Assessing the sustainability reporting quality of oil & gas companies in Indonesia and Malaysia: Examining the influence of board and CEO chair characteristics

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Abstract. Presently, companies, particularly those significantly impacting the environment and society, are obliged to report their sustainability-related actions. This research focuses on exploring how the characteristics of the board and the chief executive officer contribute to enhancing the quality of sustainability reporting in Oil & Gas companies operating in Indonesia and Malaysia. The study involves an analysis of 18 companies across the years 2012-2022, forming an unbalanced panel dataset encompassing a total of 178 company-year observations. Utilizing the random effect model, the findings suggest that the board's size, an independent board, and a CEO with a lengthier tenure significantly contribute to improving the quality of corporate sustainability reporting. On the other hand, the gender diversity of the board and the age of the CEO do not exhibit a significant impact on enhancing the quality of corporate sustainability reporting. This research fills a gap in the existing literature by investigating the correlation between board and CEO characteristics and the quality of sustainability reporting within the Oil & Gas sector, specifically focusing on the Indonesian and Malaysian contexts. Moreover, it offers valuable insights and understanding for industry practitioners.

1 Introduction

Sustainability reporting involves disclosing a company's impact on the environment and society, along with its efforts to sustain all involved parties [1,2]. The research in Shamil et al., [3], Hahn and Kühlner [4], Rao et al., [5] emphasizes the pivotal role of corporate governance in implementing reporting systems for economic, environmental, and social performance within a business entity. As per Crifo et al., [6], robust corporate governance mechanisms enhance transparency and accountability, resulting in superior reporting practices. However, a substantial number of studies exploring the link between corporate governance and sustainability reporting have predominantly been conducted in developed...
nations [2,7,8]. There is a scarcity of studies examining similar connections in developing countries [9,10], particularly within nascent sustainability reporting domains like India [11]. Moreover, investigations examining the correlation between corporate governance and sustainability reporting within Oil & Gas companies are limited, especially in the context of two developing countries such as Indonesia and Malaysia. Consequently, there's a need for further exploration into the relationship between corporate governance and the quality of sustainability reporting among Oil & Gas companies in Malaysia and Indonesia.

This research investigates the impact of board members and chief executive officers (CEOs) on the quality of sustainability reporting within Oil & Gas companies operating in Indonesia and Malaysia. Geographically adjacent, Indonesia and Malaysia share similarities in elements of culture, language, and customs. However, in terms of corporate governance, the two countries differ. Indonesia follows a two-tier board model, comprised of the board of commissioners and the board of directors [12]. On the other hand, Malaysia operates under a one-tier board model, which involves the board of directors and the top management team [13]. In the one-tier board model, the responsibilities of the board of directors include providing guidance, oversight, and control over the execution of the top management team's duties and responsibilities. Consequently, the roles and responsibilities of the board of directors in the one-tier model are analogous to those of the board of commissioners in the two-tier model. The responsibilities of the top management team in the one-tier model align with those of the board of directors in the two-tier model, involving crucial decision-making to drive optimal company performance and sustainability. For clarity, the board of commissioners in Indonesia and the board of directors in Malaysia will henceforth be referenced as the 'Board'. Additionally, the board of directors in Indonesia and the top management team in Malaysia will be referred to as the Chief Executive Officer (CEO).

2 Literature review and hypothesis development

2.1 Literature review

Comprehending corporate sustainability reporting is a multifaceted concept, necessitating a multi-theoretical approach in its examination [14]. Past research exploring corporate sustainability has employed numerous theories to unveil management's comprehension and incentive in disclosing corporate sustainability. These encompass agency theory, legitimacy theory, stakeholder theory, stewardship theory, and signaling theory.

2.1.1 Agency theory

As per agency theory, conflicts of interest can emerge due to differing objectives between managers and shareholders. Jensen and Mackling highlighted that one of the principal roles of the board involves overseeing and supervising managers [15]. Consequently, control over agency costs and the information imbalances arising from disputes between managers and shareholders can be achieved. Moreover, drawing from agency theory, Peter Agyemang-Mintah and Hannu Schadewitz [16] and Carter et al., [17] demonstrated that boards exhibiting higher levels of gender diversity might stimulate enhanced monitoring functions. This can be ascribed to the premise that gender diversity significantly contributes to bolstering board autonomy [18], thus amplifying board efficacy, which, in turn, could advance environmental performance [19,20].
2.1.2 Stakeholder theory

