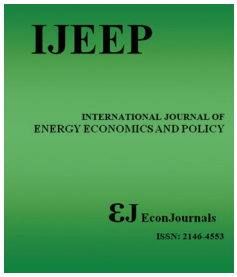

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The Impact of Board Structure on Voluntary Environmental and Energy Disclosure in an Emerging Market

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ABSTRACT

This study aimed to investigate the effect of board structure on voluntary environmental and energy disclosure of listed firms in Indonesia. The study employed a one-step and two-step system generalized method of moments using an unbalanced data panel of 356 non-finance companies. The findings showed that board size positively and significantly affected environmental and energy disclosure. Moreover, board independence negatively and significantly influenced environmental and energy disclosure, while women on board and CEO duality have an insignificant impact. The strategic implication showed that adding more members to the board of directors boosted voluntary environmental and energy disclosure.

Keywords: Board Size, Board Independence, Women on Board, CEO Duality, Environmental and Energy Disclosure
JEL Classifications: E44, M13, Q40, Q50

1. INTRODUCTION

Changes in global climate circumstances raise public awareness of corporate environmental and energy disclosure as a significant subject for academic literature and industry worldwide. According to the World Economic Forum's Global Risks Report (World Economic Forum, 2020), the environment and climate are the top risks expected to impact the global economy significantly. This implies environmental and climatic challenges must be identified, assessed, and managed for firms to create long-term value (Vitolla et al., 2021; Raimo et al., 2021). The impact of the health crisis cannot be ignored because it also affects the world economy (Baldwin and Munro, 2020; Lestari et al., 2021; Riadi et al., 2022).

Accurate portrayal of environmental and energy elements and performance has become critical (Simionescu et al., 2020). Public concern about the frequent environmental and climatic calamities caused by corporate activity has raised the desire for knowledge on business environmental management. The sharing of environmental and energy information has piqued the interest of various stakeholders, including investors and regulators, due to its contribution to long-term sustainability (Jitmaneeroj, 2016; Gerged et al., 2020). Furthermore, increased public awareness of corporate sustainability caused the development of more sustainable disclosure norms and standards. This information shows the stakeholders the company's commitment to sustainable development (Xie et al., 2019; Sarumpaet et al., 2017).

The environmental and energy information disclosure in annual reports is mandatory or voluntary. Mandatory disclosure is required by applicable accounting regulations and standards. In contrast, voluntary information disclosure is used by company administrators to provide accounting and additional information important to annual report users in decision-making. Mandatory or voluntary disclosure helps disseminate information to shareholders about the company's environmental and energy issues and activities. However, many investors believe that companies in Indonesia focus solely on mandated rather than voluntary

disclosure. This indicates that companies must expand voluntary environmental and energy disclosure.

There are numerous capital market authorities' legislations, including financial authority services regulation No. 29/POJK.04/2016 on public corporations or issuers' annual reports. In line with this, financial authority services regulation No. 43 started regulating corporate governance and information disclosure for public organizations and issuers with smaller and medium-sized properties. Moreover, this disclosure covers environmental aspects of the production process, including controlling pollution in conducting the company's business operations, preventing or repairing environmental damage due to natural resource processing, and conserving natural resources (law of the republic of Indonesia No. 23 of 1997 Article 5 Paragraph 2 concerning Environment). The law of the republic of Indonesia No. 40 of 2007 article 74 concerning social and environmental responsibility states that a company conducting business activities related to natural resources should be socially and environmentally responsible. However, many companies' increases in environmental and energy activities contradict voluntary environmental and energy disclosure.

This study aimed to investigate the impact of board structure on voluntary environmental and energy disclosure in Indonesia. The country prioritizes the financial pathway in the G20 Indonesia 2022 Presidency, which discusses climate risks and the dangers of transitioning to a low-carbon economy and sustainable finance from a macroeconomic and financial stability perspective. Moreover, previous studies were conducted on voluntary environmental and energy disclosure in the united kingdom (Liao et al., 2015; Tauringana and Chithambo, 2015; Jizi, 2017), the United States (Giannarakis et al., 2019), and Italy (D'Amico et al., 2016). According to Narayan et al. (2011), developed countries have well-established capital stock markets mostly due to globalization and financial liberalization. Therefore, a more accurate financial system requires analyzing a country's peculiarities (Bayraktar, 2014).

