilon_i$ ..(3)

$EA_i=\alpha_0+\beta_1BSIZE+\beta_2BIND+\beta_3BOMET+\beta_4ACOINDE+\beta_5ENVICOM+\beta_6SIZE+\beta_7INDM+\beta_8AFS+\varepsilon_i$ .....(4)

$SUS_i=\alpha_0+\beta_1BSIZE+\beta_2BIND+\beta_3BOMET+\beta_4ACOINDE+\beta_5ENVICOM+B_6SIZE+\beta_7INDM+\beta_8AFS+\varepsilon$..... (5)

$OERI_i=\alpha_0+\beta_1BSIZE+\beta_2BIND+\beta_3BOMET+\beta_4ACOINDE+\beta_5ENVICOM+B_6SIZE+\beta_7INDM+\beta_8AFS+\varepsilon_i$..... (6)

$OED_i=\alpha_0+\beta_1BSIZE+\beta_2BIND+\beta_3BOMET+\beta_4ACOINDE+\beta_5ENVICOM+B_6SIZE+\beta_7INDM+\beta_8AFS+\varepsilon_i$..... (7)

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Where:

OED: the overall of environmental disclosure of company $_i$ in 2015 (Total scores of Environmental Policies index(EP) , Product and process Environmental Issues index(PPEI), Environmental Auditing index(EA), Sustainability index(SUS), Other Environmental Related Information index(OERI) and Compliance with Environmental Laws and Standards index(CELS) in the annual report of the company)

$\alpha_{0:}$ intercept

BSIZE: board size of company $_i$

BIND: Board independence of company $_i$

BOMET: board meeting of company $_i$

ACOINDE: audit committee independence of company $_i$

ENVICOM: environmental committee of company $_i$

SIZE: size of company $_i$

INDM: industry membership of company $_i$

AFS: auditor type of company $_i$

Ɛi: random error term

The apriori signs are $\beta_1 > 0$, $\beta_2 > 0$, $\beta_3 > 0$, $\beta_4 > 0$, $\beta_5 > 0$, $\beta_6 > 0$, $\beta_7 > 0$, $\beta_8 > 0$, $\beta_9 > 0$

4. RESULT AND DISCUSSION

Results in this study are presented as follows. Firstly, the descriptive statistics table and analysis and followed by multivariate analysis and discussions of findings.

4.1 Descriptive Analysis

Table 3: Descriptive Statistics (Comparison of average disclosure indexes of categories and overall environmental disclosure)

Panel A	South Africa						Nigeria					
Variables	Obs	mean	median	Std Dev	min	max	Obs	mean	median	Std Dev	min	max
EP	213	33.7653	33.38	24.067	0	100	90	10.4067	8.33	11.2637	0	53.33
PPEI	213	45.5993	55.55	34.198	0	100	90	7.5477	0	14.5626	0	57.14
CELS	213	58.5868	75	41.466	0	100	90	10.2777	0	18.6986	0	75
EA	213	53.5258	100	50.923	0	100	90	6.7415	0	24.0631	0	100
SUS	213	84.6384	100	32.921	0	100	90	38.2022	50	41.3016	0	100
OERI	213	19.0848	14.29	15.482 5	0	57.29	90	8.0918	7.145	9.0788	0	42.35
OED	**213**	**40.1515**	**45.71**	**25.160 9**	**0**	**91.43**	**90**	**10.7326**	**5.71**	**12.568**	**0**	**65.71**
BSIZE	213	9.3619	9	2.8237	5	18	90	9.3	9	2.8852	5	17
BIND	213	52.0952	52	16.290 1	30	78	90	11.8697	0	19.2723	0	89
BOMET	213	5.0765	5	1.7524	3	10	90	4.9111	5	1.4034	3	11
ACOINDE	213	94.473 9	100	16.881 7	67	100	90	15.9948	0	22.8092	0	100
FS	213	124,529	3,390	10382 7	21985	19810859	90	17453226 7	21278	62273927 7	68.48	4166159 0

Panel: B: Dummy variables	South Africa							Nigeria						
ENVICOM	F	Valid %	mean	median	Std Dev	Min	Max	F	Valid %	mean	median	Std Dev	min	max
YES	74	35	56	62.8	22.098 1	2.86	91.43	4	4	29.285	35.715	18.280 2	2.85	42.86

	13		29.669	32.40	22.481		68.5	8				11.689		65.7
N	9	65	5	5	7	0	7	6	96	9.9858	5.71	5	0	1
	21							9						
Total	3	100						0	100					
INDUM														
			48.636		24.168	2.8	91.4	4				10.007		34.2
YES	96	45	2	54.27	6	6	3	6	51	9.5047	5.71	3	0	9
	11		33.189				88.5	4				14.792		65.7
N	7	55	7	37.14	23.878	0	7	4	49	12.016	5.7	8	0	1
	21							9						
Total	3	100						0	100					
AFS														
	15		45.218	49.92			91.4	5		14.340		14.687		65.7
YES	4	72	9	5	24.514	0	3	4	60	9	8.57	6	0	1
			26.924		21.968		68.5	3						
No	59	28	6	22.86	6	0	7	6	40	5.3202	5.7	4.9771	0	20
	21							9						
Total	3	100						0	100					

Notes: Bsize, board size; BIND, board independence; BOMET, board meetings; ACOINDE, audit committee independence; ENVICOM, environmental committee; FS, firm size; INDUM, industry membership; AFS, audit firm size. EP, environmental policies disclosure; PPEI, product and process environmental issues disclosure; CELS, compliance with environmental laws and standards disclosure; EA, environmental auditing disclosure (EA); SUS, Sustainability OERI, other environmental related information disclosure; OED, a model for Overall environmental disclosure. For South Africa panel B, environmentally sensitive industries=96 (45%); Number of firms audited by "Big4" =154 (72%) While Nigeria environmentally sensitive industries = 46 (51%); the number of companies audited by "big 4" = 54 (60%) of the total subsample.