According to stakeholder theory, there exists a contractual connection between companies, represented by executive managers, and stakeholders. In this relationship, managers are dedicated to meeting the expectations of diverse stakeholders to secure their recognition and endorsement [21]. Within the social and environmental context, a company's stakeholders encompass individuals or groups who might be affected or advantaged by the business entity, whose rights could be infringed upon, or who should be respected by the company [22]. Engaging in environmentally responsible practices aligns with the fundamental needs of a broader spectrum of stakeholder groups, extending beyond communities, employees, investors, and the environment. Within this context, Elmagrhi et al., [19] posits that the presence of women in boardrooms can amplify and bolster the pressure on companies to uphold heightened levels of environmental performance in order to satisfy the requirements of influential stakeholders.

2.1.3 Legitimacy theory

Legitimacy theory asserts that for organizations to attain acknowledgment and approval, they must identify their stakeholders and discern their stakeholders' requisites or expectations [23]. This theory perceives that companies are responsible for adhering to societal norms and addressing social requirements to maintain their legitimacy within the community [24]. According to Orazalin and Mahmood [25], neglecting these societal needs and expectations can jeopardize the company's survival. Legitimacy theory supports the idea that sustainability disclosures serve to shape stakeholders' perceptions of the company and exhibit the company's dedication to environmental and social concerns [26–28].

2.2 Hypothesis development

2.2.1 Board size and quality of sustainability reporting

Shamil et al., [3], Kılıç and C. Kuzey [24] emphasize that smaller boards tend to be more effective in reducing agency conflicts between managers and shareholders. Conversely, larger board sizes can lead to ineffective coordination and heightened agency costs [29], increased communication challenges, delayed decision-making, and weakened managerial oversight [30,31].

In contrast, Sufian and Zahan [32] discovered no direct correlation between board size and sustainability reporting, while the majority of studies indicate a positive link between larger board sizes and sustainability reporting [3,5,31]. From the perspective of legitimacy theory, larger boards possess a wealth of expertise among their members, contributing to improved sustainability reporting, thereby addressing issues related to accountability and legitimacy [33]. Moreover, more recent studies have consistently shown a positive association between board size and sustainability reporting [9,34–37]. Aligning with legitimacy theory and the prevailing findings in previous studies, this research presumes that a larger board size positively influences the sustainability reporting of Oil & Gas companies in Indonesia and Malaysia. As a result, the developed hypothesis is as follows:

H1. The board's size enhances the quality of sustainability reporting for Gas & Oil companies in Indonesia and Malaysia.
2.2.2 Independent board and quality of sustainability reporting

Stakeholder theory posits that companies with more autonomous boards tend to excel in satisfying diverse stakeholders by providing high-quality information [38,39]. Evidence from Maroun et al., [40] and Chau et al., [41] demonstrates that independent boards enhance sustainability reporting standards in South Africa. Citing stakeholder theory, multiple studies suggest a positive association between autonomous boards and corporate social responsibility [42,43].

Conversely, as per agency theory, independent boards improve managerial oversight, monitor social conduct, and mitigate agency issues [3,5,44,45]. Furthermore, agency theorists propose that the non-financial nature of independent board roles drives them to advocate for the social concerns of external stakeholders. Consequently, autonomous boards pay increased attention to Environmental, Social, and Governance (ESG) matters to bolster the corporate image, exerting significant pressure on managers to deliver improved sustainability information [46,47]. However, recent empirical studies highlight that there is no substantial correlation between autonomous boards and the quality of sustainability reporting [3,9,48–51]. Empirical evidence suggests an inconsistent relationship between independent boards and the quality of sustainability reporting. Nevertheless, there is an expectation that boards with a higher number of independent members will enhance the quality of sustainability reporting. Particularly in Indonesia, where the Financial Services Authority Regulation (POJK) Number 57/POJK.04/2017 mandates that public companies have at least thirty percent of their board composed of independent members. Consequently, the developed hypothesis is as follows:

H2. The independence of the board enhances the quality of sustainability reporting for Gas & Oil companies in Indonesia and Malaysia.

2.2.3 Women's participation on boards and sustainability reporting quality

The inclusion of women in boardrooms has garnered significant attention among both industry professionals and researchers. Presently, women's representation on boards is believed to foster more well-rounded decision-making, given the perceived differences in thinking between men and women [52]. Women's participation tends to demonstrate higher sensitivity toward sustainability-related issues, display more generosity in addressing community matters, and adopt a stakeholder-oriented approach, paying attention to employees, the environment, and society. Moreover, they tend to exhibit distinct leadership styles compared to men [53]. Consequently, women's participation on boards is considered to bolster more effective decision-making, ultimately enhancing corporate sustainability strategies and the quality of sustainability reporting [52,53].