2. LITERATURE REVIEW

Scholarly literature has employed stakeholder, agency, and legitimacy theories to account for businesses' decisions to publish environmental information (Liao et al., 2015; Stanny and Ely, 2008; Llena et al., 2007; Freedman and Jaggi, 2005). A multi-theory framework was also applied, indicating an overlap across the theories explaining disclosure practices (Deegan, 2002; Baalouch et al., 2019). Previous studies examined the board structure's impact on environmental disclosure. For instance, Halme and Huse (1997) investigated the association between corporate governance and environmental disclosure. The study found a substantial correlation between board size and the environmental information in large Spanish, Swedish, Norwegian, and Finnish firms' annual reports. Trireksani and Djajadikerta (2016) examined annual reports but focused on the environmental disclosures of the mining companies registered on the Indonesian Stock Exchange. The findings indicated that board size significantly affects environmental information, while board independence and diversity have a negligible effect. Similarly, Rao et al. (2012) examined the words devoted to the environment in the annual reports of 96 Australian publicly traded companies. The study found a correlation between the board of directors and environmental disclosure. Ezhilarasi and Kabra (2017) found that foreign institutional ownership significantly predicts environmental disclosure more than the board structure of Indian companies. Additionally, Gerged (2021) and Raimo et al. (2021) found a positive correlation between board structure and the environmental data from annual company reports.

2.1. Board Size

The stakeholder-agency theory states that the board of directors is a critical governance instrument for monitoring and aligning managers' actions and efforts with stakeholders' interests. While there is no optimal board size for performing these responsibilities, studies suggest that a bigger board of directors might provide additional resources for monitoring and advisory functions (de Villiers et al., 2011; Coles et al., 2006; Hill and Jones, 1992; Walsh and Seward, 1990). Bigger boards may contain people with higher reputations and more talents and expertise that potentially increase their efficiency in monitoring, counseling, and guiding the management (Certo, 2003; Dalton et al., 1999). Additionally, bigger boards may effectively represent the diverse stakeholders' interests and are more likely to include members with experience in areas such as environmental projects (de Villiers et al., 2011; Tauringana and Chithambo, 2015). Larger boards of directors may also favor access to financial resources helpful for environmental projects and collect and represent environmental information in the stakeholders' interests (Tauringana and Chithambo, 2015; de Villiers et al., 2011). Therefore, these factors may facilitate a broader distribution of environmental data in integrated reports. Previous studies showed contradicting effects of board size on environmental disclosure. Some studies found that board size positively impacts the amount of company environmental disclosure (Raimo et al., 2021; Gerged, 2021; Trireksani and Djajadikerta, 2016; Tauringana and Chithambo, 2015; Rao et al., 2012). Prado-Lorenzo and Garc'a-Sanchez (2010) found a negative effect, while Ezhilarasi and Kabra (2017) and Halme and Huse (1997) discovered a non-significant effect.

H1: Board size positively impacts environmental disclosure.

2.2 Board Independence

Based on the agency theory, board independence is an effective corporate governance structure for mitigating management opportunism from ownership and control separation (Fama and Jensen, 1983). According to the stakeholder-agency theory, a board of directors with many independent members is more effective in monitoring and minimizing managers' opportunistic behaviors that jeopardize stakeholders' interests (Tejedo-Romero and Araujo, 2020; Hill and Jones, 1992). This monitoring extends beyond financial performance to include CSR and environmental activities. Independent members are less concerned with financial success and focus more on corporate social responsibility, environmental stewardship, and sustainable development (de Villiers et al., 2011; Post et al., 2011; Baalouch et al., 2019; Ibrahim and Angelidis, 1995; Tauringana and Chithambo, 2015; Ibrahim et al., 2003). Additionally, they are more receptive to societal pressures and