Table 3, panel A results show that environmental disclosures are more relevant in the South African sample and less in Nigeria sample. For, instance, the mean of overall environmental disclosure score accounts for 40% while in Nigeria the average for overall environmental disclosure amount to 10.7%. Moreover, considering the categories of environmental disclosure, in all mean scores of South Africa's sample showed excellent means over Nigeria. For example, South Africa's compliance with environmental laws and standards (CELS) average rating amount to 58.58% of Nigeria's average score of 10.27%. These results support the conjecture that integrated reporting framework and regulatory environment stimulates the extent of environmental disclosure more than the opposite (figure 2).

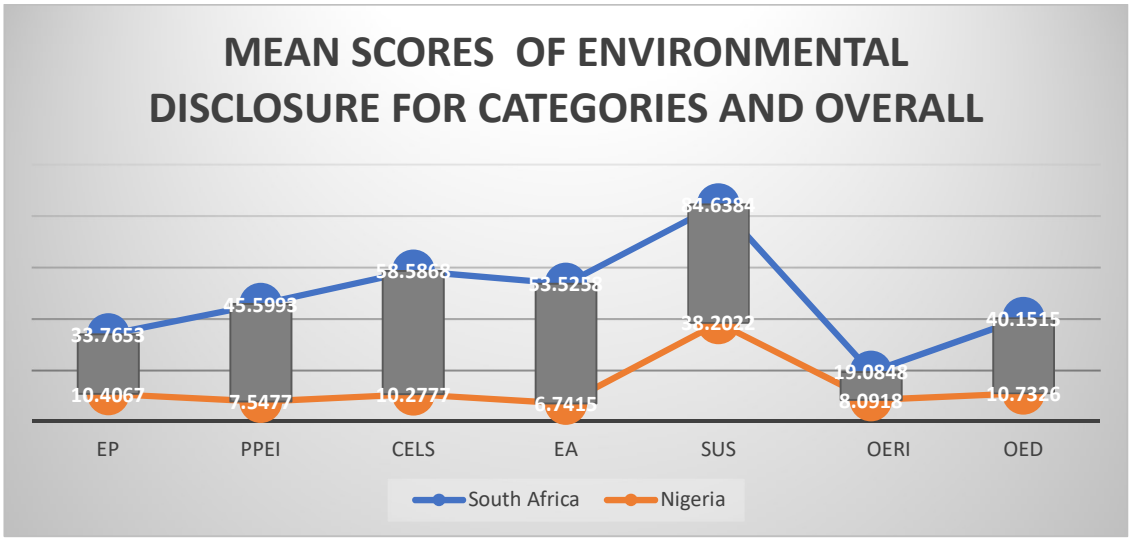

Figure 2: Comparison of environmental disclosure mean scores for South Africa and Nigeria.

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Panel B of Table 3 shows relevant information in this study. It reveals that 35% of South Africa sample firms that have an environmental committee as one of their corporate board mechanisms had an average of 56% of the overall environmental disclosure, while 65% of the same sample size of South Africa without environmental committee has an average of 29.66%. Also revealed in this study with regards to the panel B of table 4 results is that in a stakeholder-oriented model such as South Africa (Khlif et al., 2015) environmentally sensitive industries are legitimately concerned towards the natural capital. For instance, 45% of the total sample size of South Africa belongs to environmentally polluting industries scored a mean of 48%, whereas, the less environmentally sensitive industries totalling 117 (55%) have a mean value of 33%. On the contrary, the same result for Nigeria is quite revealing and confirms the relatively weak reporting framework and environment the firms operate. Panel B, also, reveal that for Nigeria, environmentally sensitive industries demonstrate poor concern towards the environment with regards to their environmental reporting in the traditional annual reports. For instance, out of 90 firms, 46 (51%) are in the membership of environmentally sensitive industries but not surprising, their mean score is 9.5% while 44 (49%) number of less environmentally sensitive industries score higher mean of 12%. This outcome buttresses the point that in a weak reporting environment, less environmental polluting industries disclosed more than and higher quantity environmental information.

Audit firm size's reputation theory was confirmed in the analysis in Panel B of table 3. A total of 72% and 60% of South Africa and Nigeria samples engage the services of "Big4" and audit firm size demonstrated legitimatizing their reputation. Audit firm size in table 4 statistically significantly influences overall environmental disclosure in both study countries. The result implies that in a poor and weak institution, audit firm reputation substitute for strong legal and regulatory framework.

4.2 Multivariate Analysis

Table 4 reports the results of multiple regressions of the seven models encompassing the six categories of environmental disclosure an overall environmental disclosure.