However, Alazzani et al., [54] discovered no direct link between the presence of women on boards and the environmental performance of companies in Malaysia. Similarly, Gallego-Sosa [55] suggests that the presence of women in boardrooms doesn't significantly explain the environmental performance within the banking sectors of Europe and North America. Additionally, several empirical studies reveal a negative relationship between women's presence on boards and environmental performance. For instance, Cucari et al., [56] asserts that gender diversity on boards is negatively linked to corporate environmental and social responsibility reporting in Italy. In a similar vein, Ardito et al., [57] confirmed that the presence of women on boards shows a negative correlation with environmental performance in European and U.S. companies.

The empirical evidence yields conflicting results regarding the impact of women's representation in boardrooms on the quality of corporate sustainability reporting. Nevertheless, theoretical literature, such as agency, stakeholder, legitimacy, and signaling
theories, supports the notion of having women on boards as contributors to overall company performance, including the enhancement of sustainability reporting quality. Therefore, the developed hypothesis is as follows:

H3. Women's participation on boards enhances the quality of sustainability reporting for Gas & Oil companies in Indonesia and Malaysia.

2.2.4 Age of CEO chairman and quality of sustainability reporting

Empirical investigations exploring the correlation between the CEO chairman and company performance, which encompasses the quality of financial reporting, yield conflicting findings. Some perspectives, such as Kim and Lim [58], suggest that an older age of the CEO chairman correlates with increased risk aversion, potential loss of creativity, and reduced productivity, subsequently impacting company performance negatively. This view aligns with Liu and Zeng [47] in Khan et al. [59] in Pakistan and Fahadh and Rahman in India [60], reporting a negative association between CEO chairman age diversity and environmental social responsibility performance.

Conversely, Li et al., [61] asserts that diverse age ranges among top management (CEOs) stimulate innovation, thereby enhancing firms' competitive advantage. Additionally, Georgen et al., [62] argues that higher levels of age diversity in top management teams augment the effectiveness of managerial decisions and company performance, as the age of team leaders influences their approaches in business management, leading to increased experience and receptiveness to fresh ideas [63,64]. Moreover, according to Ferrero et al., [65] age diversity among directors results in more balanced decision-making, potentially improving company performance. However, Katmon [66] found an insignificant relationship between age diversity and the quality of Corporate Social Responsibility (CSR) disclosure.

Recent research, as per Beji et al., [67] indicates a positive correlation between the CEO chairman's age and environmental social responsibility in France.

As a result, the hypothesis formulated is as follows:

H4. The CEO chairman's age enhances the quality of sustainability reporting for Gas & Oil companies in Indonesia and Malaysia.

2.2.5 CEO chairman's tenure and sustainability reporting quality

Empirical examinations investigating the relationship between the CEO chairman's tenure and the quality of corporate sustainability reporting are seemingly scarce. However, Kruger suggests that CEO chairmen with lengthier tenures exhibit a greater dedication to accomplishing the company's long-term objectives and demonstrate heightened social concern. Additionally, Harjoto et al., [68] argues that boards and management teams with varied tenures possess a better grasp of company operations and regulations [69,70]. In a recent study Jouber [71] utilized a sample of 2,544 companies across 42 countries, illustrating that the tenure of the top management team leader (CEO) predominantly fosters increased environmental and social responsibility. Similarly, Fallah and Mojarrad [72] highlighted that CEO tenure significantly and positively influences the social and environmental responsibility of companies categorized as major polluters in Iran.

Consequently, the formulated hypothesis is as follows:

H5. The CEO chairman's tenure enhances the quality of sustainability reporting for Gas & Oil companies in Indonesia and Malaysia.
2.3 Control variable

The study incorporates company-specific elements such as size, profitability, growth, leverage, and age as control variables. Prior research indicates that such company-specific factors display a notable correlation with the quality of sustainability reporting.

For instance, Orazalin and Mahmood [9] established that larger companies are linked to higher-quality sustainability reporting. Additionally, Dissanayake [73] concluded that companies with lengthier operational histories tend to divulge more sustainability information due to their enhanced organizational structure and broader reporting experience.

