



## **Dynamic Relationship Between Board of Directors and Corporate Sustainability Performance: Evidence from Energy Sector**

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### **ABSTRACT**

The 2030 agenda for sustainable development establishes a new global sustainability target, with corporations expected to contribute significantly by implementing sustainable practices. One strategy for engaging corporations in sustainable practice focuses on corporate governance (CG) mechanisms, such as the board of directors (BOD). On the premise of stakeholder theory, agency theory and resource dependency theory, the relationship between BOD and corporate sustainability performance (CSP) was investigated using the panel data analysis. Utilising a sample of 335 energy sector corporations from 48 countries our GMM estimation shows a significant relationship between CSP and board size, different positions for CEO and Chairperson roles, and interlocking directors. The findings also showed that having more independent directors on a board lowered CSP, while gender and cultural diversity did not affect CSP. The implications of these findings to policymakers on the energy sector corporations are not limited to improving CSP via formulating and implementing specific CG strategies and policies that are beneficial but also provide explicit information on how corporate energy sectors can change their behaviour with respect to sustainable practices and good governance to address social and environmental issues.

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## INTRODUCTION

Over the last few decades, communities and regulatory agencies have been concerned about the rate of erosion of the planet's non-renewable and natural resources as well as associated environmental pollution and carbon emission. These worrying conditions have prompted a dramatic shift concerning sustainability. However, sustainability is a contentious conception, with much disagreement over what it actually means in practice. Researchers defined sustainable development from different perspectives; however, they all share the message of "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). Over time, the concept of sustainable development has become more precise in embanking its three dimensions: environmental, social and economic. In order to accelerate global progress on the way to sustainability by 2030, 17 Sustainable Development Goals (SDGs) and 169 associated targets had been established by the United Nations (UN, 2015). Of importance, 11 out of 17 SDGs are linked to sustainability's environmental and social dimensions (Schroeder et al., 2019). Following initiatives such as the carbon disclosure project (CDP) and Kyoto Protocol, many parties have paid closer attention to sustainability issues including the academia. Particularly, the energy sector corporations have been under increasing pressure to incorporate eco-friendly practices into their daily activities to align corporate strategies with corporate sustainability principles (Liu et al., 2019). The rapid increase in population and continuing economic development results in an increase in energy consumption, causing unprecedented levels of greenhouse gas emissions (GHGs). For instance, in 2019, non-renewable fuel sources ignition for energy reported 74% of total GHGs in the United States (USEIA, 2021). Events like the 2010 Macondo Blowout and explosion in the United States Gulf Coast highlighted the link between sustainable production, management and performance of the energy sector corporation. Due to a lack of sustainable practices and an effective management system, these corporations suffered a loss of USD65 billion (Acheampong et al., 2022).

Given the impacts that have been observed, adopting sustainability initiatives should be a top priority of the energy sector operators, employers, government agencies and civil societies. For this reason, the energy industry must establish shared value among corporations, workers, shareholders, consumers, and community members to achieve its corporate sustainability performance (CSP). Since CSP is still a developing field of study, researchers have focused on a wide range of sectors. The stakeholder community started paying more attention to the energy sector as the world economy grew more dependent on it. This growing awareness of sustainability issues is not simply a result of external pressure but also a shift in perspective to comply with corporate governance rules (Aureli et al., 2020). In this context, the board of directors (BOD), as the primary decision-making body of any corporation, plays a crucial role in CSP affairs. It creates business policy, authorises annual budgets for CSR initiatives, scrutinises the actions of top executives, and organises independent CSR committees (Minciullo et al., 2022; Naciti et al., 2022; Pareek et al., 2019). Also, BOD always leads the corporation and sets strategic objectives to achieve its long-term survival and growth (Luo et al., 2021). Previous studies found that BOD attributes were linked to sustainability reporting (Bello et al., 2022; Jamil et al., 2021). Furthermore, studies showed that independent directors, women, CEO duality, board size and other board-related factors played a key role (Bose et al., 2021; Chams et al., 2019; Garcia Martin et al., 2020; Kumba Digdowiseiso, 2022). However, most of the available studies were done in multiple industries, especially in developed economies (Giannarakis et al., 2020; Mubeen et al., 2020), with merely a small amount of literature on sustainability practices in the energy sector (Saeed et al., 2021). Consequently, the issue remains under-explored in both developed and developing economies.

In light of the expanding body of literature on BOD attributes and CSP, this study aims at exploring the influence of BOD's attributes on CSP in the energy sector. This study presents a narrative that connects corporate governance to CSP and is theoretically underpinned by the stakeholder, agency, and resource dependency theories. This study focuses on BOD attributes, namely independent directors on the board, the board size, separate positions for CEO and chairperson, interlocking directorship, board gender and cultural diversity. From the theoretical perspective, the resource dependency theory proposes that directors contribute resources to the corporation through skills and expertise in particular areas that improve the board's decision-making processes and, in turn, the corporate performance. In addition, stakeholder and agency theories indicate that boards can improve corporate performance by aligning corporate interests with their stakeholders through governance mechanisms like that has become the focus of this study, i.e. BOD and its attributes.

Based on these theoretical assumptions, this study argues that BOD is anticipated to improve CSP while addressing sustainability challenges.