Table 4 Regression analyses with dependent variable calculated as per models 1, 2, 3,4,5,6 and 7

Independent Variables			South Africa							Nigeria				
	Model 1(M1)	**Model 2(M2)**	**Model 3(M3)**	**Model 4(M4)**	**Model 5(5)**	**Model 6(6)**	**Model 7(7)**	**Model 1(M1)**	**Model 2(M2)**	**Model 3(M3)**	**Model 4(M4)**	**Model 5(5)**	**Model 6(6)**	**Model 7(7)**
C	-9.544156	-18.05044	1.285565	-0.319653	-3.45201	-5.869141	-5.456065	-5.283344	-21.92146	-12.67344	11.89278	8.89278	-8.543048	-12.44949
	(0.3295)	(0.2233)	(0.9448)	(0.9883)	(0.5967)	(0.3977)	(0.5995)	(0.3389)	(0.0011)	(0.1527)	(0.3231)	(0.5231)	(0.0511)	0.0284

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Bsize	1.421287	2.614216	2.230097	2.008936	0.671981	0.771991	1.757716	1.121558	1.436294	1.696002	-2.875932	-5.875932	0.680805	1.067189
	(0.0117)*	**(0.0023)****	**(0.0369)****	(0.1079)	**(0.0428)****	**(0.0528)****	**(0.0034)****	**(0.0219)****	**(0.0129)****	**(0.0299)****	(0.0076)****	(0.0457)**	(0.0748)	**(0.0315)****
BIND	0.085930	0.161112	0.252174	0.558223	0.081523	0.071513	0.110393	0.123237	0.190528	0.261866	0.392189	0.292189	0.177855	0.228227
	(0.4009)	(0.2982)	(0.1950)	**(0.0149)****	(0.4245)	(0.3245)	(0.3100)	(0.1005)	**(0.0319)****	**(0.0301)****	**(0.0185)****	**(0.0285)****	**(0.0031)*****	**(0.0033)*****
BOMET	0.761256	0.516856	1.652489	-0.038569	-0.031934	-0.201934	0.476930	0.150064	1.658790	-0.283271	3.363371	4.363371	1.497301	1.245980
	(0.3655)						(0.5933)	(0.8718)	(0.1323)	(0.6844)	(0.3013)	(0.5013)	(0.9836)	(0.7348)
ACOINDE	0.058084	0.106309	-0.045219	-0.193472	0.179766	0.078766	0.056936	0.054884	0.091516	0.022510	-0.057745	-0.067545	-0.026658	0.040118
	(0.5697)	(0.4918)	(0.8157)	(0.3953)	(0.5776)	(0.2776)	(0.5999)	(0.3703)	(0.2052)	(0.8178)	(0.6646)	(0.7646)	(0.5792)	(0.5187)
ENVICOM	17.58235	17.74424	21.10116	39.57829	9.673466	7.683426	16.99066	2.824099	5.087024	7.116478	-3.196894	-5.296894	1.946799	3.619897
	(0.0000)***	**(0.0005)*****	**(0.0010)*****	**(0.0000)*****	**(0.0000)*****	**(0.0013)*****	**(0.0000)*****	(0.3687)	(0.1701)	(0.1580)	(0.6394)	(0.4374)	0.4301	(0.2575)
FS	9.49E-10	-1.43E-09	-1.03E-09	3.81E-09	2.92E-10	2.92E-10	4.67E-11	-1.23E-09	-3.20E-09	-5.99E-09	5.43E-09	4.42E-09	-4.52E-09	-2.50E-09
	(0.5134)	(0.5148)	(0.7079)	(0.2386)	(0.6780)	(0.7770)	(0.9759)	(0.5583)	(0.1965)	(0.0760)	(0.2378)	(0.3368)	**(0.0072)*****	(0.2407)
INDUM	9.371840	10.75881	20.16103	6.445843	6.851779	5.551769	9.775367	1.115702	1.959748	-0.629017	-5.826614	-5.626614	1.905328	1.914144
	(0.0026)***	**(0.0215)****	**(0.0007)*****	(0.3466)	**(0.0005)****	**(0.0115)****	**(0.0031)*****	(0.6553)	(0.5054)	(0.8748)	(0.2889)	(0.2769)	(0.3331)	0.4515
AFS	8.369823	10.77206	4.933077	9.728695	8.063869	4.063869	7.972030	2.728981	5.761236	9.990094	6.294929	7.295929	1.583889	5.008107
	(0.0146)***	**(0.0375)****	(0.4457)	(0.2000)	(0.0688)	(0.0933)	**(0.0284)****	(0.2579)	**(0.0441)****	**(0.0108)****	(0.2314)	(0.2314)	(0.4025)	**(0.0428)****
R^2a	34.37%	25.82%	21.49%	25.11%	24.12%	20.12%	32.40%	15.25%	29.84%	21.41%	12.09%	22.09%	19.44%	29.73%

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F stat	14.22470	9.789288	7.913914	9.466490	8.345697	7.362197	13.10370	3.003125	5.731765	4.032004	2.512812	3.512812	3.685632	5.706847
Prob (F-statistics	**(0.00000)** ***	**(0.00000)** ***	**(0.00000)** ***	**(0.00000)** ***	**(0.00000)** ***	**(0.00000)** ***	**(0.00000)** ***	**(0.005311)** ***	**(0.00009)** ***	**(0.00452)** ***	**(0.017234)** ***	**(0.027334)** ***	**(0.001033)** **	**(0.00009)** ***
Mean dependent	33.53966	45.43729	58.51724	52.22167	84.6384	19.39167	40.06059	10.40678	7.547778	10.27778	6.741573	38.2022	8.091889	10.73267
S.D. dependent Var	24.02330	34.19286	41.73020	50.06921	32.921	15.44510	25.14910	11.26372	14.56268	18.69869	24.06314	41.3016	9.078851	12.56807

