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Abstract

The study examines firm characteristics and voluntary environmental disclosures among oil and gas and industrial goods companies listed on the Nigerian Exchange Group (NGX). The inappropriate estimation technique often adopted in a content analysis studies motivates this study. The study adopts longitudinal research design, taking a census of thirty (30) companies of the entire oil and gas and industrial goods companies during the period 2014 to 2021, secondary data was sourced from the annual reports, while adopting the Cragg double hurdle model. The marginal effect (elasticities) of the explained variables of the double hurdle model shows the same exact direction of the coefficient with the second hurdle result where FS, ROA, and LEV have positive coefficients with p-values (0.0440, 0.0512, 0.0197; p=0.000, 0.306, 0.007) respectively while FA maintains its negative coefficient with p-value (-0.0006, p=0.274). FS, ROA and LEV being positively signed indicate conformity to both stakeholder and legitimacy theories, however with caution being exercised on ROA and FA. The study concludes that some firms attributes such as FS and LEV determines the decision and intensity of environmental disclosure while ROA and FA do not.

Keywords: Double hurdle, environmental disclosure, environmental sensitive firms, firm attributes

Introduction

A growing number of people are worried about how business operations are affecting the environment. With particular reference to the Bhopal and Exxon Valdez disasters, this worrying environmental issue has been going on for decades. As a result of negative environmental effects such climate change and global warming, natural disasters, and pollution, stakeholders' worries about the need to protect the environment globally have increased (Akbas, 2014). The situation is also the same in Nigeria, especially in the Niger Delta region where the discovery of mining resources has resulted in environmental hazards and ensuing instability. The pursuit of sustainability has led to the development of international organizations like GRI, IIRC, the United Nations Protocol, and the Agreement on Environments that set forth various standards for how humans should interact with the environment (Ezeagba, 2017). In Nigeria, we have had ethical regulatory laws such as NESREA and NOSDRA that prescribed sanctions about environmental activities of firms (Omoye & Wilson-Oshilim, 2018). There has been the demand by stakeholders that firm environmental disclosure practices should be communicated through the annual report. Environmental

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disclosure becomes a means through which firms report its environmental activities to the stakeholders (Hendri & Puteri, 2015). It is believed that environmental disclosure practices will improve environmental performance and enhances the image of firms to be environmentally responsive. However, no reporting framework exist upon which firms should comply and disclose environmental practices among Nigerian firm. The general remarks on sustainability issues contained in the codes of corporate governance did not espouse core environmental issues upon which firms are expected to comply with (SEC, 2011; SEC, 2014; FRCN, 2018). Giving the voluntary nature of environmental disclosure practices in Nigeria, there has been an unending debates as regard its determinants.

Several studies have been done on factors that influences the decision of firms to disclosures their environmental practices, specifically firm attributes (Ahmad, 2017; Brammer & Pavelin, 2018; Dibia & Onwuchekwa, 2015; Elshabasy, 2018; Egbunike & Tarilaye, 2017; Ohidoa et al., 2016; Onyali & Okafor, 2018). An analysis of the state of empirics clearly shows concentration of firms in Environmentally Sensitive Industries (ESI) such as the Oil and Gas, industrial goods sectors just to mention a few. The reason is that environmental disclosure practices could be influenced by environmental sensitivity. Be that as it may, these studies also present a peculiar scenarios worth re-examining. An environmental disclosure score or index is produced using either a content analysis or binary scores depending on whether environmental disclosure is portrayed as a discrete or continuous consequence. In the former, the probit and logit models are used for analysis, while multiple regression is used in the later, in both cases seen as a one-step strategy. When using these approaches, specifically when the disclosure score is generated from content analysis, it is implied that a set of variables could influence businesses' decisions to disclose since it is voluntary on one hand and the extent of disclosure on the other (Ekundayo et al., 2021). The issue with this premise is that it's feasible for a variable to have various effects on an entity's decision to reveal information as well as the scope and intensity of their disclosures, which becomes a two-stage distinct stochastic process. Therefore, adopting the probit and logit models which are regarded as a one-step strategy is inherently restrictive.