The CSP scores from the Thomson Reuters database were used and the GMM model was applied to a sample of 335 energy sector corporations from 48 countries to determine the relationship between BOD and CSP. The results of the study showed that board size, different positions for CEO and Chairperson and interlocking directors had a significant and positive effect on driving CSP in the energy sector. While the board independent directors indicated a negative but significant relationship, board gender diversity and cultural diversity had no impact on driving CSP in the energy sector. It is worth noting from these findings that board size, different positions for CEO and Chairperson and interlocking directors played a critical role in corporations' long-term survival and growth by carrying out corporate activities that contributed to society's environmental and social well-being. This study contributes to the growing body of knowledge regarding the BOD's attributes that are important for sustainability practice and identifies the practical framework to help the global implementation of sustainability practices. While prior studies depended on subjective data, such as creating an index based on content analysis, sustainability performance scores from the Thomson Reuters database were used in this study, which is non-discretionary data, to determine the breadth of corporate sustainability operations. This study also contributes to the literature by providing empirical evidence that specific BOD attributes, notably board size, separate positions for CEO and Chairperson, and interlocking directors, positively affect CSP, as measured by a primary measure of CSP rather than meta-analytic results. In terms of theory, this study's findings extend the resource dependency, stakeholder, and agency theories, by highlighting board size, separate positions for CEO and Chairperson, and interlocking directors are beneficial BOD attributes for bringing resources into organisations and reducing stakeholder agency conflicts.

The remainder of the study is organised into five sections. Section 2 contains a review of the literature and formulation of hypotheses. Thereafter, Section 3 shows the study's methodology. Section 4 discusses the study's findings, while Section 5 summarises the findings and recommendations for future research.

## **LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT**

BOD is seen as one of the most critical CG mechanisms in eliciting various corporate activities, such as encouraging moral and ethical commitment, adherence to legislation and rules, knowledge and understanding of environmental and social concerns, corporate disclosure and reporting, corporate profitability and sustainable corporate growth. The following section presents various theoretical frameworks addressing the relationship between BOD and CSP.

### **BOD as Determinants of CSP**

Generally, the notion of corporate sustainability is based on environmental, social and economic pillars of sustainability. The environmental pillar aims to preserve the natural resources in the ecosphere, while the social pillar aims to achieve equality of opportunity and meet the basic human needs of current and future generations. Meanwhile, the purpose of the economic pillar is to create long-term value. The current study followed the definition of sustainability presented by Rezaee (2017) as "the process of focusing on the achievement of economic sustainability performance in creating shareholder value, while recognising the importance of environmental, social and governance performance in protecting the interest of other stakeholders". To protect the interest of stakeholders, corporations should generate a sustainable competitive advantage in a fast-changing environment by effectively allocating resources, maximising profit and promoting social welfare to survive in the competitive market and maintain legitimacy (Galbreath, 2018). For this purpose, corporations need effective sustainability management. Effective sustainability management can only be implemented by supporting internal CG mechanisms that impact intra-corporate organisations. Internal CG mechanisms include the corporate board, ownership concentration, capital and incentive structure and reporting, and disclosure transparency (Ludwig et al., 2022). These internal CG mechanisms can depend on the country and cultural aspects due to their interdependence with external mechanisms. However, regardless of jurisdiction, the BOD should always lead the corporation and set strategic goals to ensure its long-term survival and growth (Cadbury, 1992; WBCSD, 2019). Importantly, the CG mechanisms and

strategies should be effective to ensure corporate long-term accomplishments. A focus on corporate ethics, overall corporate risk management system and long-term value creation can be accomplished if they are understood and applied effectively and efficiently (WBCSD, 2019). Corporations can incorporate target-oriented sustainability measures by implementing effective corporate governance mechanisms like independent directors on board, board size, CEO roles, interlocking directors, board-level sustainability committee, board diversity, ownership concentration and disclosures, and transparency practices.

In previous studies, BOD's attributes were frequently studied in the context of CSR, corporate environmental and social performance (Bose et al., 2021; Chams et al., 2019; Garcia Martin et al., 2020; Horiguchi et al., 2018; Naciti, 2019; Zaid et al., 2020). However, all the board's characteristics were not studied in the context of sustainability. Researchers tended to focus on multiple industries, but ignored the energy sector corporations, which are responsible for even more than two-thirds of the global GHGs and a significant contributor to climate change. Consequently, this study focused on BOD's attributes, such as independent directors, board size, different positions for CEO and Chairperson, interlocking directors, board gender and cultural diversity to explain CSP variation in energy sector corporations.