Diverse findings have been reported regarding the relationship between leverage and sustainability reporting. Some studies, such as Ho and Taylor [74] and Karaman et al., [75] indicate a positive association, while others, like Orazalin and Mahmood [9] and Kouloukoui et al., [76], suggest negative connections. Concerning the link between profitability and the quality of sustainability reporting, sources like Andrikopoulos et al., [77] and Dissanayake et al., [73] provide varied perspectives.

Lastly, Hsu [78] elucidates that companies experiencing high growth tend to prioritize funding growth, even at the expense of reducing financing for programs associated with environmental social responsibility and sustainability.

3 Research methods

The dataset comprises 18 Oil & Gas companies listed in the Indonesian and Malaysian markets during the timeframe spanning from 2012 to 2022. This dataset forms an unbalanced panel of information, totaling 178 companies observed over the specified years. Among the sampled companies, 14 were from the Indonesian market, resulting in a total observation count of 136 company-years. Additionally, the Malaysian market contributed 4 companies, accumulating a total observation count of 42 company-years.

3.1 Variable

3.1.1 Dependent variable

The variable under examination is the quality of sustainability reporting, which is assessed using a sustainability reporting checklist aligned with the G3 guidelines provided by GRI. This checklist encompasses 48 distinct sustainability reporting elements, categorized into economic performance (7 items), environmental performance (16 items), and social performance (25 items). Specifically, these variables are evaluated using a weighted assessment method designed to underscore the level of importance attributed to specific reporting elements. This method permits a nuanced evaluation that differentiates between poor and excellent reporting, a distinction that isn't captured by binary methods [79].

The assessment of the sustainability reporting index in this study was conducted using a six-point scale, derived from Janggu et al., [80] with certain modifications. Initially measured on a six-point scale as follows: 0 = No mention, 1 = General mention (in one or two sentences), 2 = Brief explanation (in three to five sentences), 3 = Detailed explanations supported with images or detailed descriptions, 4 = Brief explanations encompassing incurred costs and images or graphics, and 5 = Comprehensive descriptions detailing activities or items that involve costs. This scale was preferred due to its consideration of the breadth and nature of the disclosed information, encompassing both qualitative and quantitative disclosures. Each value assigned to the indicators is totaled, then divided by the expected values using the following formula:
CSRD_{it} = \frac{\text{Number of scores of revealed indicators}_{it}}{\text{Expected total score}_{it}} \quad (1)

Where: \( i \) represents a specific company, and \( t \) indicates a specific period.

### 3.1.2 Independent variable

The variables independent of the study consist of the attributes related to the board and the Chief Executive Officer (CEO). The board's features are delineated by board size, the presence of an independent board, and the inclusion of women on the board. On the other hand, the CEO chairman's characteristics are characterized by the age and duration of tenure of the CEO chairman.

### 3.1.3 Control variable

Firm-specific factors consisting of company size, profitability, growth, leverage, and company age are considered control variables.

### 3.1.4 Analysis models

The study focused on analyzing the combined data of Indonesia and Malaysia. But the study also separately analysed data specific to Indonesia and Malaysia, for comparison.

The results of the Hausman test from the combined data gave \( \text{chi}^2 = 8.05 \) and \( \text{Prob} > \text{chi}^2 = 0.6243 \), indicating that the Random Effect Model (REM) is more suitable than the Fixed Effect Model (FEM). Especially for data from Malaysia it seems that REM is more suitable than FEM, because the results of the Hausman test give a value of \( \text{chi}^2 = 4.48 \) and \( \text{Prob} > \text{chi}^2 = 0.9233 \). Therefore, the estimation model for combined data and Malaysia-specific data uses REM, as has been used by Ebaid, Hussain et al., and Matuszak et al., [81–83]. The results of the Hausman test from Indonesia-specific data give a value of \( \text{chi}^2 = 12.68 \) and \( \text{Prob} > \text{chi}^2 = 0.0034 \), meaning that FEM is more suitable than REM. However, these selected FEMs suffer from symptoms of heteroscedasticity and autocorrelation that are difficult to overcome. In addition, the Generalized Method of Moments (GMM) model used gives biased results. Therefore, Indonesia-specific data were analyzed using Feasible Generalized Least Squares (FGLS), as suggested by Thuy et al., Chakroun et al., and Al-Malkawi & R. Pillai [84–86].