Cragg (1971) recommends using the double-hurdle regression technique to get over the one step approach's restrictiveness. The decision to adopt and the strength of adoption are influenced by two distinct stochastic processes in the double-hurdle model, which is a two-stage approach and a parametric generalization of the P-Tobit model. The double-hurdle approach has the benefit of determining whether a set of variables

determines the intensity/extent of disclosures once firms have taken the decision to disclose. Although this approach has been applied in few studies both in and outside Nigeria (Ekundayo et al., 2021; Ekpulu & Iyoha, 2023; Martinez-Espineira, 2006; Moffatt 2005; Teklewold et al., 2006), however, there is further need to re-examine the study. For instance, while the study of Ekundayo et al. (2021) provides useful insight on the determinants of environmental disclosure from agency perspective, the study of Ekpulu and Iyoha (2023) examines how firm attributes determines such disclosure, however failing to account for the marginal effect (elasticities) of the explained variables of the double hurdle model. Ekundayo et al. (2023) states that with the nonlinear nature of the double-hurdle model, it is challenging to interpret the estimated coefficient, hence the need to compute marginal effects (elasticities) of the explained variables of the double-hurdle model. The marginal effect, for practical purpose, is appropriate in explaining the intensity of environmental disclosure, after having examined the chances of participating in environmental disclosure. This position is fully attended in this paper. Therefore, based on the restrictiveness in the one step approach which most studies adopted and the non-inclusion of the elasticities of the explained variables in the double hurdle in the study of Ekpulu and Iyoha (2023), there is the need to overcome this problem, the reason for the study.

Literature Review

Theoretical Framework

The model for this study is anchored on stakeholders' and legitimacy theories. Stakeholders Theory: According to Freeman (2010), the key thrust of stakeholder theory is that organizations are inherently related to various groups that have desires and/or are influenced by the actions of organisations. Therefore, managers of firms need to resolve the concerns and demands of these various stakeholders' in a way that generates value and ensures long-term survival of firms. In view of the adverse impact of organisations activities on its environment, there has been a shift from profit maximization to other components such as people and planet (Tripple Button Line Accounting). The justification is that, apart from profits, organisation should be socially and environmentally responsible. Particularly, the environmental degradation and other adverse effects caused by organisation activities has stair up the need for stakeholders such as host communities of these organisation to demand for organisations being environmentally responsible. Although environmental laws have been enacted to protect host communities against harmful activities of organisations, however, there has been calls that environmental activities should communicate through annual disclosures. However, no specific prescribed benchmark for reporting corporate

environmental practices in Nigeria, consequently, its disclosure is voluntary and its determined by myriads of factors such as firm related factors, environmental sensitivity factors etc.

Legitimacy Theory: Legitimacy theory is a generalized perception or assumption that an entity's actions are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs and definitions (Suchman, 1995). This is reflected in companies' consideration, concern and expectation to gain legitimacy from stakeholders' viewpoint, and also pledge that their business operations are carried out in a socially and environmentally acceptable manner (Aghdam, 2015). According to Patten (1992), the theory is centered on the social contract that ought to exist between corporate entities and society; these contracts stipulate that business entities' values and those of society ought to be intertwined. If businesses are unable to address social environmental problems, which could have a detrimental impact on the businesses, this contract is seen to have been broken (Milne & Patten, 2002). Environmental disclosure procedures can be communicated, for example, through disclosures in annual reports. The legitimacy hypothesis, which contends that corporations publish environmental information primarily to sustain the implicit social compact, increase their continued presence in the environment, and avert legitimacy crises, thus serves as another foundation for the study. However, there is no specific corporate environmental disclosures practices framework in Nigeria, this suggests that these disclosure practices is voluntary and could be determined by several factors such as firm specific attributes (firm size, earnings, leverage and firm age). In line with the above theories, concerned stakeholders exhibit varying interests. From the creditor, who is interested in the firm's leverage and earnings, to the government, who is interested in the profit for tax purposes, and down to existing and potential employees, who are interested in the firm's size, earnings, and age for job security assurance, companies are under pressure from these stakeholders to be environmentally friendly in the production process and final products in order to remain strategic and competitive for better performance. Also, prior studies formed the justification for this model, however with modification, specifically, in respect to the estimation method used (Ekundayo et al., 2021; Ekpulu & Iyoha, 2023).

Empirical Review

Environmental disclosure is a prepared document that describes an organization's environmental burden and actions, including its goals, policies, practices, and outcomes. It is regularly released and reported to the general public (Ong et al., 2016). According to Deegan and Rankin (1996), corporate environmental disclosures relate to the interaction between an organization's physical and social surroundings and include

information regarding human resources, community involvement, the environment, energy use, and product safety. It is an all-encompassing word that refers to the various ways in which companies provide specific users of financial statements with information regarding their environmental activities (Olayinka & Oluwamayuwa 2014). According to Akanet (2013), environmental disclosures could be communicated through a company's annual reports; alternatively, it could also be presented separately.