### **Theoretical Background**

The link between BOD and sustainability had been explained by various scholars using the agency theory (Naciti, 2019). The primary goal of employing the agency theory is to monitor the role of BOD and shareholders' interests in order to achieve economic and financial benefits (Elshandidy, 2022; Jan et al., 2021; Yanuar Trisnowati, 2022). In the context of sustainability, according to Gardazi et al. (2020) and Cordeiro et al. (2020), the agency theory perspective emphasised that corporations should structure and design the board to achieve ethical and social performance with promising financial returns. Contrarily, the neo-institutional theory explained managerial behaviour that challenges economic rationality by recognising the shared economic and social behaviour governed by country-specific corporations (Geels, 2020; Zraat et al., 2021). To legitimise certain actions in societies, these corporations specified a legal, political and financial system (Rubino et al., 2020). According to Jain et al. (2016), the major social objection against this theory was that corporations with shareholder-centric governance focused on shareholders' interests over those of other stakeholders' interests. Meanwhile, the resource dependency theory views that the responsibility of the corporate board is to improve corporate performance by allocating resources effectively (Guney et al., 2020; Nguyen et al., 2021). The resource dependency theory claims that BOD is seen as versatile initiator of adopting and implementing sustainability practices, empowering management to create pro-social behaviour and increasing the corporation's overall value (Abad-Segura et al., 2019; Elmagrhi et al., 2019). In terms of legitimacy theory, the participation of CG and management in social activities is crucial from a legal point of view. It gives the corporation a good image and competitive advantage in the market and society (Crossley et al., 2021). Regarding the stakeholder theory, the corporate board should ensure that corporations can meet the financial and non-financial needs and benefits of all stakeholders (Horisch et al., 2020; Jan et al., 2021). According to Freeman (1984), the foundation of the stakeholder theory is the recognition of economic, legal and philanthropic of the corporation for the shareholders as well as stakeholders. The interdependency between the corporate board and corporate sustainability is bridged by a mixture of instrumental and normative perspectives. This corporate linkage provides a two-fold advantage: firstly, it is seen as meeting the demands and intrinsic value of stakeholders, and at the same time, it is seen as improving the corporate competitive advantage and profitability.

Agency, resource dependency and stakeholder theories appear to be more relevant than other similar theories (e.g., neo-institutional and legitimacy theory) for investigating the impact of BOD's attributes on CSP in the energy sector. These theories expand the scope of the societal involvement of corporations and their interdependencies with the societal environment, and they assert that the corporation's objective is to create value for all stakeholders with a promising return.

## **Hypotheses Development**

### **Independent Directors on the Board**

The agency theory suggested that independent monitoring of managers' actions could be achieved by appointing external board members (Poletti-Hughes et al., 2019). The presence of external directors protecting the corporation from socially irresponsible actions is more likely to deter managers from pursuing self-interest. Therefore, independent directors may promote sustainability, as these directors are expected to focus on sustainable corporate development and have better stakeholder orientation (Endo, 2020). For instance, Ardito et al. (2021) found that independent directors are more employee-oriented and favour corporate philanthropy. In comparison to managers, independent directors are more eager to follow environmental guidelines (Vitolla et al., 2020) and follow ethical codes (Garcia-Sanchez et al., 2015). They generally have more diversified academic and professional backgrounds (Fernandez-Gago et al., 2018) and provide extensive information related to CSR reporting and disclosure. However, the association between independent directors on the board and CSP discloses mixed results in the existing empirical literature. For example, Zubeltzu-Jaka et al. (2020) showed that a board with several independent directors reduces social disclosure. Similarly, Tibiletti et al. (2021) and Alipour et al. (2019) asserted that there is no link between the number of independent directors on the board and sustainability disclosure. In contrast, Hussain et al. (2018) reported that better social and environmental performance can be achieved by having more independent directors on a board. Likewise, Al-Mamun et al. (2021) and Fernandez-Gago et al. (2018) found a significant and positive correlation between independent directors and CSR. Moreover, Nguyen et al. (2021) discovered that having many independent directors on the board tends to increase the attention on social and environmental issues, while trying to pursue stakeholders' concerns. Therefore, the following hypothesis is proposed:

*H1. The presence of a large number of independent directors on the board has a positive and significant impact on CSP in the energy sector.*

### **Board Size**

The corporate board plays a key role in setting strategy and reinforcing behaviour, which has important managerial implications. Since the risks involved with disproportionate manager control over large boards (Jensen, 1993), it had been suggested that large boards could lead to lack of coordination and teamwork, slow decision-making process and lack of harmony. Therefore, a small board is advised since it is linked to bonded and cohesive team dynamics (Lonkani, 2019). These team dynamics are thought to be a major driver of sustainable performance, which is more voluntary (Hussain et al., 2018). On the other hand, a smaller board has been argued to have less diversified expertise and knowledge background (Beji et al., 2021). However, a smaller board may be unable to control and monitor due to the high workload. Past literature reported conflicting results concerning sustainability performance and board size. To exemplify, Hussain et al. (2018) demonstrated that board size is not linked to CSP since sustainability activities are carried out more voluntarily. Contrarily, Garcia Martin et al. (2020) and Naciti (2019) found a positive link between board size and CSP. They argued that a large board is viewed as a diverse group that is more sympathetic to stakeholders' concerns. Therefore, they are more involved in social and environmental activities. Consequently, the following hypothesis is formulated:

*H2. Board size has a positive and significant relationship with CSP in the energy sector.*