strategically positioned to safeguard stakeholders' interests than executive members (Tejedo-Romero and Araujo, 2020; Liao et al.,2015; Prado-Lorenzo and Garcia-Sanchez, 2010). This is achievable because they are not directly involved in the firm's daily activities and are not subject to significant competitive pressure (Sonnenfeld, 1981; de Villiers et al., 2011; Prado-Lorenzo and Garcia-Sanchez, 2010). Consequently, the enhanced monitoring capabilities increase environmental awareness and focus on stakeholders. This means that independent members may facilitate a broader release of environmental information within integrated reports. According to Rao et al. (2012), Liao et al. (2015), Giannarakis et al. (2019), and Gerged (2021), an independent board improves a company's environmental disclosure, though other studies found contradicting results (Baalouch et al., 2019; Trireksani and Djajadikerta, 2016; Tauringana and Chithambo, 2015; Prado-Lorenzo and Garcia-Sanchez, 2010).

H2: Board independence positively impacts environmental disclosure.

2.3. Female Board Members

The stakeholder-agency theory holds that a diverse board of directors is more effective at monitoring and representing various stakeholders (Tejedo-Romero and Araujo, 2020; Rodrigues et al., 2017) based on gender diversity. Women enhance monitoring roles and meet the stakeholders' requirements and interests more effectively (Tejedo-Romero and Araujo, 2020; Liao et al., 2015). According to Huse and Solberg (2006), women are more efficient at monitoring because of their dedication, thoroughness, and capacity to foster a positive culture on the board of directors. This efficiency in monitoring managerial operations extends to ethical, CSR, and environmental concerns. Furthermore, women are concerned with sustainability and the environment (Tejedo-Romero and Araujo, 2020; Liao et al., 2015; Wehrmeyer and McNeil, 2000; Prado-Lorenzo and Garcia-Sanchez, 2010). This is related to their cultural ideals that are less concerned with the economy and personal interests and focus more on overall well-being and quality of life (Hofstede et al., 2010; Prado-Lorenzo and Garcia-Sanchez, 2010; Ibrahim and Angelidis, 1995; Liao et al., 2015). The increased capacity to address the stakeholders' requirements is associated with women's proclivity for transparency and ethical behavior (Tejedo-Romero and Araujo, 2020; Baalouch et al.,2019; Vitolla et al., 2020). Therefore, the enhanced monitoring skills increased sustainability awareness, and focus on stakeholders distinguish female directors may facilitate broader environmental information disclosure. According to Raimo et al. (2021), Tingbani et al. (2020), Baalouch et al. (2019), Liao et al. (2015), and Rao et al. (2012), the board of gender diversity enhances the amount of environmental disclosure in the company's annual report. However, Lorenzo and Garcia-Sanchez (2010) and Trireksani and Djajadikerta (2016) found inconsequential results.

H3: Women on board positively impact environmental disclosure.

2.4. CEO Duality

Duality is the presence of a CEO and Chairman on a company's Board of Directors. According to agency theory, these rights raise the chance that CEOs would pursue strategies that benefit their interests at the firm's expense (Jensen, 1986; Jensen and Meckling, 1976). Previous studies found a negative correlation between CEO duality and environmental disclosure, implying that duality may exacerbate conflicts of interest and adversely affect a corporation's transparency process (Freitas Neto and Mol, 2017; Chau and Gray, 2010; Alfraih, 2016). In contrast, Gerged (2021), Prado-Lorenzo and Garcia-Sanchez (2010), and Jizi et al. (2014) emphasized the beneficial correlation between CEO duality and environmental disclosure. However, they occasionally result in a decline in environmental disclosure (Oware and Awunyo-Vitor, 2021; Hassan et al., 2020; Jizi et al., 2014). More powerful CEOs advocate for social and environmental transparency to be considered effective and boost their tenure or salary possibilities (Jizi et al., 2014).

H4: CEO duality negatively impacts environmental disclosure.