As commercial entities are increasingly expected to be both lucrative and environmentally responsible, the idea of corporate environmental disclosure has taken on a significant dimension in today's corporate world (Ong et al., 2016). According to Prior et al. (2008), companies can benefit from favorable treatment with regard to regulations, support from environmental activist groups, positive press coverage, and reputation maintenance by disclosing their social and environmental activities. According to Chang and Zhang (2015), companies should give environmental information disclosure a lot of consideration in order to establish outstanding long-term strategies and be competitive in the market. They further argued that an increased level of environmental information disclosure by corporate entities is pivotal in communicating their level of environmental responsibility to stakeholders. Along the same line of thought, Banwarie (2011) highlights that environmental disclosures from a strategic perspective can be used by a firm to manage its relations with the community in which it operates in order to enhance its long-term profitability and survival. Improved environmental disclosure could give a business a competitive edge, boost its corporate image, increase the value of its stock on the capital market, and lower its cost of capital, according to a further study of the literature (Akanet, 2013).

With reference to International Accounting standards (IAS) and International Financial Reporting Standards (IFRS), there is no defined standard for environmental disclosure practices. According to Goyal (2013), there are multiple direct and indirect references to environmental disclosures in various accounting rules rather than a distinct IAS or IFRS devoted to the topic. The situation is identical in Nigeria because there is no reporting system. It is possible to find comments on sustainability issues in corporate governance codes (SEC, 2011; FRCN, 2018). Consequently, environmental practices disclosure in annual reports of companies in Nigeria is voluntary. The GRI standard on environmental disclosure was used in the majority of earlier studies on this topic conducted in Nigeria and other economies without a statutory reporting structure on environmental disclosure. The GRI is the most frequently used and acknowledged standard for

advice on and reporting on corporate responsibility (Tschopp & Nastanski, 2014). The GRI structure went further to give specific line of items upon which companies are expected to report on.

Environmental disclosure is influenced by a variety of factors such as firm attributes, corporate governance just to mention a few being that it is voluntary. However, the focus of this study is on firm attributes such as firm age, financial leverage, firm profitability and firm size as the determinants. The concerned stakeholders are exhibiting varying interests. On firm size, Yao et al. (2011) contend that because of media attention and public scrutiny, huge corporations are under greater pressure to demonstrate greater environmental responsibility. Patten (2002) posits that larger organizations tend to disclose more information because they are more afraid of exposure than smaller ones. Also, large companies also pay a higher agency cost when they decide not to disclose their environmental operations because their shareholders are scattered (Christ & Burritt 2013). Therefore, increased environmental information disclosure reduces their anticipated agency expense. On the contrary, Da Silva and Aibar-Guzman (2010) contend that small firms' limited financial resources would prevent them from being able to finance environmental reporting. Therefore, larger companies are more likely to have the resources to pay for delivering environmental data to annual report readers. Some studies found a positive relationship between firm size and environmental disclosure (Ahmad 2017; Egbunike & Tarilaye, 2017; Onyali & Okafor, 2018; Eneh & Amakor, 2019) while others reported inverse relationship (Dibia & Onwuchekwa, 2015; Gatimbu & Wabwine, 2016). Being that this study intends deploy an entirely new technique on firms decision to adopt and the intensity of disclosure, the first hypothesis is:

H_1: *that firm size has a significant positive influence on the decision to disclose and the intensity of environmental disclosure of firms listed in the NGX.*

Profitability is the difference between incomes and expenses (Onyali & Okafor, 2018). Pandey et al. (2010) claim that it is a company's final product. According to El Ayach et al. (2014), it shows how well asset management organizations are performing. The relationship between a firm's economic success and the degree of environmental disclosure has been researched in the literature. According to Erhun et al. (2016), businesses with positive news are more inclined to participate in sustainability initiatives. In a similar spirit, Gunu and Adamade (2015) contend that only profitable businesses are better positioned to demonstrate considerations for the environment's protection and wise use of its resources Profitability, according to Mgbame and Ilaboya (2013), may affect whether or not businesses choose to share environmental

information. In keeping with this idea, Razeed (2009) emphasizes that businesses' economic success, as determined by their profitability, played a significant role in their decision to disclose environmental information. Therefore, it would be realistic to predict that profitable businesses would be motivated to disclose more environmental information in order to distinguish themselves from less successful ones (Onyali & Okafor, 2018). Regarding the connection between a company's profitability and the degree of environmental disclosure, the findings of past empirical studies on the subject of the empirical relationship between profitability and environmental disclosure offer conflicting conclusions. Numerous research found a positive connection (Osazuwa et al., 2013; Saha & Akter, 2013).