The specification of the analytical model developed for this study is shown in observation (1). Equation (2) applies to analyzing the combined data of Indonesia and Malaysia, Indonesia-specific data, and Malaysia-specific data.

\[
\begin{align*}
\text{QLTY}_{SR_{it}} &= \beta_0 + \beta_1 \text{B\_SIZE}_{it} + \beta_2 \text{B\_IND}_{it} + \beta_3 \text{B\_WMN}_{it} + \\
&\quad \beta_4 \text{CEO\_AGE}_{it} + \beta_5 \text{CEO\_TEN}_{it} + \beta_6 \text{SIZE}_{it} + \beta_7 \text{PROF}_{it} + \beta_8 \text{GROWTH}_{it} + \beta_9 \text{LEV}_{it} + \\
&\quad \beta_{10} \text{AGE}_{it} + \varepsilon_{it}
\end{align*}
\]

Where:

\( \text{QLTY}_{SR_{it}} \) represents the quality of sustainability reporting for a specific Oil & Gas company \( i \) at a particular time \( t \). \( \text{B\_SIZE}_{it} \) denotes a board metric calculated as the total count of board members. \( \text{B\_IND}_{it} \) stands for an independent board, formulated as the proportion of independent board members to the total number of board members. \( \text{B\_WMN}_{it} \) refers to a women's board, identified as the ratio of female board members to the total board members. \( \text{CEO\_AGE}_{it} \) signifies the age of the CEO chairman, quantified as the duration in years from
their birthdate to the date of data collection. CEOC_TENit represents the CEO chairman's tenure, measured as the time interval in years from the appointment date to the date of data collection. SIZEit is a company metric presented as the logarithm of 10% of the book value of total assets in US Dollars. PROFit indicates profitability, calculated as the ratio of earnings after tax to total assets. GROWTHit stands for the annual growth ratio of total assets. LEVit measures leverage, expressed as the ratio of the company's total debt to total assets. AGEit represents the age of the company, computed as the duration in years from the company's inception to the date of data collection.

4 Results and discussion

4.1 Results

This section contains descriptive statistics, correlation matrices among predictor variables, and a summary of the results of the combined (REM), Indonesia (FGLS), and Malaysia (REM) models.

4.1.1 Descriptive statistics

Descriptive statistics for all variable values analysed in Show in table 1.

Table 1. Descriptive statistics.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Combined</th>
<th>Indonesia</th>
<th>Malaysia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Dev.</td>
<td>Min</td>
</tr>
<tr>
<td>QLTY_S R</td>
<td>0.207</td>
<td>0.086</td>
<td>0.058</td>
</tr>
<tr>
<td>B_SIZE</td>
<td>4.348</td>
<td>1.833</td>
<td>2</td>
</tr>
<tr>
<td>B_IND</td>
<td>0.466</td>
<td>0.121</td>
<td>0</td>
</tr>
<tr>
<td>B_WM N</td>
<td>0.097</td>
<td>0.135</td>
<td>0</td>
</tr>
<tr>
<td>CEO_A GE</td>
<td>58.06</td>
<td>2.1036</td>
<td>27</td>
</tr>
<tr>
<td>CEO_TE N</td>
<td>6.427</td>
<td>7.009</td>
<td>1</td>
</tr>
<tr>
<td>PROF</td>
<td>0.650</td>
<td>0.672</td>
<td>-</td>
</tr>
<tr>
<td>LEV</td>
<td>0.576</td>
<td>0.298</td>
<td>0.001</td>
</tr>
<tr>
<td>AGE</td>
<td>30.13</td>
<td>8.2077</td>
<td>1.900</td>
</tr>
</tbody>
</table>

Table 1 shows that the mean sustainability reporting quality (QLTY_SR) of the combined data (Indonesia and Malaysia) is 0.207. The mean QLTY_SR of Indonesia is 0.197 and the mean QLTY_SR of Malaysia is 0.237. Thus, it is known that the mean QLTY_SR Indonesia is smaller than Malaysia. The mean board size (B_SIZE) of the combined data is 4,348 or more than 4 members. Meanwhile, the mean board size from Indonesia is 3,581 and the mean board size from Malaysia is 6,833. Thus, Indonesia's mean board size is smaller than Malaysia's. The independent board mean (B_IND) of the combined data is 0.466 or 46.60%. Meanwhile, the mean independent board from Indonesian data is 42.70% and the mean independent board from Malaysia is 59.00%. Thus, it appears that Indonesia's independent mean is smaller than Malaysia's. However, the mean independent board of Indonesian Oil & Gas companies is 47.20% which requires public companies in Indonesia to have an independent board of at least thirty percent of the total board members. The mean women's board (B_WM N) of the combined data is 0.097 or
9.70%. Meanwhile, the mean women's board from Indonesia is 5.90% and the mean women's board from Malaysia is 22.00%. Thus, the proportion of female member representatives on the board of Indonesian Oil & Gas companies is smaller than Malaysia.