3. METHODS

The study sample comprising the firms listed on IDX was classified into the following industries using the Indonesia Stock Exchange's seven non-finance industry classifications. The industries were 16 agriculture-related businesses, 63 basic industry and chemicals-related businesses, 35 mining-related businesses, and 31 miscellaneous-related businesses. Others included 35 consumer goods-related businesses, 50 property, real estate, building construction-related businesses, 43 infrastructure utilities, transportation-related businesses, and 83 trade services and investment-related businesses. Data were obtained from the annual reports of sampled companies. This study aimed to examine Indonesia's ICD reporting patterns from 2009 to 2018. As of December 31, 2018, the Indonesian stock exchange listed 530 companies, of which only 356 businesses met the requirements.

The environmental disclosure quality was the dependent variable comprising the environmental disclosure (ENV) and the energy disclosure index (ENG). The indices for the environmental and energy disclosure were calculated using content analysis in line with Raimo et al. (2021), Gerged (2021), Trireksani and Djajadikerta (2016), and Prado-Lorenzo and Garcia-Sanchez, (2010). According to Krippendorff (1980), content analysis derives reproducible and accurate conclusions from data based on their context. This approach is widely acknowledged as impartial and dependable and is mostly employed to investigate intellectual and human capital disclosure (Ulfah et al., 2021; Kusumawardani et al., 2021a). Furthermore, Larran Jorge et al. (2016) stated that content analysis reduces questionnaire and interview deficiencies (Larran Jorge et al., 2016). Implementing content analysis is a more cost-effective and time-efficient approach to data collecting. Duff (2018) stated that manual content analysis was preferable to electronic research aided by specialized tools. The approach facilitates the interpretation and inference of environmental information from its context. Additionally, it avoids hassles associated with using synonyms and ambiguous words. The environmental disclosure study employed an unweighted dichotomous procedure. After content review, a score of 1 was

assigned when the annual report contained the item disclosure and 0 when the report had no item disclosure. The disclosure score index was constructed as follows:

$$ENV_j = \frac{\sum_{t=1}^{n_j} X_{i,j}}{m}$$

$$ENG_j = \frac{\sum_{t=1}^{n_j} X_{i,j}}{m}$$

Where ENV and ENG are the environmental and energy indices, respectively, n_j denotes a company's overall environmental and energy disclosure ranking, and m is the number of related environmental disclosure items (13 items) and energy disclosure items (7 items) (Table 1).

The dependent variable in this analysis is the board structure, which includes CEO duality, women on boards, as well as board independence, and size. The control variables include firm size, profitability, leverage, cash holdings, and firm age. Table 2 shows the independent and control variables representing the constructs.

The association between board structure variables and the environmental disclosure quality was evaluated using system GMM estimation. The regression equation is as follows:

$$ENV_{,i,t} = \alpha_{,i,t} + \beta_1 ENV_{i,t-1} + \beta_2 BSIZE_{i,t} + \beta_3 BIND_{i,t} + \beta_4 BWOM_{i,t} + \beta_5 DUAL_{i,t} + \beta_6 SIZE_{i,t} + \beta_7 ROA_{i,t} + \beta_8 LEV_{i,t} + \beta_9 CASH_{i,t} + \beta_{10} AGE_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$ENG_{,i,t} = \alpha_{,i,t} + \beta_1 ENG_{i,t-1} + \beta_2 BSIZE_{i,t} + \beta_3 BIND_{i,t} + \beta_4 BWOM_{i,t} + \beta_5 DUALi,t + \beta_6 SIZE_{i,t} + \beta_7 ROA_{i,t} + \beta_8 LEV_{i,t} + \beta_9 CASH_{i,t} + \beta_{10} AGE_{i,t} + \varepsilon_{i,t} \quad (2)$$

The control variables used include SIZE, ROA, LEV, CASH, and AGE. Regarding SIZE, large companies engage in various activities with a significant social impact, where firm size compels disclosure (Hackston and Milne, 1996). Profitability (ROA) is measured by return on assets (Gerged, 2021; Yudaruddin, 2017), where companies with low profitability ratios attempt to increase capital, resulting in many disclosures. Concerning leverage (LEV), capital policy impacts business stability (Yudaruddin, 2022). According to agency theory, firms with a higher leverage ratio disclose more information because of higher agency costs (Jensen