The positive link between profitability and the level of environmental disclosure can be explained on the basis that more wealthy businesses will have the cash to pay for environmental disclosure expenditures (Brammer & Pavelin, 2008). There have also been claims that businesses with high levels of profitability should reveal more information in order to increase their reputation with investors and prevent the negative headlines that comes with having excessive earnings (De Villiers & Van Staden, 2011; Cormier & Magnan, 1999). Other studies came to negative conclusions (Aghdam, 2015; Andrikopoulos & Kriklani, 2013; De Villiers & Van Staden, 2011; Kathyayini, Tilt & Lester, 2012). However, several research claimed that there is no connection between corporate profitability and how much information is disclosed about the environment. (Ahmad et al., 2003; Brammer & Pavelin, 2006; Clarkson et al., 2011; Galani et al., 2012; Suleiman et al., 2014). Being that this study intends deploy an entirely new technique on firms decision to adopt and the intensity of disclosure, the second hypothesis is:

H_2: *that firm profitability has a significant positive influence on the decision to disclose and the intensity of environmental disclosure of firms listed in the NGX.*

Financial leverage is the ratio of debt to equity that a firm utilizes to fund its assets. (Enekwe et al., 2014). For corporate environmental disclosure, leverage has been one of the most frequently used firm characteristics (Hannifa & Cooke, 2015; Cormier & Magnan, 2003; Ahmad et al., 2003). It is the debt to equity ratio and it demonstrates how management chose the best possible combination of financing solutions (Modugu, 2013). Businesses with high levels of debt, leverage, or gearing generally lack the financial resources required to meet the standards of sustainability reporting, according to Stanny and Ely (2008). High-leveraged enterprises may be less likely to make environmentally harmful investments since they lack the incentives to do so in order to increase wealth, according to Jensen (1986) and Myers (1977).

This position was further strengthened by the claim made by Cormier and Gordon (2001) that the release of environmental information may increase ownership costs for highly leveraged businesses and that such expenses may make loan talks more difficult and expensive.

Alsaeed (2006) makes the counterargument that companies with significant leverage are more inclined to voluntarily reveal more environmental information in order to manage agency and monitoring expenses. Ho and Taylor (2007) assert that in an effort to reduce agency costs, firms with greater leverage are more likely to increase the volume of corporate disclosure. Highly leveraged organizations have higher agency costs of debt and increased monitoring costs, according to Jensen and Meckling (1976). Prior empirical research on the relationship between financial leverage and environmental disclosure has shown mixed findings about the relationship between a company's financial leverage and its amount of environmental disclosure. According to certain studies, the link is favorable. (Suleiman et al., 2014; Juhmani, 2014). Some other studies found a negative relationship (Uwuigbe & Egbide, 2012; Ahmad, 2017; Hakim & Majda, 2013; Andrikopoulos & Kriklani, 2013). However, a study carried out by Akbas (2014) report that there is no relationship between firm financial leverage and the extent of environmental disclosure. Being that this study intends deploy an entirely new technique on firms decision to adopt and the intensity of disclosure, the third hypothesis is:

H_3: *that firm leverage has a significant positive influence on the decision to disclose and the intensity of environmental disclosure of firms listed in the NGX.*

Firm age is the period of time since a company was established and started conducting business (Mgeni & Nayak, 2016). It is assessed from the date of incorporation of the firms. Ogoun and Ekpulu (2020) posits that older businesses should have a competitive, strategic, and inventive advantage over younger organizations, which should also improve the related business leadership advantages. According to Roberts (1992) and Choi (1999), as a corporation gets older, its reputation for discretionary actions like environmental protection and sharing of environmental information improves. Liu and Anbumozhi, (2009) supports this argument by stating that the age of a firm is an indication that the firm is satisfying its stakeholders with respect to compliance with its financial and social/environmental obligations. Similarly, time and experience help companies discover what they excel at, and learn how to do it better. They specialize in standardizing, coordinating, and speeding up their manufacturing processes to cut costs and

enhance quality. Also, older organisations are expected to inspire greater creative practices and corporate leadership.

On the empirical relationship between firm age and environmental disclosure, The findings of previous studies provide mixed results on the relationship between the age of a company and the level of environmental disclosure. Some studies have found the relationship positive (Untari, 2010; Khaldoon, 2015). Other studies found inverse relationship (Ibrahim, 2014; Kabir, 2014; Elshabasy, 2018). However, results from some other studies reveal that firm age does not affect environmental disclosure (Akbas, 2014; Prihandono, 2010; Cahyani & Suryaningsih, 2016). Being that this study intends deploy an entirely new technique on firms decision to adopt and the intensity of disclosure, the fourth hypothesis is:

H4: that firm age has a significant positive influence on the decision to disclose and the intensity of environmental disclosure of firms listed in the NGX.