Notes: Bsize, board size; BIND, board independence; BOMET, board meetings; ACOINDE, audit committee independence; ENVICOM, environmental committee; FS, firm size; INDUM, industry membership; AFS, audit firm size. *,**,***Significant at p<0.10; p<0.05; p<0.01, respectively. M1, model for environmental policies disclosure (EP) ; M2, model for product and process environmental issues disclosure (PPEI); M3, model for compliance with environmental laws and standards disclosure (CELS); M4, model for environmental auditing disclosure (EA); M5, model for Sustainability (SUS); M6, model for other environmental related information disclosure (OERI); M7, model for Overall environmental disclosure (OED)

The Results in Table 4 indicate that at this level of overall environmental disclosure (OED), there is a significant association between total environmental disclosure quantity and board characteristics of listed firms in South Africa and Nigeria.The M7 for South Africa and Nigeria show a sign of (*F*=13.10370, P=0.000000) and (*F*=5.706847, P=0.000009) respectively. Moreover, all the models for various categories of environmental disclosure show there is statistical significance influence of board characteristics on the extent of each category of environmental disclosure of both countries. The category of environmental policies (EP) M1, indicates (*F*=14.22470, P=0.0000) for South Africa while similar Nigerian M1, the results show statistical significance (*F*=3.003125, P=0.005311). The M2 provided statistical significance evidence *(F*=9.789288, P=0.000) and (*F*=5.731765. P=0.000009) for product and process-related environmental issues (PPEI) disclosure for both South Africa and Nigeria respectively. In the same vein, M3 for Compliance with Environmental Laws and Standards (CELS) indicate statistical significance (*F*=7.913914. P=0.000000) for South Africa and (*F*=4.032004. P=0.000452) for Nigeria. Also, M4 regression results for both countries suggest that corporate governance statistically significant (*F*=9.466490. P=0.00000) and (*F*=2.512812. P=0.017234) influence environmental auditing of listed firms in South Africa and Nigeria. Following the same pattern, M6 which is a model for regression of the effect of corporate board mechanisms on the extent of other environmentally- related information disclosed. The result of the regression analysis shows the significance of (F=7.362197, P=0.00000) South Africa (F=3.685632. P=0.001033) Nigeria statistically.

Table 5 reports f-statistic and significance of estimated of multiple regressions of the seven models encompassing the six categories of environmental disclosure an overall environmental disclosure.

Table 5: Shows summary of F-statistic and significance of estimated models for acceptance of H1

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Country	South Africa		Nigeria	
Variable	F-statistic	Prob.	F-statistic	Prob.
M 1 Board characteristics Vs EP	14.2247	0.0000*** >	3.0031	0.0053***
M 2 Board characteristics Vs PPEI	9.7893	0.0000*** >	5.7318	0.0000***
M 3 Board characteristics Vs CELS	7.91391	0.0000*** >	4.0320	0.0004***
M 4 Board characteristics Vs EA	9.4665	0.0000*** >	2.5128	0.0172***
M 5 Board characteristics Vs OERI	7.3622	0.0000*** >	3.6856	0.0010***
M 6 Board characteristics Vs SUS	8.3456	0.0000*** >	3.5530	0.0010***
M 7 Board characteristics Vs OED	13.1037	0.0000*** >	5.7068	0.0000***

Notes: *,**,***Significant at p<0.10; p<0.05; p<0.01, respectively; >, associated more than; M1, model for environmental policies disclosure (EP) ; M2, model for product and process environmental issues disclosure (PPEI); M3, model for compliance with environmental laws and standards disclosure (CELS); M4, model for environmental auditing disclosure (EA); M5, model for Sustainability (SUS); M6, model for other environmental related information disclosure (OERI); M7, model for Overall environmental disclosure (OED)

From Table 5, the overall environmental disclosure and the various categories of environmental disclosure models reveal that corporate governance statistically significantly (P=0.01) associated more on influence the extent of environmental disclosure of listed firms in South Africa and Nigeria. The results provide supporting evidence for the first conjecture H1; Board characteristics influences the extent of corporate environmental disclosure more in South Africa than Nigeria. The adjusted R-squared of 0.324029 (32.40%) and 0.297302 (29.73%) of estimated models reveal that the independent and control variables explain the variability of the extent of environmental disclosure in South Africa and Nigeria respectively. The finding agrees with (e.g. Akbas, 2016; Beekes et al., 2016) that the overall model is significant in all the models considered. We, therefore, accept the H1 and environmental disclosure quantity is more in the integrated reporting framework country (South Africa) and less in the traditional reporting framework country (Nigeria).

Table 6 report coefficients and significance of estimated M7 for both countries.

Table 6: Shows coefficients and significance models for acceptance of H2

	South Africa		Nigeria	
Variable	Coefficient	Prob.	Coefficient	Prob.
BSIZE Vs OED (M7)	1.757716	0.0034***	1.067189	0.0315**
BIND Vs OED (M7)	0.110393	0.3100	0.228227	0.0033***
ACOINDE Vs OED (M7)	0.476930	0.5933	1.245980	0.1898

BOMET Vs OED (M7)	0.056936	0.5999	0.040118	0.5187
ENVICOM Vs OED (M7)	16.99066	0.0000***	3.619897	0.2575
INDM Vs OED (M7)	9.775367	0.0031***	1.914144	0.4515
FS Vs OED (M7)	0.030301	0.9759	-1.181833	0.2407
AFS Vs OED (M7)	7.972030	0.0284**	5.008107	0.0428**

Notes: Bsize, board size; BIND, board independence; BOMET, board meetings; ACOINDE, audit committee independence; ENVICOM, environmental committee; FS, firm size; INDUM, industry membership; AFS, audit firm size. *, **, ***Significant at p<0.10; p<0.05; p<0.01, respectively. M7, model for Overall environmental disclosure (OED

Table 6, shows the influence of selected corporate board mechanisms and firm attributes on the overall of environmental disclosure of companies (OED) which is the proxy for corporate environmental disclosure quantity. The result indicates that only Board independence (BIND) which is statistically significant (p<0.01) in Nigeria, all other board variables agreed with H1. The superior result of BIND against South African listed firms provide evidence in support of the view of Ernstberger & Grüning, (2013) however, strong corporate governance arrangements may serve as bonding mechanisms in weak legal environments (traditional reporting framework), suggesting a substitutive relationship between corporate governance and the regulatory framework. It implies that the independent executive direct board as a dimension of a better-governed company ensures reduction of information asymmetry (Ernstberger & Grüning, 2013; Ntim, 2016).

