Indonesian Journal of Sustainability Accounting and Management
ISSN 2597–6214 | e–ISSN 2597–6222
DOI: 10.20448/ijsam.v10i1.8578

Determinants of Sustainability Disclosure: A Comparative Panel Analysis of Emerging and World Markets

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Abstract: This study explores the determinants of sustainability disclosure and examines cross-market differences between the DJSI Emerging Markets Index and the DJSI World Markets Index. Using a panel dataset consisting of 595 company-year observations from 85 companies across 23 countries that were continuously included in the index during the 2016–2022 period, fixed-effects models estimated with Driscoll–Kraay standard errors were applied. The findings reveal substantial cross-market differences. In emerging markets, corporate governance mechanisms exhibit limited explanatory power, suggesting that sustainability disclosures are weakly institutionalized. In contrast, in world markets, sustainability disclosures are more strongly associated with board independence, firm maturity, and financial capacity. The negative relationship between auditor tenure and disclosure highlights the importance of auditor independence. Furthermore, the weak association between CO_2 emission intensity and disclosure scores indicates a potential disconnect between reported sustainability information and actual environmental performance. Overall, the findings underscore the critical role of institutional and organizational context in shaping sustainability disclosure practices. This study contributes to the sustainability disclosure literature by providing a comparative panel analysis of emerging and world markets using DJSI-listed firms. It highlights how institutional contexts shape disclosure practices differently and offers empirical evidence on cross-market variations by integrating governance and financial determinants within a unified analytical framework.

Keywords: Corporate governance, DJSI emerging markets index, DJSI world markets index, panel data analysis, sustainability disclosure score, sustainability reporting.

Article info: Received 13 February 2026 | revised 2 April 2026 | accepted 23 April 2026 | published 4 May 2026

Recommended citation: Sakin, I., & Turk, Z. (2026). Determinants of Sustainability Disclosure: A Comparative Panel Analysis of Emerging and World Markets. *Indonesian Journal of Sustainability Accounting and Management*, *10*(1), 151–168. https://doi.org/10.20448/ijsam.v10i1.8578

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INTRODUCTION

In recent years, sustainability has become an increasingly key criterion. Sustainability is defined as meeting the needs of the present without jeopardizing the needs of future generations (World Commission on Environment and Development, 1987) and is gaining increasing importance on a global scale (Bataleblu, Rauch, Cochran, & Matt, 2024). Global problems such as climate change, rapid depletion of natural resources, social inequalities, and societal injustices have made sustainability a priority agenda item for both policymakers and businesses (Ali, Fukofuka, & Narayan, 2023). In line with these developments, businesses have begun to make sustainability practices an important part of their corporate strategies. In particular, the increasing demands from investors, regulators, and other stakeholders for the disclosure of sustainability information have led businesses to report on the environmental, social, and governance (ESG) dimensions of their activities more systematically (Hoque, 2017). In this process, various sustainability indicators and scores have been developed to measure and compare sustainability performance, and these indicators have become important tools in evaluating the sustainability performance of businesses.

Considering these developments, sustainability reporting has become one of the main tools enabling businesses to communicate their ESG activities to stakeholders. In this context, various databases and indices are used to evaluate the scope and quality of sustainability disclosures. In particular, indicators offered by the Dow Jones Sustainability Index (DJSI) and the Refinitiv database are among the widely used measurement tools for comparing sustainability reporting trends in businesses and enabling the evaluation of sustainability performance through standardized indicators.

Previous studies have shown that corporate governance structures, financial capacity, firm characteristics, and country-level corporate quality are important determinants of sustainability disclosures (Fernando & Lawrence, 2014; Ioannou & Serafeim, 2019). It is argued that effective governance mechanisms increase transparency and accountability. Financial resources are said to ensure the continuity of investments related to sustainability reporting. However, empirical findings are not always consistent. Results change, particularly when considering differences in corporate maturity and market sophistication. Furthermore, much of the existing literature focuses on single-country samples. Some studies, however, only examine specific ESG dimensions. This provides limited information on how sustainability disclosure mechanisms operate in different market environments.

Recent systematic literature reviews reveal a similar picture. These studies emphasize that sustainability disclosures are shaped by multi-level institutional pressures and governance structures. However, empirical findings appear fragmented and context-sensitive (Ali & Wilson, 2024; Arkoh, Costantini, & Scarpa, 2024; Seow, 2024). Studies in developing and emerging economies also show similar inconsistencies. Firm size, profitability, leverage ratio, and ownership structure have different effects on sustainability disclosures (Farisyi, Musadieq, Utami, & Damayanti, 2022). This highlights the need for comparative studies that take institutional differences into account.

This study examines the institutional and financial determinants of sustainability disclosures. The analysis is based on a comparison of firms included in the Dow Jones Sustainability Emerging Markets Index and the Dow Jones Sustainability World Index. The study makes a clear distinction between emerging markets and global markets. It examines whether similar governance and financial mechanisms produce different results in different institutional environments. These differences are linked to various factors such as the degree of regulatory implementation, the nature of the regulatory framework, and the level of pressure from stakeholders. Although there are various studies in the literature on the factors influencing sustainability disclosures, these studies have largely focused on developed countries. However, this may differ in emerging markets, given the variations in their corporate and economic structures. A review of the existing literature reveals a limited number of studies examining how differences between developed and emerging markets affect sustainability disclosures. This study examines the factors influencing sustainability disclosures of companies included in both the emerging markets index and the world markets index. Accordingly, it aims to

contribute to the literature by analyzing the effects of corporate governance, financial capacity, and firm characteristics on sustainability disclosures.