Table 1: Items of corporate environmental and energy disclosure

Items environmental disclosure	Items energy disclosure
1. Pollution control operations, research and development expenditures for pollution reduction	1. Use energy more efficiently in operations
2. A statement showing that the company's operations do not cause pollution or meet the requirements of pollution laws and regulations	2. Using used goods to produce energy
3.Statements indicating that pollution has been or will be reduced	3. Reveal energy savings as a result of recycled products
4.Prevention or repair of environmental damage due to the processing of natural resources such as reforestation or others	4. Discuss the company's efforts to reduce energy consumption
5. Observation of natural resources such as recycling glass, iron, and oil	5. Disclosure of the energy efficiency improvement of the product
6. Use of recycled materials	6. Research that leads to energy and product efficiency improvements
7. Received an award related to the company's environmental program	7. Disclosing the company's energy policy (in general)
8. Designing facilities that are harmonious with the environment	
9. Contribution to art aimed at beautifying the environment	
10. Contribution to the restoration of historical buildings	
11.Waste treatment (in general)	
12. Studying the environmental impact to monitor the company's environmental impact	
13. Environmental protection (in general)	

Table 2: Independent and control variables

Variables	Symbol	Definition and measure	Expected Sign
Independent			
Board Size	BSIZE	The total number of members on the board of directors	+
Board Independence	BIND	The proportion of independent directors concerning the total number of directors	+
Women on Boards	BWOM	The proportion of female board members concerning the total number of directors	+
CEO Duality	DUAL	This dummy variable, which has a value of 1 or 0, considers the presence or absence of duality	–
Control			
Firms Size	SIZE	Ln total_assets	+
Profitability	ROA	netprofit/total asset (%)	+
Leverage	LEV	Total debt/total equity (%)	+
Cash	CASH	Cash and cash equivalent to total asset	+
Age of Firm	AGE	The age of a company as of the day it was founded	+

and Meckling, 1976). Another control variable was CASH, where cash holding plays an important role in the company's operational activities (Kusumawardani et al., 2021b; Hadjaat et al., 2021; Yudaruddin, 2019). Ortiz (2020) found that firms hold less cash when operating in a more transparent reporting environment. Regarding AGE, the estimated relationship between firm age and the quality of corporate information disclosure is positive. Established companies disclose more extensive information, including intellectual capital, than companies with a shorter lifespan (Kusumawardani et al., 2021a).

The relationship between board structure variables and environmental disclosure quality was estimated using the one-step and two-step system generalized method of moments (GMM) estimator introduced by Arellano and Bover (1995). This dynamic panel model was utilized to account for environmental disclosure quality and deal with endogeneity in some variables. According to Blundell and Bond (1998), the GMM estimator eliminates the possibility of bias in finite samples and the asymptotic imprecision associated with the difference estimator. This study incorporated a Windmeijer (2005) finite sample correction and described orthogonal instrument transformations. The two-step system GMM estimation was valid when the AR (2) and Hansen-J tests were statistically insignificant.

4. RESULTS AND DISCUSSION

Table 3 summarizes the descriptive statistics for the variables used in the study. The environmental and energy disclosure indices have an average value of 0.22 and 0.16, respectively, as dependent variables. This finding indicates that, on average, the sampled companies supply around half of the voluntary disclosure information requested in the environmental and energy items. Board size has an average value of 4.31, indicating that the boards of directors of the selected companies average 12 directors. Furthermore, board independence averages 1.62, indicating a dearth of independent directors in the selected companies. Woman on board has an average value of 0.40, indicating a relatively low proportion of females on the boards of directors of the selected companies. The average value of CEO duality is 0.33.