Methodology

The functional form of the model is stated below:

EVD= f(CFATT)---(i)

EVD= Environmental disclosure; CFATT= Corporate firm attributes. The corporate firm attributes of interest are firm size (FS), financial performance (FP), leverage (LEV) and financial age (FA). These variables are expressed in functional form with reporting quality:

EVD= f(FS, FP, LEV, FA)--(ii)

Model (ii) is presented in econometric form:

$EVD_{it} = \lambda_{it} + \lambda_1 FS_{it} + \lambda_2 FP_{it} + \lambda_3 LEV_{it} + \lambda_4 FA_{it} + \varepsilon_{it}$ ---(iii)

Where: λ_{it} = intercept of each cross sections; λ_1 to λ_4= Unknown coefficient; ε_{it}= error term; i= firm (1-30); and t= time (1-8 years).

Translating equ. (iii) into the Cragg (1971) double-hurdle specification, the participation and the intensity stage of the double-hurdle model is described below:

The double hurdle model is simply running two models in one: the choice/selection model and the outcome model. The double hurdle model enables for stochastic participation and consumption decisions to be made independently (Eakins, 2013). In 1971, Cragg originally suggested the model to enable for two separate

processes to be analyzed within the framework of a single model. Therefore, the extent of environmental disclosure depends on both the firms' decision to participate in the disclosure practices and the observed extent or quantity of disclosure. The choice to reveal is the initial step, and the dependent variable is a binary one. The second process is a measure of the extent of the disclosure, usually with a categorical variable that may or may not be dichotomous. While the first phase is comparable to a probit analysis in that it models the decision to reveal, the level of environmental disclosure is determined by a truncated regression in the model having a lower limit of zero {ll(0)}. Accordingly, the double hurdle model enhances the Tobit and extended Tobit (Heckit models) (Cragg, 1971; Eakins, 2013). Because the Tobit model is nested inside the double hurdle model, direct statistical tests may be used to evaluate which model fits the data the best. The model assumes that the factors explaining a firm choice of disclosure and how much to disclose have a different effect on these two decisions, unlike Tobit model that assume the same effect on these two decisions. The Cragg model is an independent double hurdle model that allows the factors that determine disclosure choice and disclosure depth or level to differ. With reference to the study of Ekundayo et al. (2021), below is the econometric expression of the two stages:

Participation model

$D^*_i = 1$ if $Z_i \delta + u_i > 0$

---(iv)

$D_i = 0$ if $Z_i \delta + u_i \leq 0$

In the above equations, the unobserved latent variable D^*_i representing the participation hurdle and i d is the observed binary variable ($D^*_i = 1$ indicate that there is firm/household participates in the practice of environmental disclosures while $D_i = 0$ is an indication of no participation). Z_i is a vector of observed independent or autonomous covariates that describe individual i's decision to partake in the disclosure. u_i is an unobserved random variable that encompasses all variables other than Z_i that impact firm's choice to participate the disclosure of its environmental activities. The depth of environmental disclosure in the second/next stage is then given by:

Intensity model

$Y_i^* = x_i \beta + \varepsilon_i$

$Y_i = Y_i^*$ *if* $D_i = 1$ and $Y_i^* > 0$

---(v)

$u_i \approx N(0,1)$; $\varepsilon_i \approx N(0, \sigma^2)$

corr $(u_i, \varepsilon_i) = \rho$ unobserved elements having an effect on the participant may have an effect on the quantity or amount sold. The double-hurdle model's coefficients are calculated by maximizing the log-likelihood function:

---(vi)

$$LogL = \sum_0 \ln\left[1 - \varphi(z_i'\alpha)\varphi\left(\frac{x_i'\beta}{\sigma}\right)\right] + \sum_+ \ln\left[\varphi(z_i'\alpha)\frac{1}{\alpha}\varphi\left(\frac{y_i - x_i\beta}{\alpha}\right)\right]$$