However, the results also indicate that both board size and Audit firm size (Big4) in both countries M7 have a positive and statistically significant relation (p=0.0034, p=0.0315) and (p=0.0284, p=0.0428) respectively.Based on the evidence, board size and firm audit size associate more to the extent of environmental disclosure among listed companies in South Africa and less in Nigeria. The results agree with the findings of (Akbas, 2016; Haniffa & Cooke, 2005; Jizi et al., 2013; Ntim & Osei, 2011; Osazuwa et al., 2016) that board size influences the extent of environmental disclosure. The finding agrees with agency theory (John & Senbet, 1998) that having a large board comprising a diversity of expertise (Sun, Salama, Hussainey, & Habbash, 2010) encourages more disclosure. We find that audit firm size influences the extent of corporate environmental disclosure.The result concurs with (Braam & Borghans, 2014). Moreso, South Africa's estimated M7 regression result indicates that environmental committee (ENVICOM) and industry membership (INDUM) are statistically significant (p≤0.01) and (p≤0.01) respectively. On the contrary, Nigeria estimated M7 regression results show that both variables are statistically insignificant at (p>0.05) for ENVICOM and (P>0.05) for INDUM. The results of South Africa with regards to environmental committee and industry membership positive association to the extent of overall environmental disclosure were not surprising. South African companies are operating in a relatively strong legal environment and have a strong regulatory standard (i.e. Integrated reporting).The ENVICOM result from South Africa confirms the views of Liao et al., (2015) & Council on Social Work Education (2015). The findings agree with Dixon et al., (2017); Peters & Romi (2013) and gaining of environmental legitimacy Berrone et al., (2015).The result disagrees with the view of Berrone & Gomez-Mejia (2009). In the same vein, our findings show that environmentally sensitive industries in a strong reporting framework (South Africa) and less weak reporting framework (Nigeria). Environmentally sensitive industries result from South Africa agrees with (Brammer & Pavelin, 2008; Galani et al., 2012; Halkos & Skouloudis, 2016b). However, on the contrary, disagree with Ong et

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al., (2016). While environmentally sensitive industries result from Nigeria, tend to agree with Ismail & Ibrahim (2008) that document insignificant relationship and Ong et al. (2016) of low disclosure of environmentally sensitive industries that portrays poor and weak legal environment.

On the other hand, the coefficients for the variables audit committee independence; board meeting and firm size were not significant in both countries. This finding implies that these variables do not significantly influence the extent of environmental disclosure of listed firms in South Africa and Nigeria. These results negate the agency theory which expects the presence of independent directors on the board to help to overcome agency related problems (Aburaya, 2010; Ho and Wong, 2001; Rahim et al., 2015) and larger firms to disclose extensively disclose environmental information.

Table 7 report coefficients and significance of board size in all the models for South Africa and Nigeria.

Table 7: Shows coefficients and significance board size for acceptance of H3

	South Africa		**Nigeria**	
Variable	Coefficient	Prob.	Coefficient	Prob.
BSIZE Vs EP (M1)	1.421287	0.0117***	1.121558	0.0219**
BSIZE Vs PPEI (M2)	2.614216	0.0023***	1.436294	0.0129***
BSIZE Vs CELS (M3)	2.230097	0.0369**	1.696002	0.0299**
BSIZE Vs EA (M4)	2.008936	0.1079*	-2.875932	0.0076***
BSIZE Vs OERI (M6)	0.771991	0.0528**	0.680805	0.0748*
BSIZE Vs OED (M7)	1.757716	0.0034***	1.067189	0.0315**

Notes: Bsize, board size. *,**,***Significant at p<0.10; p<0.05; p<0.01, respectively.M1, model for environmental policies disclosure (EP) ; M2, model for product and process environmental issues disclosure (PPEI); M3, model for compliance with environmental laws and standards disclosure (CELS); M4, model for environmental auditing disclosure (EA); M6, model for other environmental related information disclosure (OERI); M7, model for Overall environmental disclosure (OED)

Table 7 agrees with the stated H2 that board size is more associated with the extent of environmental disclosure in South Africa. The finding that board size statistically significantly influence the degree of environmental disclosure in South Africa, and Nigeria is in tandem with the results of Akbas (2016); Andrikopoulos & Kriklani (2013) Jizi et al. (2013) ; Osazuwa et al., (2016); Samaha et al. (2015). Supported by agency theory, stakeholder theory and legitimacy theory. The beauty of our approach is that the whole model is ranging from categories to overall environmental disclosure. We document that larger number of directors on the board of companies positively statistically significantly determine the extent of environmental disclosure in both South Africa and Nigeria except M4 environmental auditing. The result of environmental auditing disclosure category shows the mixed result. For South Africa, board size has a positive relationship with environmental auditing but relatively less significant (p = 0.10, r=2.008936). While in Nigeria, the relationship between board size and environmental auditing disclosure reveal a negative and significant association (p=0.0076,r=-2.875932).