Referring to Table 1, it is known that the mean age of the CEO Chairman (CEO_AGE) from the combined data of Indonesia and Malaysia is 58,062 years. Meanwhile, the mean age of the Chief CEO of an Indonesian company is 57,162 years and the age of the Chief CEO of a Malaysian company is 60,976. Although the age of the Chief CEO of a Malaysian company is on average older than that of Indonesia, the maximum age of the CEO of an Indonesian company (86 years) is older than Malaysia's at 70 years. The average tenure of the CEO Chairman (CEO_TEN) from the combined data of Indonesia and Malaysia is 6,427 years. The mean tenure of the Chief CEO of an Indonesian company is 6,882 years and the tenure of the Chief CEO of a Malaysian company is 4,952, it appears that the mean tenure of the Chief CEO of an Indonesian company is longer than that of Malaysia. Mean profitability (PROF) measured by the return on assets from the combined data of Indonesia and Malaysia is -65.00%, this means that on average Oil & Gas companies from both countries experience losses. In this case, the mean profitability of Indonesian companies of -0.53% is smaller than the mean profitability of Malaysia which is -1.06%. Thus, the average level of losses suffered by Oil & Gas companies in Indonesia is lighter than Malaysia. Furthermore, for descriptive statistics other variables can be seen in Table 1.

4.1.2 Multicollinearity test results

This study applied a correlation matrix, using combined Indonesian and Malaysian data, to detect multicollinearity symptoms between predictor variables, namely independent variables and control variables. The correlation matrix between predictor variables is shown in Table 2.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B_SIZE</th>
<th>B_IND</th>
<th>B_WMN</th>
<th>CEO_AGE</th>
<th>CEO_TEN</th>
<th>SIZE</th>
<th>ROA</th>
<th>GROW</th>
<th>DAR</th>
<th>AGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>B_SIZE</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B_IND</td>
<td>0.351</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B_WMN</td>
<td>0.547</td>
<td>0.228</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEO_AGE</td>
<td>0.008</td>
<td>0.103</td>
<td>-0.080</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEO_TEN</td>
<td>-0.122</td>
<td>-0.064</td>
<td>-0.111</td>
<td>0.399</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIZE</td>
<td>-0.008</td>
<td>-0.155</td>
<td>0.052</td>
<td>-0.039</td>
<td>-0.165</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROA</td>
<td>-0.063</td>
<td>0.036</td>
<td>-0.045</td>
<td>-0.021</td>
<td>0.034</td>
<td>0.120</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GROW</td>
<td>0.136</td>
<td>0.134</td>
<td>0.017</td>
<td>0.021</td>
<td>-0.064</td>
<td>-0.013</td>
<td>0.022</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DAR</td>
<td>-0.360</td>
<td>-0.100</td>
<td>-0.128</td>
<td>0.078</td>
<td>-0.024</td>
<td>-0.136</td>
<td>0.012</td>
<td>-0.054</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>AGE</td>
<td>0.474</td>
<td>0.033</td>
<td>0.424</td>
<td>0.155</td>
<td>0.027</td>
<td>-0.053</td>
<td>0.080</td>
<td>-0.128</td>
<td>0.161</td>
<td>1</td>
</tr>
</tbody>
</table>

From Table 2 it is known that the magnitude of the correlation coefficient between predictor variables gives a value below 0.850, which indicates that the data are free from symptoms of multicollinearity.

4.1.3 Results of data analysis

This study is more focused on analyzing the combined data of Indonesia and Malaysia to examine the role of board characteristics and CEO chairmen in improving the quality of sustainability reporting of Oil & Gas companies. In addition, the study also analyzed separately Indonesia-specific data and separately Malaysia-specific data for comparison.

Furthermore, a summary of the results of the model analysis from the combined data of Indonesia and Malaysia, Indonesia-specific data, and Malaysia-specific data is shown in table 3.
Table 3. Summary of analysis results from the combined model, Indonesia-specific model, and Malaysia-specific model.