### **Separate Positions for CEO and Chairperson Roles**

Based on the agency theory, Poletti-Hughes et al. (2019) demonstrated that separate CEO and Chairperson positions on the board enhance the board's independence from management. This detachment may result in new information, increased liability and reduction in the BOD's competence to control opportunistic behaviour (Saona et al., 2020). Mubeen et al. (2020) argued that separating the roles of CEO and Chairperson could improve management efficacy, lower agency cost and improve corporate performance. This is due to the fact that when the CEO has dual roles, he or she serves as a Chairperson and the corporation's power is concentrated under one person, allowing the CEO to oversee management information. Basically, a conflict of

interest occurs when one person serves as both CEO and Chairperson. Having a dual role necessitates ethical self-monitoring, which is not always successful and can result in power abuse. Furthermore, an independent director as a Chairperson has greater responsibility to stakeholders, improving corporate accountability. In this regard, non-executive directors are connected to external factors that push an internal CG mechanism in initiating corporate sustainability strategies. Previous empirical studies on the link between CEO duality and CSP had revealed mixed results. For example, Ma et al. (2019) demonstrated a positive link between CEO duality and environmental performance. Similarly, Mubeen et al. (2020) found that CEO duality and sustainability reporting had a positive and significant relationship. In contrast, Liao et al. (2015) found an insignificant relationship between CEO duality and corporate sustainability initiatives. Due to these conflicting results, there is a need to examine the CEO and Chairperson roles thoroughly. Therefore, the following hypothesis is proposed:

*H3. Separate positions for CEO and Chairperson roles have a positive and significant relationship with CSP in the energy sector.*

#### **Interlocking Directorships**

Director interlocks provide additional experience and access to valuable information due to concurrent connections amongst various corporations. This scenario enhances the ability of interlocking directors to influence strategic decisions made by the corporations with which he or she is associated (Valeeva et al., 2020). Several academic pieces of evidence showed that interlocking directors influence corporate orientation by adopting interlocked corporation processes and policies (Ding et al., 2021; Rubino et al., 2020). According to the resource dependency theory, directors who serve on the boards of multiple corporations may have a better chance of staying up-to-date on environmental information and knowledge (Salancik et al., 1978). Besides, interlocking directors have access to multiple networks simultaneously and may also provide corporations with more reliable information that is not commercially available (Briseno-Garcia et al., 2022). Furthermore, even if the information that comes out from interlocked corporations is accessible in the market, the interlocking directors enhance the value of human capital of the board by sharing information without any cost (Yildiz et al., 2021). Additionally, the information shared by a board member is generally more authentic than that provided by an external source. Directors with experience on multiple boards will likely better understand environmental issues, concerns for stakeholders, corporate reputation and financial performance. As a result, interconnected directors will be more inclined to reveal important aspects of environmental management and recognise green opportunities. Previous studies on the link between directors interlock and CSP revealed mixed results. For example, Rubino et al. (2020) found that the presence of interlocking directors on the board had no significant effect on environmental performance. Conversely, Bose et al. (2021) and Lu et al. (2021) reported a positive effect of directors interlock on CSR and the environmental performance of the corporations. Therefore, the following hypothesis is formulated:

*H4. Interlocking directorships have a positive and significant relationship with CSP in the energy sector.*

#### **Board Gender and Cultural Diversity**

The board's diversity is more inclined to comprehend and meet the needs of various stakeholders. A diverse board, as opposed to a directive board with a more homogenous profile, is more likely to value different perspectives and expertise during decision-making (Lee et al., 2019; Martinez-Ferrero et al., 2021). Regarding gender diversity, Lonkani (2019) argued that female BOD outperformed men in various situations, especially when things were uncertain. On the other hand, women have more communal traits; they are compassionate, cooperative, friendly, interpersonally sensitive and more concerned about others' well-being (Ben-Amar et al., 2017). In this respect, Iannotta et al. (2016) asserted that as their concern for others' needs, women BOD are more actively engaged in corporate strategy issues that influence stakeholders other than shareholders. Therefore, women BOD may be more responsive regarding environmental and social issues. Consistently, Rodriguez-Ariza et al. (2017) demonstrated that female directors were more oriented towards charitable donations and CSR issues than male counterparts. Female BOD contribute more to practical CSR-related

issues. Moreover, compared to male directors, women directors typically have different professional backgrounds and adopt a more participative leadership style (Giannarakis et al., 2020). Their diverse perspectives foster an environment conducive to open dialogue, which could help the board address sustainability issues more effectively. Therefore, the following hypothesis is proposed:

*H5. Female BODs have a positive and significant relationship with CSP in the energy sector.*

Previous researchers had also looked into the board's cultural diversity and financial performance. For instance, Ayega et al. (2018) analysed the effect of board cultural diversity on corporate performance. The results demonstrated a strong link between board cultural diversity and corporate performance. Conversely, Frijns et al. (2016) explored the effect of cultural diversity on corporate performance. The findings revealed that cultural diversity on the corporate board negatively influenced corporate performance. However, the abovementioned studies showed a mixed result. Furthermore, Rao et al. (2016) stated that corporations that linked their success to accomplishing pre-determined objectives might choose to hire a BOD with diverse backgrounds with ethical and moral values. Similarly, Lau et al. (2016) argued that a BOD, consisting of members with a diverse professional background gained in other countries is more inclined to commit to CSR implementation. Furthermore, individuals from various ethnicities always seem to have distinct norms and values (Shih et al., 2019), which means that different ethical standards and perceptions may affect the board's decision. Besides, board members from various nationalities could enhance CSR quality by providing guidance when tackling CSR challenges in various markets (Katmon et al., 2019). Bringing all of the above into account, and due to the scarcity of information, the following hypothesis is formulated:

*H6. Cultural diversity on the board has a positive and significant relationship with CSP in the energy sector.*

## METHODOLOGY

### Population and Sample Selection

The sample for this study was extracted from the Thomson Reuters Eikon Asset4 (Thomson Reuters) database. The Thomson Reuters database is widely used in the financial markets and is a leading financial data provider worldwide. Furthermore, Thomson Reuters provides worldwide comprehensive economic, social, environmental and governance data to measure corporate sustainability performance. It includes data on 5,000 corporations worldwide as well as 400 data categories. Moreover, it includes ethical screening criteria and all aspects of corporate sustainability performance (Jitmaneroj, 2016) and data from the corporations' annual reports regarding BOD's attributes.

This study used information from the Thomson Reuters database to create a sample by following two steps. The first step was to narrow the sample to only corporations in the energy sector. Globally, the Thomson Reuters database provides information on 2,467 energy sector corporations regarding CSP. However, only 335 sample data were selected out of 2,467 due to missing data for less than four to five years were excluded from the sample in the second step. The study's samples were taken from 2016 to 2020 from energy sector corporations that revealed information on CSP. As a result, this study used 335 energy sector corporations as a sample and included 1,675 observations with data for all variables from 2016 to 2020 in 48 countries worldwide. The overall data summary is shown in Table 1.

Table 1 Summary of Data

Total Companies Registered	2467
Total Companies Based ESG Score	380
Companies Excluded Based on Data Availability	45
<b>Total Companies Chosen for Analysis</b>	<b>335</b>
Oil and Gas corporations	288
Renewable energy corporations	15
Coal corporations	22
Uranium energy corporations	10

## Data Analysis

When data have both cross-sectional and time-series dimensions, panel data analysis is the most efficient method. The data are pooled across space and time since the same cross-sectional unit is surveyed over time. The dependent variable and some of the independent variables could be determined simultaneously in this study. In this respect, this study had a simultaneous problem. Therefore, to address this issue, the current research required an econometric model that accounts for endogeneity and unobserved fixed effects unique to each corporation. This issue could be solved by using pooled ordinary least squares (OLS) estimation; however, this produced biased and inconsistent estimators when the unobserved effect is correlated with the explanatory variables. To prevent this econometric problem, Andres Alonso et al. (2008) recommended using either the first difference or fixed effect within the estimators when exploring the association between CG and corporate performance. Conversely, Hermalin et al. (2003) demonstrated that corporate board members are determined endogenously and they also argued that when strict exogeneity conditions fail, the first difference and fixed effects are inconsistent. Specifically, Hermalin et al. (2003) explained that the fixed effect estimators are biased in the particular instance of the board's structure because they do not consider the effect of corporate performance on the current board structure. After implementing a CG mechanism, corporations take some time to see the results of the performance. Following the study by Arellano et al. (1991), the system-generalised method of moments (SGMM) two-step estimator was used to test the hypotheses in dealing with autocorrelation and heterogeneity, heteroskedasticity and endogenous, and predicted independent variables. SGMM is suitable for studies with a short sample period and a large number of cross-sections (Chin et al., 2022; Roodman, 2009; Sini et al., 2021). SGMM comprises two-level equations requiring the instrumental variables to eliminate the correlation problem amongst residual and predictor variables. According to Hermalin et al. (2003), corporate governance, such as the BOD variables, was considered endogenously linked with corporate performance, and thus instrumented. Therefore, the lag t-2 of all predictor variables was chosen as an instrument in this study. Furthermore, two diagnostic tests, such as the Sargan test of over-identifying restrictions and AR (2), had been reported. Sargan test of over-identifying restrictions verifies validity of the instruments by examining moment conditions used in the estimation technique. If the moment condition is met, the instruments are valid. Concurrently, AR (2) test examines the non-serial correlation between error terms. It was worth noting that the results of SGMM two-step estimators match those of the pooled OLS and fixed-effects models (Table 5).

## Variables Measurement

### Dependent Variables

The main focus of this study was on sustainability dimensions, in terms of environmental and social performance. The economic performance score was excluded from the CSP measurement as it was considered irrelevant in the context of CSP. This is justified by a study of (Chollet et al., 2018). They argued that economic performance is irrelevant in the context of CSP, as economic performance is similar to financial performance. Following a study by Chollet and Sandwidi (2018), the aggregate CSP was calculated by dividing the sum of environmental and social scores by two, which was represented in the percentage.

### Independent Variables

CG attributes, such as the BOD attributes are independent variables and BOD data were also extracted from the Thomson Reuters database. Following previous studies (Naciti, 2019; Rubino et al., 2020), BOD attributes such as, independent directors on the board were measured by the percentage of independent directors. Furthermore, board size is the total number of board members and separation of Chairperson and CEO was measured by dummy variable, for example, if there were different positions for the Chairperson and CEO, the ranking was indicated as 1, otherwise 0. Moreover, board gender diversity was calculated by the percentage of female directors, while board cultural diversity was measured by the percentage of board members, who are from a cultural background other than that of corporate headquarters. In terms of interlocking directors, it was measured as the percentage of directors serving on the board of multiple corporations. In line with a study by Rubino et al. (2020), directors interlock is calculated as the ratio of interlocking directors on the board to the total board size.