Table 1: Measurement of variables

S/n	Variable	Measurement	Used by prior studies	Appriori expectation and Justification
1	Environmental disclosure	(i) For the first hurdle, environmental disclosure is proxy by dummy variable measure of 1 if firm discloses and 0 if otherwise (ii) for the second hurdle, it is proxy by generating an index score (either in ratio or integer form) based on the GRI benchmark.	Ndukwe and Onwucheka (2015); Ezhilarasi and Kabra (2017)	Nil
2	Firm size	This is measured by log of total assets	Egbunike and Tarilaye, (2017)	+ (Legitimacy and agency theories)
3	Financial performance	This is measured by the ratio of profit after tax to total assets	Hannifa and Cook (2002); Omoye and Wilson-Oshilim (2018	+ (stakeholder, signalling and resource base view theories)
4	Leverage	This is measured by the ratio of total debts to total equity.	Rafique (2010); Uwigbe (2011)	+/- (Stakeholders and agency theories)
5	Firm age	This is measured by the number of years of a firm from the year of listing	Omar (2014)	+ (Legitimacy theory)

Findings and Results Discussions

Multivariate Regression Result

The multivariate regression seeks to examine the relationship between firm attributes and voluntary environmental disclosure. In doing this, the double-hurdle estimation technique was employed. The result is presented and discussed below:

Table 2: Double Hurdle Regression Result

Variable	Probit Model	Tobit Model	Double Hurdle Model		
			Ist Hurdle	2nd Hurdle	Marginal Effect, dydx
C	-2.873 (1.041) {0.006}	0.012 (0.168) {0.941}	-2.873*** (1.041) {0.006}	-.1590** (0.069) {0.021}	-
FS	0.188 (0.066) {0.004}	0.041 (0.358) {0.000}	0.188*** (0.066) {0.004}	0.037*** (0.004) {0.000}	0.044*** (0.005) {0.000}
ROA	0.797 (0.858) {0.353}	0.030 (0.036) {0.403}	0.797 (0.858) {0.353}	0.007 (0.013) {0.598}	0.051 (0.050) {0.306}
LEV	0.202 (0.123) {0.100}	0.0262 (0.008) {0.001}	0.202* (0.123) {0.100}	0.009*** (0.003) {0.001}	0.020*** (0.007) {0.007}
FA	0.022 (0.007) {0.006}	0.003 (0.001) {0.000}	0.022*** (0.007) {0.002}	-0.002*** (0.000) {0.000}	-0.001 (0.001) {0.274}
Log Likelihood	-61.742	-33.890	134.893		
LR chi2(4)	36.90	44.09	126.62		
Prob> chi2	0.000	0.0000	0.000		
Pseudo R2	0.230	0.394	-0.884		
No. of Obs.	240	240	240		240
LR chi 2(4)[overall]			87.713 (0.000)		

Source: Researcher's compilation (2023) from STATA 17.0 *** sign@1%, ** sig@5% and * sig@10%, (Coefficient), {P-value}

From the result presented, in the **first hurdle**, a positive coefficient with a significant P-value for FS (0.1880, p=0.004) was revealed. For ROA, it shows a positive coefficient with an insignificant P-value (0.7969, p=0.353). LEV have a positive coefficient and a significant P-value @10 sig. lev. (0.2021, p=0.100). Also, FA shows a positive coefficient with a corresponding significant P-value (0.0224, p=0.002). Furthermore, the result presented indicate that in the **second hurdle**, a positive coefficient with a significant P-value for FS (0.0374, p=0.000) was revealed. For ROA, the result maintained the same trend where a positive coefficient with an insignificant P-value (0.0065, p=0.598) was discovered. LEV have a positive coefficient and a significant P-value (0.0092, p=0.001). Nevertheless, FA shows a negative coefficient but with a significant P-value (-0.0021, p=0.000). Interestingly, the marginal effect output did not reveal substantial deviation from the second hurdle. The marginal effect shows the same exact direction

of the coefficient with the second hurdle result where FS, ROA, and LEV have positive coefficients with their corresponding P-values (0.0440, 0.0512, 0.0197; p=0.000, 0.306, 0.007). FA maintains its negative coefficient with an insignificant P-value (-0.0006, p=0.274). The marginal effect, for practical purpose, is appropriate in explaining the intensity of environmental disclosure, after having examined the chances of participating in environmental disclosure. This position is fully attended to in the next sub-title after the presentation of results.