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Combined Random Effect Model</th>
<th>Indonesia Feasible Generalized Least Square</th>
<th>Malaysia Random Effect Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>z</td>
<td>P&gt;</td>
</tr>
<tr>
<td>B SIZE</td>
<td>0.1778***</td>
<td>4.30</td>
<td>0.000</td>
</tr>
<tr>
<td>B IND</td>
<td>0.08911**</td>
<td>2.24</td>
<td>0.025</td>
</tr>
<tr>
<td>B GEN</td>
<td>-0.4991</td>
<td>-1.09</td>
<td>0.277</td>
</tr>
<tr>
<td>CEO AGE</td>
<td>-0.0038</td>
<td>-0.57</td>
<td>0.569</td>
</tr>
<tr>
<td>CEO TEN</td>
<td>0.0369***</td>
<td>4.06</td>
<td>0.000</td>
</tr>
<tr>
<td>SIZE</td>
<td>0.0333</td>
<td>0.35</td>
<td>0.728</td>
</tr>
<tr>
<td>PROF</td>
<td>0.0057</td>
<td>1.12</td>
<td>0.315</td>
</tr>
<tr>
<td>GROWTH</td>
<td>-0.0031</td>
<td>-0.74</td>
<td>0.459</td>
</tr>
<tr>
<td>LEV</td>
<td>-0.0706***</td>
<td>-3.62</td>
<td>0.000</td>
</tr>
<tr>
<td>AGE</td>
<td>0.0198***</td>
<td>3.24</td>
<td>0.001</td>
</tr>
<tr>
<td>Constant</td>
<td>0.0532</td>
<td>0.71</td>
<td>0.479</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>52.17%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wald chi²</td>
<td>96.23</td>
<td>337.47</td>
<td>151.07</td>
</tr>
<tr>
<td>Prob &gt; chi²</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Company number</td>
<td>18</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>Observations</td>
<td>178</td>
<td>136</td>
<td>42</td>
</tr>
</tbody>
</table>

Notes: ***statistically significant at 1%; **statistically significant at 5%; *statistically significant at 10%.

From Table 3 it is known that the REM model used to analyze the compound data appears fit, because it gives a value of Adjusted R-squared = 52.17%, Wald chi² = 96.23 with a value of Prob > chi² = 0.000. The REM model used to analyze Malaysia-specific data is also fit, as it gives an Adjusted R-squared value = 62.97%, Wald chi² = 151.07 with a Prob value of > chi² = 0.000. Similarly, the FGLS model from Indonesia-specific data shows adequate goodness of fit with Wald chi² = 337.47 and Prob > chi² = 0.000.

4.2 Discussion

Initially, the study's results indicate a significant positive impact of 1% of board size on the quality of sustainability reporting within Oil & Gas companies operating in Indonesia and Malaysia. This suggests that as the board size increases, there is stronger pressure exerted on the top management team to act in the shareholders' best interests, consequently enhancing the quality of sustainability reporting.

The conclusions drawn from this research align with various theoretical frameworks, including agency, legitimacy, and stakeholder theories. These theories suggest that larger boards contribute to enhanced decision-making effectiveness, thereby potentially improving overall company performance, which includes the quality of sustainability reporting. These findings are in line with multiple recent studies [34–36]. As a result, the study's outcomes have implications for supporting Hypothesis 1.

The study's second finding reveals a significant positive impact, reaching a level of 5%, on the quality of sustainability reporting within Oil & Gas companies in Indonesia and Malaysia associated with the presence of independent boards. This discovery mirrors the estimated outcomes based on data specific to Indonesia. However, the estimates drawn from data specific to Malaysia suggest that the board size does not impact the quality of sustainability reporting in Oil & Gas companies.
The positive influence observed implies that a greater presence of independent members on the board intensifies their influence on the top management team to enhance the quality of sustainability reporting in Oil & Gas companies. This conclusion is corroborated by stakeholder theory, which posits that companies equipped with more independent boards are more adept at satisfying various stakeholders by offering superior quality information [38,39]. Furthermore, contemporary empirical studies [87] Jamil, Mohd Ghazali, and Puat Nelson [39], and Ong and Djadjikerta [88] support the significantly positive relationship between independent boards and the quality of sustainability reporting. Hence, the study's findings hold implications for supporting Hypothesis 2.

Thirdly, the study's results indicate that the inclusion of women on boards does not impact the quality of sustainability reporting in Oil & Gas companies operating in Indonesia and Malaysia. These conclusions contrast with existing literature that suggests the presence of women in boardrooms can foster more well-rounded decision-making, potentially enhancing the quality of sustainability reporting [52,53,55]. However, these outcomes align with Alazzani et al., [54], Gallego-Sosa [55], Hartaman [89], which found no association between women's boards and corporate social responsibility reputation, attributing this to a limited percentage of female representation on the boards within their sample. Consequently, this study's findings lead to the rejection of Hypothesis 3.