Table 8 provides coefficients and significance of board independence in all the models for South Africa and Nigeria.

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Table 8: Shows coefficients and significance board independence variable for rejection of H4

	South Africa		Nigeria	
Variable	Coefficient	Prob.	Coefficient	Prob.
BIND Vs EP(M1)	0.085930	0.4009	0.123237	0.1005*
BIND Vs PPEI (M2)	0.161112	0.2982	0.190528	0.0319**
BIND Vs CELS(M3)	0.252174	0.1950	0.261866	0.0301**
BIND Vs EA (M4)	0.558223	0.0149**	0.392189	0.0185***
BIND Vs OERI (M6)	0.071513	0.3245	0.177855	0.0031***
BIND Vs OED(M7)	0.110393	0.3100	0.228227	0.0033***

Notes: BIND, board independence. *,**,***Significant at p<0.10; p<0.05; p<0.01, respectively.M1, model for environmental policies disclosure (EP) ; M2, model for product and process environmental issues disclosure (PPEI); M3, model for compliance with environmental laws and standards disclosure (CELS); M4, model for environmental auditing disclosure (EA); M5, model for Sustainability (SUS); M6, model for other environmental related information disclosure (OERI); M7, model for Overall environmental disclosure (OED)

The Table 8 shows that only environmental auditing disclosure model agrees with the H3, that board independence is more associated with the extent of environmental auditing; all other corporate environmental disclosure variables showed that South Africa's board independence is less associated (insignificant) with the extent of corporate environmental disclosure when compared with Nigeria. There is a significant positive correlation between board independence and disclosure amount of each of environmental policies, product and process-related environmental issues, Compliance with Environmental Laws Standards, environmental auditing and sustainability and other environmentally- related information in Nigeria. Overall conclusion about board independent influence on the extent of corporate environmental disclosure is that BIND statistically significantly associated with environmental disclosure of listed firms in Nigeria more and less in South Africa. We, therefore, reject H3. On this note, the finding is in line with Ernstberger & Grüning (2013) suggesting a substitutive relationship between corporate governance and the regulatory environment. The revelation implies that South African legal and regulatory framework is strong (Khlif et al., 2015) that compensate the level of South Africa environmental disclosure while the independent executive directors on board of listed firms in Nigeria substituted for poor regulatory environment (Adegbite, 2015)

Table 9 reports coefficients and significance audit independence in all the models for South Africa and Nigeria.

Table 9: Shows coefficients and significance audit independence variable for rejection of H4

	South Africa		Nigeria	
Variable	Coefficient	Prob.	Coefficient	Prob.
ACOINDE Vs EP (M1)	0.058084	0.5697	0.054884	0.3703
ACOINDE Vs PPEI (M2)	0.106309	0.4918	0.091516	0.2052
ACOINDE Vs CELS (M3)	-0.045219	0.8157	0.022510	0.8178

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ACOINDE Vs EA (M4)	-0.193472	0.3953	-0.057745	0.6646
ACOINDE Vs OERI (M6)	0.078766	0.2776	-0.026658	0.5792
ACOINDE Vs OED (M7)	0.056936	0.5999	0.040118	0.5187

Notes: ACOINDE, audit committee independence; *,**,***Significant at p<0.10; p<0.05; p<0.01, respectively.M1, model for environmental policies disclosure (EP) ; M2, model for product and process environmental issues disclosure (PPEI); M3, model for compliance with environmental laws and standards disclosure (CELS); M4, model for environmental auditing disclosure (EA); M5, model for Sustainability (SUS); M6, model for other environmental related information disclosure (OERI); M7, model for Overall environmental disclosure (OED)

Virtually in all the models of corporate environmental disclosures quantity for both countries are insignificant with respect to ACOINDE. Thus, all the categories models indicate that audit committee independence (ACOINDE) insignificantly influence the extent of environmental policies, product and process-related environmental issues, compliance with environmental laws standards, environmental auditing and sustainability and other environmentally- related information in both South Africa and Nigeria. This insignificant result (r=0.058936, p=0.56936) for South Africa and (r=0.040118, p=0.5187) of Nigeria relationship is confirmed by M7 that overall environmental disclosure quantity (OED) is not influenced by audit committee independence. Hence, these results allow invalidating our H4, corroborating the result attained by (AbuRaya, 2010; Akbas, 2016) that found that presence of independent directors on the audit committee is unrelated to the extent of environmental disclosure. The findings do not support the crucial role of overcoming agency related problems as expected by stakeholders.

Table 10 reports coefficients and significance board meeting in all the models for South Africa and Nigeria.

Table 10: Shows coefficients and significance board meeting variable for rejection of H5

	South Africa		**Nigeria**	
Variable	Coefficient	Prob.	Coefficient	Prob.
BOMET Vs EP(M1)	0.761256	0.3655	0.150064	0.8718
BOMET Vs PPEI (M2)	0.516856	0.6844	1.658790	0.1323
BOMET Vs CELS (M3)	1.652489	0.3013	-0.283271	0.8489
BOMET Vs EA (M4)	-0.038569	0.9836	3.363371	0.1001*
BOMET Vs OERI (M6)	-0.201934	0.7348	1.497301	0.0431**
BOMET Vs OED (M7)	0.476930	0.5933	1.245980	0.1898

Notes: BOMET, board meetings; *,**,***Significant at p<0.10; p<0.05; p<0.01, respectively.M1, model for environmental policies disclosure (EP) ; M2, model for product and process environmental issues disclosure (PPEI); M3, model for compliance with environmental laws and standards disclosure (CELS); M4, model for environmental auditing disclosure (EA); M5, model for Sustainability (SUS); M6, model for other environmental related information disclosure (OERI); M7, model for Overall environmental disclosure (OED)

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The Table 10 reveals that among all the categories of environmental disclosures in both countries, only board meeting in M6 statistically significantly influence other environmental related information issues (OERI) disclosure in Nigeria. The result suggests that board meetings are more associated with the extent of corporate environmental disclosure in Nigeria and less in South Africa. Therefore, we, reject H5. The results contradict the earlier finding of Osazuwa et al. (2016) in Nigeria and (Ntim & Osei, 2011) from South Africa.