**Control Variables**

Corporations with higher debts and large size are likely to have better sustainability activities and practices. Therefore, leverage (LEV) and firm size (lfs) were considered as control variables (Chollet et al., 2018). LEV was calculated as total debts divided by total assets, as suggested by (Walls et al., 2012). Simultaneously, the natural logarithm of the total asset reported by the corporation was used to calculate lfs.

**Model Specification**

The following analytical model, with variable code names and descriptions, was used to investigate the impact of BOD’s attributes on CSP. The description of the variables used in models 1 and 2 are presented in Table 2.

$$csp_{it} = \alpha_0 + \beta_1 lbi_{it} + \beta_2 lbs_{it} + \beta_3 ceod_{it} + \beta_4 ldi_{it} + \beta_5 lbgend_{it} + \beta_6 lbcd_{it} + \beta_7 llev_{it} + \beta_8 lfs_{it} + \lambda_{it} + \eta_t + \varepsilon_{it} \quad (1)$$

$$csp_{it} = \alpha_0 + \beta_1 csp_{it-1} + \beta_2 lbi_{it} + \beta_3 lbs_{it} + \beta_4 ceod_{it} + \beta_5 ldi_{it} + \beta_6 lbgend_{it} + \beta_7 lbcd_{it} + \beta_8 llev_{it} + \beta_9 lfs_{it} + \lambda_{it} + \eta_t + \varepsilon_{it} \quad (2)$$

where, csp = Corporate sustainability performance,  $csp_{it-1}$  = lagged dependent corporate sustainability performance, lbi= Independent directors on board, lbs= Board size, ceod= Separate position for CEO and Chairperson, ldi= Directors interlocks, lbgend= Board gender diversity, lbcd= Board cultural diversity, llev= leverage, lfs= Firm size,  $\lambda_{it}$ = Country effect,  $\eta_t$  = Time effect,  $\varepsilon$  = error term.

Table 2 Variables Description and Source

Variables	Definition	Source
Corporate Sustainability Performance	Corporate score that combines environmental and social domains. The overall score is expressed as a percentage ranging from 0% to 100%.	Thomson Reuters Eikon Database
Board independence	The percentage of non-executive board members	Thomson Reuters Eikon Database
Board Size	The number of board members as at the end of the financial year	Thomson Reuters Eikon Database
Separate position for CEO and Chairperson	Specifying the CEO and chairman have separate board positions	Thomson Reuters Eikon Database
Interlocking directorship	Directors who serve on multiple corporate boards	Annual Reports
Board gender diversity	The percentage of women on the board	Thomson Reuters Eikon Database
Board Cultural diversity	The percentage of board members from a different culture than corporate headquarters	Thomson Reuters Eikon Database
Leverage	leverage determined by dividing total debt by total assets	Thomson Reuters Eikon Database
Firm size	The natural logarithm of the total assets that have been reported by the corporation	Thomson Reuters Eikon Database

**RESULTS AND DISCUSSIONS**

**Descriptive Statistics**

Descriptive statistics for dependent, independent and control variables were performed to show the overall picture of the data set used for the current study. The number of observations, mean, standard deviation, maximum and minimum values are shown in Table 3. CSP had a mean of 39.77, standard deviation of 25.62 and ranged from 0 to 95 for the minimum and maximum values. With a mean of 63.09 and a standard deviation of 25.32, independent directors (bi) ranged from 0 to 100. With a mean of 8.97 and a standard deviation of 3.06, board size (bs) ranged from 3 to 24 as a minimum and maximum value. The different positions for CEO and Chairperson (ceod) had a mean of 0.655 and standard deviation of 0.47, indicating 0 and 1 as the minimum and maximum values, respectively. Moreover, directors interlock (di) ranged from 0 to 100, with a mean of 52.52 and standard deviation of 22.78. The board gender diversity (bgend) score ranged from 0 to 60, with a mean of 15.17776 and standard deviation of 12.55. Board cultural diversity (bcd) had a mean value of 40.36919, ranged from 0 to 99.10 and standard deviation of 27.50. With a standard deviation of 6404.31 and mean of -65.02, lev ranged from -253614 to 58245.83. Furthermore, with a mean of 21.96 and standard deviation of 1.966933, lfs ranged from 14.89 to 26.74.

Table 3 Descriptive Statics

Variable	Observations	Mean	Std. Dev.	Min	Max
csp	1,675	39.7791	25.62329	0	95.02551
lbi	1,675	63.09519	25.32036	0	100
lbs	1,675	15.17776	12.55622	0	60
ceod	1,675	8.975522	3.060911	3	24
ldi	1,675	.6555224	.4753395	0	1
lbgend	1,675	52.52086	22.78931	0	100
lbcd	1,675	40.36919	27.50909	0	99.10714
llev	1,675	65.02812	6404.316	-253614	58245.83
lfs	1675	21.96613	1.966933	14.89314	26.74253

### Correlation Analyses

Table 4 reports the correlation coefficients for all explanatory variables. Correlation is one of the tests to identify the level of multicollinearity amongst explanatory variables. Table 4 shows the highest correlation was found between lbgend and lbcd, which was 67.23% and significant at 1% level, while the lowest correlation was found between ldi and llev, which was 1.3% and insignificant. As the correlation coefficient between two explanatory variables is less than 0.90, the correlation matrix results showed no severe multicollinearity issues.