Fourthly, this study's findings reveal that the age of the Chief Executive Officer (CEO) doesn't influence the quality of sustainability reporting in Oil & Gas companies operating in Indonesia and Malaysia. These results don't align with prior expectations and also diverge from existing theoretical literature, such as agency, stakeholder, and legitimacy theories, which advocate for board diversity to enhance company performance, even though this support isn't specifically directed towards the CEO chairman.

These study results are consistent with the findings of Katmon [66], demonstrating no correlation between the age of CEOs and the quality of corporate environmental social responsibility reporting. However, they differ from studies conducted in Pakistan Khan et al., [59] and India Fahad and Rahman [60], which reported a significant negative association between the age of the CEO chairman and environmental social responsibility performance. Similarly, these findings also diverge from research such as Ouma and Webi [63], which concluded that age diversity in Chief Executive Officers boosts the effectiveness of management decisions and company performance by influencing leadership policies through experience and receptiveness to fresh ideas.

Moreover, the findings contradict Beji et al. [67] in France, who reported a positive relationship between the age of the CEO chairman and environmental social responsibility. Consequently, this study's findings result in rejecting Hypothesis 4.

The study's fifth finding indicates that the tenure of the chief executive officer (CEO) has a statistically significant positive impact, at a 1% level, on the quality of sustainability reporting in Oil & Gas companies in Indonesia and Malaysia. These findings are echoed by Kruger [90], who suggests that CEOs with longer tenures demonstrate more dedication toward the company's long-term objectives and exhibit a strong sense of social responsibility. Additionally, this study's results align with prior research Harjoto et al., [68], Liu and J. Sun [69], Donoher et al., [70], which argue that management teams with varied tenures better comprehend company operations, company regulations, and are inclined to provide more comprehensive information. Moreover, Jouber [71] establishes that the tenure of the management team leader significantly influences the drive for higher environmental social responsibility. Similarly, Fallah and Mojarrad [72] found a positive association between CEO tenure and the attention and social environmental responsibility of companies labeled as significant polluters in Iran. Consequently, these findings validate the acceptance of Hypothesis 5.
The outcomes related to the control variables are as follows: First, company size appears to have a positive influence on the quality of sustainability reporting in Oil & Gas companies operating in Indonesia and Malaysia. However, the impact lacks statistical significance, deviating from the results of a study Orazzalin and Mahmood [9] that established a connection between larger company size and better sustainability reporting. Second, profitability seems to positively affect the quality of sustainability reporting in these companies, although this effect doesn’t hold statistical significance, consistent with findings from a study Dissanayake et al., [73] that also observed an inconclusive relationship between profitability and the extent of sustainability reporting. Third, growth shows a negative association with the quality of sustainability reporting in these companies. However, this relationship lacks statistical significance, diverging from research Hsu [78] that found high-growth companies were negatively correlated with the quality of corporate social responsibility and sustainability.

Fourth, leverage exhibits a statistically significant negative effect of 1% on the quality of sustainability reporting in Oil & Gas companies in Indonesia and Malaysia. This aligns with findings from Bhatia [91], which identified a negative relationship between leverage and sustainability reporting in Indian companies. Fifth, age shows a statistically significant positive impact at the 5% level on the quality of sustainability reporting in these companies. This finding is supported by research Dissanayake et al., [73], which indicates that older companies tend to disclose more sustainability information due to their more robust organizational structure and broader reporting experience. Additionally, Fahad [92] explains that older companies better understand the community and environmental expectations, leading them to divulge more information related to environmental social responsibility and sustainability.

5 Conclusions and implications

Overall, the study's results underscore the significance of board characteristics and the CEO's role in enhancing the quality of sustainability reporting among Oil & Gas companies in Indonesia and Malaysia. Specifically, the study reveals that board size, board independence, and CEO tenure contribute to an improved quality of sustainability reporting in these companies. However, the presence of female board members and the CEO's age do not significantly impact the enhancement of sustainability reporting quality in Oil & Gas companies within these regions.

Acknowledgement

We would like to thank the Center for Research and Community Service (P3M) of Bandung State Polytechnic (Polban) for funding this research so that we can make several papers, including papers for this seminar.

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