Table 11 shows coefficients and significance of environmental committee in all the models for South Africa and Nigeria.

Table 11: Shows coefficients and significance environmental committee variable for acceptance of H6

Country	**South Africa**		**Nigeria**	
Variable	Coefficient	Prob.	Coefficient	Prob.
ENVICOM Vs EP (M1)	17.58235	0.0000***	2.824099	0.3687
ENVICOM Vs PPEI (M2)	17.74424	0.0005***	5.087024	0.1701
ENVICOM Vs CELS (M3)	21.10116	0.0010***	7.116478	0.1580
ENVICOM Vs EA(M4)	39.57829	0.0000***	-3.196894	0.6394
ENVICOM Vs OERI(M6)	7.683426	0.0013***	1.946799	0.4301
ENVICOM Vs OED (M7)	16.99066	0.0000***	3.619897	0.2575

Notes: ENVICOM, environmental committee; *,**,***Significant at p<0.10; p<0.05; p<0.01, respectively.M1, model for environmental policies disclosure (EP) ; M2, model for product and process environmental issues disclosure (PPEI); M3, model for compliance with environmental laws and standards disclosure (CELS); M4, model for environmental auditing disclosure (EA); M5, model for Sustainability (SUS); M6, model for other environmental related information disclosure (OERI); M7, model for Overall environmental disclosure (OED)

Importantly, the environmental committee variable coefficient in all the models of corporate environmental disclosure for South Africa proves to be positive at p = 0.00 (p<0.01) significance level, in conformity with the expected sign. Firms operating in a highly regulated and strong reporting environment is also enjoined to be proactive (Peters & Romi, 2012) in agreement with agency theory and legitimacy theory. The models sustain well such a relationship. While models for Nigeria, supports the view of firms operating in poorly regulated and weakly reporting environment as ENVICOM do not significantly (P>0.10) influence environmental disclosure. As a result, H6 is accepted, our result on the influence of environmental committee on the extent of environmental disclosure is a corroborating finding of Dixon-Fowler et al., (2017); Liao et al., (2015); Peters & Romi (2013), as well as (Vasseur et al., 1997). Such a result is shown to be in contrast with the view of (Berrone & Gomez-Mejia, 2009) for South Africa.

Table 12 reports coefficients and significance of industry membership in all the models for South Africa and Nigeria.

Table 12: Shows coefficients and significance industry membership variable for acceptance of H7

Country	**South Africa**	**Nigeria**

Variable	Coefficient	Prob.	Coefficient	Prob.
INDUM Vs EP (M1)	9.371840	0.0026***	1.115702	0.6553
INDUM Vs PPEI (M2)	10.75881	0.0215**	1.959748	0.5054
INDUM Vs CELS (M3)	20.16103	0.0007***	-0.629017	0.8748
INDUM Vs EA (M4)	6.445843	0.3466	-5.826614	0.2889
INDUM Vs OERI(M6)	5.551769	0.0115***	1.905328	0.3331
INDUM Vs OED(M7)	9.775367	0.0031***	1.914144	0.4515

Notes: INDUM, industry membership; *,**,***Significant at p<0.10; p<0.05; p<0.01, respectively.M1, model for environmental policies disclosure (EP) ; M2, model for product and process environmental issues disclosure (PPEI); M3, model for compliance with environmental laws and standards disclosure (CELS); M4, model for environmental auditing disclosure (EA); M5, model for Sustainability (SUS); M6, model for other environmental related information disclosure (OERI); M7, model for Overall environmental disclosure (OED)

According to the Table 12, South Africa models reveal that the environmentally sensitive industries' coefficient is positive and statistically significant at (p<0.05), by the expected sign, expect environmental auditing M4 reveals not significant (p>0.05). On the one hand, all Nigeria models indicate that belonging to environmentally sensitive industries' do not statistically (p>0.10) influence environmental disclosure. Therefore, H7 is confirmed. The South Africa's results corroborate well the results reached by Halkos & Skouloudis (2016), Galani et al., (2012), Brammer & Pavelin, (2008) confirming that the presence of strong reporting framework institution associated with the occurrence of stakeholder activism (Darrell & Schwartz, 1997) which upheld legitimacy theory.

Table 13 reports coefficients and significance of firm size in all the models for South Africa and Nigeria.