The result with respect to firm size, indicates that firm size has a positive and significant values in the first and second hurdles and even on the marginal effect. This implies that, firm size increases the chances of corporate environmentally sensitive firms participating in environmental disclosure and the intensity of their disclosure. Having scaled through both hurdles, it is evident that firm size is a significant determinant of both the firm choice to participate and the degree of participating in environmental information disclosure. This is also demonstrated from the computed marginal effect with a positive and significant coefficient at 1% (0.044; p=0.000). Therefore, in line with the studies' result on firm size, the hypothesis, *H_1: that firm size has a significant positive influence on the decision to disclose and the intensity of environmental disclosure of firms listed in the NGX is accepted.*

This further shows that big firms with high assets value consider it paramount to participate in the environmental disclosure of their activities relating to environmental impact. Due to how susceptible big firms are to public scrutiny and the possibility of incurring high agency cost, it is more likely that they will participate and disclose more of their environmental information in a voluntary disclosure clime like Nigeria. In corroborating the above view, Yao et al. (2011), posit that large companies are under more pressure to exhibit more environmental responsibility since they receive more media attention and public scrutiny. Additionally, because their shareholders are dispersed, large businesses incur a greater agency cost when they choose not to disclose their environmental activities (Watts & Zimmerman, 1983; Christ & Burritt 2013). Therefore, increasing environmental information disclosure lowers their prospective agency expense. According to Patten (2002), larger companies fear exposure more than smaller ones, thus they choose to give more information. Several empirical studies conducted in line with this variable shows some supporting results. On the empirical relationship between firm size and environmental disclosure, some studies reported a positive relationship (Suleiman et al., 2014; Ahmad 2017; Ohidoa et al., 2016; Egbunike & Tarilaye, 2017; Onyali & Okafor, 2018; Eneh & Amakor, 2019).

According to the results on company profitability, there is a positive and insignificant values in both the first and second hurdles. The marginal effect output could further confirm that despite firm profitability having positive coefficients in both hurdles, profitability has no significant effect (0.051; p=0.306) in influencing both the chances of participating and the degree of participation in environmental disclosure. Hence, profitability is not a good determinant of environmental disclosure of firms whose activities are environmentally sensitive. Therefore, the hypothesis *H₂: that firm profitability has a significant positive influence on the decision to disclose and the intensity of environmental disclosure of firms listed in the NGX* is rejected. The study findings further reveal that company profitability does not significantly improves the likelihood of environmentally conscious corporations participating in environmental disclosure and the extent of their disclosure. After failing to overcoming these obstacles, it is clear that firm earnings have no substantial role, despite being positive, in determining the business's decision to engage in environmental information disclosure as well as the intensity of participation. This further demonstrates how important it is for large companies with huge asset values to participate in environmental disclosure of their operations' environmental effect. Interestingly, empirical evidence from extant literature supports this hypothesis. The under-cited relationship studies support the findings that there is no connection and significant influence between firm profitability and the extent of environmental disclosure (Clarkson et al., 2011; Galani et al., 2012; Suleiman et al., 2014). It will be ideal that firms in Nigeria, both indigenous and foreign firms, whose activities are subject to environmental devastation, should as a matter of stakeholders' interest and not only shareholders demand, channel some of their financial gains, reserves or retained earnings to environmental sustainability projects in line with global best practices. Investment in environmental project should not been seen as cost or expense to the firm. Firms should consider environmental projects as capital investment. This is very important because the environment which they operate is part of the major sources of their resources.

The outcome regarding firm leverage shows that leverage has positive and significant values in the first and second hurdles as well as on the average marginal effect (0.020; p=0.007) at 5%. From the result outcome, firm leverage improves the likelihood that corporate environmentally conscious businesses would participate in environmental disclosure and the breadth of their disclosure. After overcoming these hurdles, it is clear that leverage is a crucial factor in determining whether a corporation decides to engage in environmental information disclosure and how much. This further demonstrates how important it is for good debt mix in their capital structure maintain better disclosure of their environmental engagement

information. Therefore, the hypothesis **H03:** *that firm leverage has a significant positive influence on the decision to disclose and the intensity of environmental disclosure of firms listed in the NGX* is accepted. Supporting views by some authors, demonstrate that in order to manage agency and monitoring costs, firms with high leverage are more likely to voluntarily disclose more environmental information (Alsaeed, 2006; Ho & Taylor, 2007). This is premised on the fact that highly leveraged firms have higher agency costs of debt and incur more in monitoring costs (Jensen & Meckling, 1976). Though not conducted using a hurdle regression approach, empirical relationship between financial leverage and environmental disclosures provide mixed results in relation to the relationship between the financial leverage of the company and the degree of environmental disclosure. Some studies have found the relationship positive (Suleiman et al., 2014; Juhmani, 2014). Some other studies found an inverse relationship (Ahmad, 2017; Hakim & Majda, 2013; Andrikopoulos & Kriklani, 2013). Interestingly, the study result regarding financial leverage of firms have demonstrated that optimal capital structure would favour ESI firms mostly when more debts are acquired and channelled to green sustainable environmental assets or projects. The trade-off between leverage/debt and equity is more likely to favour leverage for ESI firms in Nigeria as financial leverage have shown in this study to be a good determinant of environmental disclosure. For these firms in the ESI, more leverage position will yield some tax savings for the firms despite the existing fear of bankruptcy risk and agency cost associated with such financing decisions. Nevertheless, caution should be observed on the extent of debt application.