Table 3: Descriptive statistics for all variables (*n*=2350)

Variables	Mean	Std. Dev	Min	Max
ENV	0.2296	0.2294	0	1
ENG	0.1600	0.2387	0	1
BSIZE	4.3157	1.8519	2	12
BINDP	1.6260	0.8417	1	7
WOM	0.4072	0.6890	0	5
DUAL	0.3336	0.4716	0	1
SIZE	23.286	5.1102	13.924	30.354
ROA	5.1866	7.1791	–10.227	29.943
LEV	109.93	81.496	6.3176	331.44
CASH	9.7705	9.0416	0.3132	38.798
AGE	3.2824	0.5178	1.7918	4.2047

Table 4 shows the correlation matrix and coefficients for the independent variables used to verify the assumption of multicollinearity. The correlation matrix demonstrates no high connection among the explanatory variables, indicating no multicollinearity. According to Field (2009), a correlation >0.80 indicates no multicollinearity within the data. Moreover, an independent examination of the variance inflation factor (VIF) found that no multicollinearity could impair the study's conclusions. Myers (1990) stated that multicollinearity issues arise only when VIFs exceed ten. The correlation analysis in Table 4 also confirms the absence of multicollinearity.

Table 5 shows the results of the relationship between board structure, environmental disclosure index, and the explanatory variables. The relationship between the board structure and the energy disclosure index is presented in Table 6. The one-step and two-step system GMM estimator was used to estimate the relationship between board structure variables and the quality of environmental disclosure. Studies on the persistence of environmental and energy disclosure indices show the statistically significant impact of lagged 1-year environmental disclosure index. This study's dynamic panel data models are also valid because the AR (2) and the Hansen-J tests are statistically <5%.

Tables 5 and 6 show a positive and significant relationship between BSIZE and the ENV and ENG indices, supporting H1. In columns 1–8, the coefficient on BSIZE is positive and significant at 0.05 and 0.01, meaning that board size significantly enhances the environmental and energy disclosure index. Based on the stakeholder-agency theory, a larger membership ensures a significant pool of resources and enhances monitoring, control, guiding, and consultancy activities. Additionally, a larger board of directors represents diverse stakeholder interests and enhances the likelihood that members are concerned with the environment and energy. The board also facilitates access to financial resources useful for environmental and energy data gathering and representation. These considerations explain why the size of the

Table 4: Correlation matrix

Variables	BSIZE	BINDP	WOM	DUAL	SIZE	ROA	LEV	CASH	AGE	VIF
										Eq. 1 and 2
BSIZE	1.0000									2.57
BIND	0.7555	1.0000								2.38
BWOM	0.1531	0.1769	1.0000							1.07
DUAL	−0.0329	−0.0694	−0.0357	1.0000						1.02
SIZE	−0.2271	−0.1191	0.1013	−0.0354	1.0000					1.10
ROA	0.1619	0.1237	−0.0331	0.0400	−0.1356	1.0000				1.19
LEV	0.0386	0.0318	0.0113	0.0427	−0.0440	−0.2237	1.0000			1.09
CASH	0.1508	0.1126	−0.0603	0.0643	−0.0167	0.3137	−0.1872	1.0000		1.16
AGE	0.2368	0.1480	0.1024	0.0296	−0.0712	0.0717	0.0060	0.0632	1.0000	1.07