Table 13: Shows coefficients and significance firm size variable for acceptance of H8

	South Africa		**Nigeria**	
Variable	Coefficient	Prob.	Coefficient	Prob.
FS Vs EP (M1)	9.49	0.5134	-1.23	0.5583
FS Vs PPEI (M2)	-1.43	0.5148	-3.20	0.1965
FS Vs CELS (M3)	-1.03	0.7079	-5.99	0.0760*
FS Vs EA (M4)	3.81	0.2386	5.43	0.2378
FS Vs OERI (M6)	2.92	0.7770	-4.52	0.0072***
FS Vs OED (M7)	4.67	0.9759	-2.50	0.2407

Notes: FS, firm size; *,**,***Significant at p<0.10; p<0.05; p<0.01, respectively.M1, model for environmental policies disclosure (EP) ; M2, model for product and process environmental issues disclosure (PPEI); M3, model for compliance with environmental laws and standards disclosure (CELS); M4, model for environmental auditing disclosure (EA); M5, model for Sustainability (SUS); M6, model for other environmental related information disclosure (OERI); M7, model for Overall environmental disclosure (OED)

According to results in Table 13, a significant positive relationship exists between OERI and firm size in M6 for Nigeria sample. No significant association is detected between overall environmental disclosure quantity and

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company size for both countries. Concerning environmental disclosure categories, the results confirmed the insignificant association between firm size with disclosure amount of almost all disclosure categories. Therefore, H8 proves to be rejected. This result does not match with the results achieved by Lu & Abeysekera (2014a); Lu & Abeysekera (2014b);Zeng et al., (2010) (Galani et al., 2012) Ismail & Ibrahim (2008) Suttipun & Stanton (2012) Cormier & Magnan (1999) Brammer & Pavelin (2008) as well as Chek et al., (2013). Usually, companies having a big size are characterized by more transparency, less information asymmetry.

Table 14 provides coefficients and significance of audit firm size on all the models for South Africa and Nigeria.

Table 14: Shows coefficients and significance audit firm size variable for acceptance of H9

Country	South Africa		Nigeria	
Variable	Coefficient	Prob.	Coefficient	Prob.
AFS Vs EP (M1)	8.369823	0.0146***	2.728981	0.2579
AFS Vs PPEI (M2)	10.77206	0.0375**	5.761236	0.0441**
AFS Vs CELS (M3)	4.933077	0.4457	9.990094	0.0108***
AFS Vs EA (M4)	9.728695	0.2000	6.294929	0.2314
AFS Vs OERI(M6)	4.063869	0.0933*	1.583889	0.4025
AFS Vs OED (M7)	7.972030	0.0284**	5.008107	0.0428**

Notes: AFS, audit firm size; *,**,***Significant at p<0.10; p<0.05; p<0.01, respectively.M1, model for environmental policies disclosure (EP) ; M2, model for product and process environmental issues disclosure (PPEI); M3, model for compliance with environmental laws and standards disclosure (CELS); M4, model for environmental auditing disclosure (EA); M5, model for Sustainability (SUS); M6, model for other environmental related information disclosure (OERI); M7, model for Overall environmental disclosure (OED)

The table 14 shows regarding M7 that there is a significant positive relationship between overall environmental disclosure and audit firms size for South Africa and Nigeria at (r=7.972030, p= 0.0284) and (r=5.008107, p= 0.0428) respectively. Thus, in M1 and M2 categories level, the audit firm size coefficient is positive and simultaneously significant and conforming with the expected sign in a strong legal and regulatory environment. Also, the significant positive relationship is confirmed by M2 and M3 for Nigeria. Hence, these results allow corroborating the results attained by Wang et al., (2008), Copley (1991), Braam & Borghans (2014). In this regard, surprisingly M4 in both countries reveals that audit firm size does not significantly influence environmentally auditing disclosure. Also revealed is that in a relatively weak legal and regulatory institution, audit firm size (reputation) positively and significantly (p=0.01) influences Compliance with Environmental Laws Standards while in a strong legal country the result is opposite (insignificance).

5. Conclusions

The differences in respect to the mode of reporting system between the two leading African emerging economies allows us to distinguish between the extent at which corporate board mechanisms influence environmental disclosure quantity between the two countries South Africa and Nigeria. Our results are consistent with the conclusion that corporate board characteristics influences environmental disclosure in both countries, but comparatively emphasises centres on the magnitude of the association in a relatively weak regulatory framework and that of strong reporting environment. Our results are robust for corporate environmental disclosure quality for

country that have strong institution and have implemented integrated reporting regulations. Moreover, the influence of board independence on environmental reporting suggests a substitutive relationship in a traditional reporting setting. While interestingly, our results reveal a great concern with regards to environmentally polluting industries and less environmentally polluting industries. Firms from strong regulatory framework and are environmentally-sensitive-industries are more inclined to disclose their environmental impact. While their counterpart firms from weak legal environment publish less environmental impact to stakeholders. This result is inconsistent with both the voluntary disclosure perspective and the legitimacy theory. Interestingly, companies that have environmental committee are more likely to publish their environmental responses. Furthermore, our results are based on the unique setting of medium of disclosure, characterized by mandatory integrated reporting of environmental impact and voluntary disclosure of climate change-related issues. Therefore, we are constrained to cross-sectional content analysis and should be careful of generalizing our specific results. Our results provide useful insight background information for future research and are also relevant for regulators and policymakers charged with environmental accounting. Our contribution to the literature is twofold. First, we shed further light on the difference between robust and weak reporting framework corporate board characteristics influence on the extent of environmental disclosure to the public. Second, we contribute specifically to the environmental disclosure literature by showing—in the setting of different reporting framework—industry membership influences on environmental disclosure decisions vary. In Polluting-intensive industries, the mandatory disclosure perspective (integrated reporting) and the legitimacy perspective advanced in prior research appear to complement each other in a highly regulated country while our result extends prior study arguing that environmentally sensitive industries in poorly regulatory country, voluntary disclosure perspective substitute legitimacy perspective.

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