Table 4 Correlation Matrix

	csp	lbi	lbs	ceod	ldi	lbgend	lbcd	llev	lfs
<b>csp</b>	1.0000								
<b>lbi</b>	0.2025***	1.0000							
<b>lbs</b>	0.4002***	-0.0339	1.0000						
<b>ceod</b>	0.0721***	-0.0465*	-0.0940***	1.0000					
<b>ldi</b>	0.0523**	0.1368***	-0.2246***	0.0227	1.0000				
<b>lbgend</b>	0.3436***	0.2140***	0.1815***	0.0189	0.1383***	1.0000			
<b>lbcd</b>	0.3436***	0.3182***	0.0945***	0.0982***	0.1562***	0.6723***	1.0000		
<b>llev</b>	0.0770***	-0.0040	0.0799***	-0.0550**	0.0135	0.0613**	0.0342	1.0000	
<b>lfs</b>	0.5005***	0.0621***	0.5598***	-0.0494***	0.0719***	0.2213***	0.2515***	0.1724***	1.0000

Notes: At the 0.01\*\*\*, 0.05\*\* and 0.1\* levels, correlation is significant.

### Panel Regression Analysis Results and Discussion

The pooled OLS fixed effects and SGMM models are shown in Table 5. Initially, 1,675 observations were used in the analysis. Using the Cooks distance test for outliers, the system automatically detected a set of outliers during the model estimation (Cook, 1977). The cut-off = 1 command, on the other hand, was used to automatically remove the list of outliers from the estimation process. Finally, the model was estimated using 1,551 observations in pooled OLS and fixed effects. Due to the lagged dependent variable and the system deducted outliers, 1,238 observations were used in SGMM to estimate the model. Since SGMM is a more robust model than pooled OLS and fixed-effects models in dealing with autocorrelation, heterogeneity, heteroskedasticity, and endogenous and predetermined explanatory variables, this study only focused on SGMM for further discussion of the regression results.

The results of the diagnostic check for model M3 under column 3 showed a mean of 1.44, whereby the variance inflation factor (VIF) indicated no multicollinearity between the independent variables. Additionally, Cook's distance test for outliers was used to identify and eliminate outliers from the model estimation, yielding 1,238 observations. The results of GMM model estimation showed AR1 with a significant p-value of (0.037), but AR2 had an insignificant p-value of (0.830), indicating no second-order serial correlation. The Sargan test yielded a p-value of 0.712, indicating that the model's instrument was valid. Furthermore, the lagged dependent variable was significant at a 1% level, with a positive coefficient of 0.280, demonstrating the suitability of GMM as a model estimator.

Table 5 Panel Regression Analysis

	Pooled OLS(M1)	Fixed effects (M2)	SGMM (M3)	
<b>_cons</b>	1.502*** (0.000)	-0.966 (0.241)	-5.812** (0.001)	
<b>L.lcsp</b>	0.794*** (0.000)	0.454*** (0.000)	0.280*** (0.001)	
<b>lbi</b>	0.186*** (0.000)	0.248*** (0.000)	-0.532* (0.046)	
<b>lbs</b>	0.637*** (0.000)	0.587 (0.072)	1.612* (0.049)	
<b>ceod</b>	0.0963** (0.001)	0.0789* (0.044)	0.578* (0.011)	
<b>ldi</b>	0.188** (0.007)	0.599* (0.042)	2.532** (0.008)	
<b>lbgend</b>	0.0197 (0.491)	0.0395 (0.234)	-0.114 (0.227)	
<b>lbcd</b>	0.158*** (0.000)	0.116* (0.023)	0.0813 (0.698)	
<b>llev</b>	0.0116 (0.478)	0.0109 (0.541)	0.188* (0.047)	
<b>lfs</b>	0.153***	0.0234 (0.455)	0.159 (0.244)	
<b>No. of observations</b>	1551	1551	1238	
<b>R-sq</b>	0.349	0.1555	<b>Instruments</b>	40
<b>Vif (mean)</b>	1.46		1.44	
<b>Wooldridge test</b>	Prob > F = 0.0000		<b>WaldChi<sup>2</sup></b>	1341.60***
<b>Modified Wald test</b>	Prob > X2 = 0.0000		<b>AR(1) test</b>	0.037
<b>Breusch &amp; Pagan</b>	Prob > chibar2 = 0.0000		<b>AR(2) test</b>	0.830
<b>Hausman fixed</b>	Prob>X2= 0.0000		<b>Sargan test</b>	0.712

Notes: For a total of 1551 observations, the sample includes 335 energy sector corporations, over five years. \*\*\*, \*\*, \* indicate significant levels of 1%, 5% and 10% respectively. AR(1) test Check for the presence of 1st order residual autocorrelation, The AR(2) test detects residual autocorrelation of the second order and The Sargan test demonstrates that the instrument is valid.