The hurdle regression results clearly reveals that firm age in the first hurdle is positive and significant. What the result suggest is that firm age increases the possibility or decision of ESI firms participating in environmental disclosure practices. Nevertheless, in the second hurdle and as confirmed by the average marginal effect, firm age is negative and insignificant in deciding the extent of environmental disclosure practices (-0.001; p=0.274). Therefore, the hypothesis that **H04:** *that firm age has a significant positive influence on the decision to disclose and the intensity of environmental disclosure of firms listed in the NGX* is rejected. A closer look at the result shows how appropriate and effective is the marginal effect in deciding the extent of environmental disclosure. A revisit of the result shows that firm age is positive and significant at the first hurdle but negative and significant at the second hurdle, resulting to a negative and insignificant marginal effect which serves as a deciding factor for the extent of disclosure as a matter of practical implication. Additionally, firm age fails to cross the two hurdles and as a result, could not be concluded to be a good determinant of the extent of environmental disclosure. What this could imply is that the age of

the firms that their activities are environmentally sensitive should not be seen as a driver of the decision to engage in the disclosure of environmental information to stakeholders. The study's finding on firm age goes counter to those of Liu and Anbumozhi (2009), who make the case that a company's age is a sign that it is complying with its stakeholders by meeting its financial, social, and environmental commitments. Extant literature based on empirical evidences validate the study finding of which these studies found a negative relationship (Ibrahim, 2014; Kabir, 2014; Elshabasy, 2018). Other studies reveal that firm age does not affect environmental disclosure (Akbas, 2014; Mohamed, 2013; Cahyani & Suryaningsih, 2016).

Conclusions and Recommendations

A grey area which has hitherto not been adequately explored in prior empirics in content analysis study is the appropriateness of estimation technique. This argument steams from the manner environmental disclosures is being modelled. Using the content analysis as a measure of disclosure, there is the assumption that an entity has taken the decision to adopt on the one hand, and that the intensity of such disclosures is also implied i.e. a double-hurdle scenario which most studies ignored. Consequently, plethora of studies seems to have applied a wrong statistical tool which does not help estimate factors that could determine the intensity of disclosure once there is the decision's to adopt. It is from this position that this study is birthed. In an attempt to address this double-hurdle scenario, the study adopt the double-hurdle estimation technique. Using the longitudinal research design, data set from oil and gas and industrial goods company spanning the period 2014 to 2021, the result revealed that firm size has a positive and significant values in the first and second hurdles, on company profitability, there is a positive and insignificant values in both the first and second hurdle; outcome regarding firm leverage shows that leverage has positive and significant values in the first and second hurdles; and the hurdle regression results clearly reveals that firm age in the first hurdle is positive and significant while shows a negative coefficient but with a significant impact in the second hurdle. The marginal effect , which is most appropriate for policy implication shows the same exact direction of the coefficient with the second hurdle result where firm size, profitability and leverage have positive coefficients while firm age still maintains its negative coefficient with an insignificant impact. From the findings, the study recommends as follows: (i) giving that big firms are susceptible to public scrutiny and the possibility of incurring high agency cost, they should participate and disclose more of their environmental information in a voluntary disclosure clime like Nigeria. Since size significantly drives the level of environmental disclosure, the management of firms are therefore admonished to strategically expand their market share through improved products that will further increase their overall size; (ii) on

profitability, although the result showed that it does not influence firms decisions to adopt and the intensity of adoption, however, it will be ideal that firms in Nigeria, both indigenous and foreign firms, whose activities are subject to environmental devastation, should as a matter of stakeholders' interest and not only shareholders demand, channel some of their financial gains, reserves or retained earnings to environmental sustainability projects in line with global best practices; (iii) financial leverage have shown in this study to be a good determinant of CED. For these firms in the ESI, more leverage position will yield some tax savings for the firms despite the existing fear of bankruptcy risk and agency cost associated with such financing decisions. Corporate organizations should ensure from financing asset acquisition through debts, entities should be more involved in environmental engagements; and costs associated with such engagements should be reported in the financial statements alongside the mainstream reports; and (iv) firm age does not automatically transmit into higher levels of disclosure, investors and investment analysts should be more systematic when using firm age in assessing future disclosure of firms. It should not be seen as a driver of the decision to engage in the disclosure of environmental information to stakeholders.

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