Table 5: Board structure and environmental disclosure index

Explanatory Variables	Dependent variables: Environmental disclosure index (ENV)							
	One Step GMM				Two-Step GMM			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ENV (–1)	0.5439***	0.5459***	0.5520***	0.5540***	0.4864***	0.4873***	0.5137***	0.5151***
	(0.0677)	(0.0669)	(0.0661)	(0.0652)	(0.0773)	(0.0727)	(0.0764)	(0.0731)
BSIZE	0.0115***	0.0096**	0.0117**	0.0100**	0.0131***	0.0120***	0.0122***	0.0108***
	(0.0039)	(0.0039)	(0.0040)	(0.0040)	(0.0045)	(0.0041)	(0.0044)	(0.0041)
BIND	−0.0147**	−0.0136*	−0.0160**	−0.0150**	−0.0144**	−0.0136*	–0.0152**	−0.0138*
	(0.0077)	(0.0070)	(0.0078)	(0.0072)	(0.0071)	(0.0069)	(0.0075)	(0.0073)
BWOM	−0.0001	−0.0006	−0.0014	−0.0016	−0.0017	−0.0028	−0.0025	−0.0034
	(0.0077)	(0.0078)	(0.0078)	(0.0079)	(0.0066)	(0.0066)	(0.0069)	(0.0070)
DUAL	0.0098	0.0088	0.0106	0.0095	0.0130	0.0128	0.0122	0.0118
	(0.0126)	(0.0126)	(0.0128)	(0.0127)	(0.0133)	(0.0128)	(0.0139)	(0.0134)
SIZE		−0.0006		−0.0005		−0.0007		−0.0007
		(0.0010)		(0.0010)		(0.0010)		(0.0010)
ROA		0.0003		0.0004		0.0003		0.0002
		(0.0006)		(0.0006)		(0.0006)		(0.0006)
LEV		0.00006		0.00005		0.00004		0.00003
		(0.00005)		(0.00005)		(0.00004)		(0.00006)
CASH		−0.0004		−0.0004		−0.0007		−0.0006
		(0.0004)		(0.0004)		(0.0004)		(0.0004)
AGE		0.0197**		0.0176*		0.0208**		0.0209**
		(0.0099)		(0.0098)		(0.0094)		(0.0097)
Constant	0.0897***	0.4176	0.0908***	0.0473	0.0853***	0.4192	0.0772***	0.0344
	(0.0168)	(0.0425)	(0.0208)	(0.0455)	(0.0187)	(0.0429)	(0.0229)	(0.0460)
Industry dummy	No	No	Yes	Yes	No	No	Yes	Yes
Number of obs	1888	1888	1862	1862	1888	1888	1862	1862
AR (2) test	0.775	0.775	0.826	0.804	0.880	0.883	0.879	0.880
Hansen-J test	0.265	0.265	0.162	0.235	0.263	0.411	0.162	0.235

*sig. at 10%, **sig. at 5%, and ***sig. at 1%

Table 6: Board structure and energy disclosure index

Explanatory Variables	Dependent variables: Energy disclosure index (ENG)							
	One Step GMM				Two-Step GMM			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ENG (–1)	0.5320***	0.5352***	0.5519***	0.5551***	0.5710***	0.5789***	0.5854***	0.5918***
	(0.0685)	(0.0672)	(0.0660)	(0.0646)	(0.0799)	(0.0779)	(0.0765)	(0.0748)
BSIZE	0.0107**	0.0076*	0.0114***	0.0086*	0.0101**	0.0085**	0.0103**	0.0089**
	(0.0042)	(0.0042)	(0.0043)	(0.0044)	(0.0042)	(0.0041)	(0.0042)	(0.0041)
BIND	–0.0144*	–0.0133	–0.0168**	–0.0159*	–0.0139*	–0.0134*	–0.0151*	–0.0151*
	(0.0085)	(0.0083)	(0.0084)	(0.0082)	(0.0080)	(0.0079)	(0.0078)	(0.0081)
BWOM	0.0067	0.0070	0.0053	0.0061	–0.0013	0.0015	–0.0002	0.0010
	(0.0077)	(0.0083)	(0.0081)	(0.0082)	(0.0080)	(0.0082)	(0.0080)	(0.0081)
DUAL	–0.0098	0.0073	–0.0042	0.0071	–0.0032	0.0010	–0.0065	0.0036
	(0.0126)	(0.0134)	(0.0134)	(0.0134)	(0.0134)	(0.0134)	(0.0133)	(0.0134)
SIZE		–0.0007		–0.0006		–0.0007		–0.0008
		(0.0010)		(0.0010)		(0.0010)		(0.0009)
ROA		0.0010		0.0012*		0.0007		0.0008
		(0.0006)		(0.0006)		(0.0006)		(0.0006)
LEV		0.00017**		0.00017**		0.00016**		0.00016**
		(0.00006)		(0.00006)		(0.00006)		(0.00006)
CASH		–0.00018		–0.00008		–0.00031		–0.00031
		(0.0005)		(0.0005)		(0.0004)		(0.0004)
AGE		0.0211*		0.0175		0.0075		0.0040
		(0.0115)		(0.0284)		(0.0113)		(0.0107)
Constant	0.0592***	–0.0077	0.0609***	–0.0012	0.0405***	0.0205	0.0431***	0.0360
	(0.0151)	(0.0434)	(0.0174)	(0.0433)	(0.0136)	(0.0416)	(0.0159)	(0.0426)
Industry dummy	No	No	Yes	Yes	No	No	Yes	Yes
Number of obs	1888	1888	1862	1862	1888	1888	1862	1862
AR (2) test	0.218	0.223	0.306	0.309	0.212	0.219	0.285	0.239
Hansen-J test	0.359	0.352	0.362	0.340	0.359	0.352	0.362	0.340