The results of the diagnostic check for model M3 showed no multicollinearity amongst the explanatory variables, as evidenced by the VIF, with a mean of 1.44. Furthermore, the Cook's distance test for outliers was used to identify and eliminate outliers from the model estimation, resulting in 1,238 observations being considered. Model M3 also demonstrated the findings of GMM model estimation. The p-value of AR1 was significant at (0.037), while AR2 was insignificant at (0.830), indicating no second-order serial correlation. The Sargan test showed a p-value of 0.712, indicating that the instrument in the model was valid. Additionally, with a positive coefficient of 0.280, the lagged dependent variable was significant at a 1% level, demonstrating the suitability of GMM as a model estimator.

The results indicated that board size, different CEO and Chairperson positions, and director interlocks were positively and significantly associated with CSP at 5%, 5% and 1% levels, respectively. At a 5% level, the presence of independent directors was significant, but negatively associated with CSP, whereas board gender diversity (lbgend) and board cultural diversity (lbcd) did not affect CSP.

Furthermore, the presence of interlocking directors as well as the large board size and different positions for CEO and Chairperson all contributed to an increase in CSP. Previous studies had found similar results (Garcia Martin et al., 2020; Naciti, 2019). In contrast to the prediction, increasing the number of independent directors on the board decreases CSP. These findings might be explained by the likelihood that reputational risk associated with information disclosure regarding CSP may impact independent directors' behaviour. Moreover, information provided by management to independent directors might be factually inaccurate as a result of information asymmetric (Bansal et al., 2018). Furthermore, the presence of female directors and directors from various cultural backgrounds did not affect CSP, implying that having a large number of women on the board and board members from various cultural backgrounds have a negligible impact on CSP in the energy sector corporations. One possible explanation was that diversity could exacerbate conflict and resentment (Galinsky et al., 2015). Furthermore, while diversity in the board has decision-making and economic benefits, it also runs the risk of devolving into harmful conflicts, which can stymie corporate growth (Pucheta-Martinez et al., 2019). Due to the highly regulated nature of the energy sector, corporations may appoint board members based on gender diversity and cultural background in response to public and regulatory pressure. However, they do not actively participate in corporate decision-making due to lack of experience, communication bias and conflict of interest.

## CONCLUSION

Corporate sustainability is a critical component of all business sectors and is specifically crucial in the energy sector, whereby operational risk is very high. This study examined the association between BOD's attributes and CSP of energy sector corporations with the stakeholders, agency and resource dependency theories used as the theoretical approaches to understand the CSP determinants. Using data from the Thomson Reuters database, preliminary tests were initially conducted, such as descriptive statistics, correlation matrix and VIF test to check for multicollinearity issues, and subsequently GMM estimation was deployed on a sample of 335 energy sector corporations operating in different geographical locations. The study found a significant correlation between board size, different CEO and Chairperson positions, interlocking director roles and CSP. Contrarily, board gender and cultural diversity had no impact on CSP, while the number of independent directors on a board reduces CSP. Furthermore, this study added to the body of knowledge in several aspects. Firstly, in line with the stakeholder and agency theories, the study found that a large size of the board and different positions for CEO and Chairperson roles improved CSP in the energy sector corporations. Moreover, the study indicated that interlocking directors had a significant and positive impact on CSP, which was consistent with the resource dependency theory. However, the findings contradicted the claim that having a large number of independent directors on the board, board gender diversity and board cultural diversity were positively and significantly related to CSP in the energy sector. Instead, a negative correlation was found between independent directors and CSP, while an insignificant relationship was found between board gender diversity, board cultural diversity and CSP in the energy sector.

Practically, this study would assist experts in understanding how to enhance CSP by implementing a specific board governance structure, such as board size, separate positions for CEO and Chairperson roles, and interlocking directorships. These attributes would be an effective tool for encouraging managers to act in the best interests of their stakeholders by formulating and implementing sustainable strategies and policies since BOD does not have direct access to information about corporate strategic management. Moreover, a strong composition of BOD could be a way to improve CSP and protect the rights of stakeholders. Meanwhile, in retrospect, it is expected that the independent directors, gender and cultural diversity to be statistically positive and significant. However, the finding showed that the board independent directors was negative and significant despite the fact that the independent directors enhanced the board performance, reduced agency expenses and provided better management oversight. The disclosure of sustainability-related information in the context of CSP might cause the independent directors to be more concerned about their reputations, which could lead them to act less vehemently against CSP issues (Bansal et al., 2018; Naciti, 2019). Meanwhile, gender and cultural diversity exhibited no relationship.

This study, however, had some limitations. The sustainability performance score from the Thomson Reuters database was used to improve the study's internal validity. Conversely, since the corporations sampled were relatively larger energy corporations with global coverage, the findings of the study might not be generalisable to other sectors, such as financial institutions, commercial services providers, FMCG and health sectors due to differences in their operational activities. Therefore, it is suggested that future research concentrates on these sectors. Furthermore, this study focused on the board's attributes as important governance mechanisms influencing CSP. Other board characteristics, like educational background, age of BOD members and voluntarily forming a sustainability committee to address social and environmental issues, could be the subject of future research. To further strengthen BOD's propensity for implementing sustainable practices to improve CSP, it would be beneficial to look into additional mediating or moderator variables, such as technological innovation, CSR spending and the role of sustainability officers.

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