*sig. at 10%, **sig. at 5%, and ***sig. at 1%

board of directors positively affects the amount of environmental and energy disclosure. The findings are consistent with Raimo et al. (2021), Gerged (2021), Trireksani and Djajadikerta (2016), Tauringana and Chithambo (2015), and Rao et al. (2012), which

showed that BSIZE improves the environmental and energy disclosure indices.

Tables 5 and 6 show the results of the relationship between board independence (BIND) and the environmental and energy disclosure indices. This study found a negative and significant coefficient of board independence variable. It implies that board independence reduces sample companies' environmental and energy disclosure indices, refuting H4. The independent or external directors' lack of interest in disclosing the company's environmental and energy practices may be due to a lack of knowledge about voluntary integration costs for owners. This is in line with Baalouch et al. (2019), Trireksani and Djajadikerta (2016), Tauringana and Chithambo (2015), Prado-Lorenzo and Garcia-Sanchez (2010). According to Prado-Lorenzo and Garca-Sánchez (2010), when corporations disclose much information about social and environmental issues to many stakeholders, it may be detrimental to shareholders. Independent directors may object to their disclosure to protect and not jeopardize the shareholders' interests.

The results in Tables 5 and 6 indicate that the presence of a woman on board does not affect the environment and energy disclosure index (ENV and ENG), contradicting H3. This implies that the degree of female representation on boards has no bearing on businesses' environmental and energy information in their annual reports. Increasing the number of women on board directors does not always increase the interest in environmental issues or the representation of diverse stakeholder interests. This finding contradicts the stakeholder-agency hypothesis, which advocates for more women on boards of directors to enhance monitoring capabilities and boost the environmental and energy disclosure indices. However, the finding is consistent with Lorenzo and Garcia-Sanchez (2010) and Trireksani and Djajadikerta (2016), which showed no significant effect.

Concerning CEO duality (DUAL), the results showed no significant association between DUAL and the environmental and energy disclosure indices, refuting H4. This contradicts Gerged (2021), Jizi, Prado-Lorenzo and Garcia-Sanchez (2010), Salama et al. (2014), Oware and Awunyo-Vitor (2021), Hassan et al. (2020), and Jizi et al. (2014). Possible explanations for the lack of a meaningful link between DUAL and the environmental and energy disclosure indices include an excessive burden on the dual function, contributing to inadequate information sharing.

5.CONCLUSION

Few studies have examined voluntary information disclosure, and there are numerous reasons businesses disclose information voluntarily, including environmental and energy disclosure. This study aimed to examine the effect of board structure on environmental and energy disclosure in Indonesia by considering CEO duality, female board members, board independence, and board size. It analyzed 356 non-finance companies in eight industries traded on the Indonesian stock exchanges from 2009 to 2018 and found that board size positively affects environmental and energy disclosure. Additionally, board independence is statistically significant and negatively associated with environmental and energy disclosure.

This study provides several policy implications as follows. First, board size may positively impact environmental and energy disclosure and reduce information asymmetry. Second, IDX is well-positioned to use the findings to promote increased environmental and energy disclosure awareness as capital market regulators. This would advance Indonesia's environmental and energy disclosure implementation. The financial industry was not examined due to the scarcity of data reports and the distinctions between the financial and non-financial industries. Therefore, future studies may examine the financial industry's environmental and energy disclosure practices. Changes to the IASC and IFRS occurred during this study, affecting disclosures and the structure of certain assets and liabilities, as well as the financial statements for the relevant periods.

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