LITERATURE REVIEW

Sustainability disclosures have become an important mechanism through which firms communicate their environmental, social, and governance activities to stakeholders. Previous studies have examined various factors influencing the scope, quality, and reliability of sustainability disclosures. These factors generally relate to corporate governance structures, firms' financial capacity, and firm-level characteristics within their institutional environments. Accordingly, the following subsections review the literature on the determinants of sustainability disclosures within these three perspectives.

Corporate Governance and Sustainability Disclosure

The scope and nature of sustainability disclosures are significantly determined by the structure of corporate governance mechanisms within firms. In this context, effective governance structures contribute to increased transparency, strengthened accountability, and the systematic integration of sustainability elements into corporate reporting and oversight processes. Indeed, the literature shows that board structures, audit mechanisms, and monitoring practices; it is generally accepted that the scope, consistency, and reliability of sustainability disclosures have a more important impact than the actual sustainability performance of firms (Fernandez-Feijoo, Romero, & Ruiz-Blanco, 2014; Khan, Muttakin, & Siddiqui, 2013).

The size, independence, and structural characteristics of the board of directors significantly influence the processes of prioritizing, monitoring, and communicating sustainability issues to stakeholders within the organization. In this context, strong and effective boards of directors encourage a more transparent reporting approach by limiting managerial discretion and opportunistic reporting behaviors and contribute to the adoption of a long-term perspective in sustainability disclosures (Haniffa & Cooke, 2002). Furthermore, the existence of corporate governance and audit committees enhances the credibility of sustainability disclosures by strengthening internal monitoring and formal oversight mechanisms in non-financial reporting processes (Michelon & Parbonetti, 2012).

External auditing plays a critical role in ensuring the reliability of sustainability disclosures. Auditor quality and audit tenure directly affect the perceived independence and effectiveness of external auditing. A long-term auditor-firm relationship can weaken the perception of the auditor's impartiality, negatively impacting the credibility of the audit. Previous studies have shown that excessively long auditor tenures can weaken independence. The closeness that develops between the auditor and the firm over time can negatively impact the impartiality of the audit. This situation can increase the likelihood of sustainability disclosures being made in an opportunistic manner (Simnett, Vanstraelen, & Chua, 2009).

Findings in the literature show that firms with strong corporate governance mechanisms provide more stable and reliable disclosures in sustainability reporting. This trend is particularly pronounced in environments where regulatory oversight is effective and corporate transparency is high. However, while the existence of governance mechanisms can influence how sustainability information is reported, it does not directly guarantee the actual sustainability performance of firms. Therefore, discrepancies can arise between reported information and the actual practices of firms (Buallay & Al-Ajmi, 2020). Studies show that corporate governance characteristics, such as board structure and ownership features, can affect the scope of sustainability disclosures. However, the findings do not always show complete consistency with the results in the literature. Furthermore, the focus of many studies on specific sectors is considered a limiting factor in the generalizability of the results obtained (Abdul Latif, Taufil Mohd, Kamardin, & Mohd Ariff, 2023; Nu, Hai, Huong, & Lan, 2025; Sholihah, Ningtyas, Devy, & Ningrum, 2025).

Financial Capacity and Sustainability Disclosure

Financial capacity is a significant facilitating condition for the implementation of sustainability disclosures. Financially strong firms have more resources to invest in reporting systems. They also have the capacity to

conduct ongoing activities related to data collection, assurance processes, and sustainability disclosures. Financial strength does not directly improve sustainability performance. However, it increases firms' capacity and willingness to make more comprehensive, consistent, and reliable sustainability disclosures (Michelon & Parbonetti, 2012).

Profitable firms often do not view sustainability disclosures as an optional cost. Instead, they tend to consider them a strategic investment. This approach supports a long-term commitment to non-financial reporting activities. High profitability reduces resource constraints, allowing managers to dedicate more time and attention to processes related to sustainability disclosures. This can improve the scope and quality of sustainability reporting (Clarkson, Li, Richardson, & Vasvari, 2008; Dhaliwal, Li, Tsang, & Yang, 2011).

Conversely, high financial leverage can lead to different outcomes. High debt levels can limit firms' capacity to make sustainability disclosures because firms may prioritize short-term financial obligations. This situation may lead to non-financial transparency practices being sidelined. However, debt-related monitoring pressure can also increase the demand for transparency. Therefore, financial leverage can have both positive and negative effects on sustainability disclosures.

Market-based indicators such as firm value can also influence sustainability disclosures. Firms with high market value face more stakeholder scrutiny. They also have higher reputational visibility. This leads investors, analysts, and regulators to pay more attention to firms. Increased investor interest, regulatory expectations, and stakeholder demand for transparency are leading businesses to provide more detailed and standard-compliant disclosures on sustainability issues. As companies become more visible to investors, regulators, and other stakeholders, they are encouraged to provide more detailed and standard-compliant disclosures on sustainability. This is because companies that attract public and capital market attention face greater pressure to be transparent (Eccles, Ioannou, & Serafeim, 2014).

Firm Characteristics and Institutional Context and Sustainability Disclosure

Certain structural characteristics specific to businesses are among the important factors influencing the scope and quality of sustainability disclosures. Firm size and age are frequently considered control variables in such studies. Larger and more established businesses generally have greater public recognition and attract more attention from the media and regulatory bodies. This visibility increases the pressure for transparency on these businesses and can lead to more regular and comprehensive reporting of information on sustainability issues (Branco & Rodrigues, 2006).

The organizational structure of the country in which firms operate can also influence sustainability disclosures. Firms in countries with strong regulatory and legal structures face higher expectations for transparency. Companies operating in such environments tend to present information on sustainability issues in a more systematic and comparable manner. Furthermore, these organizations are more intensively monitored by regulations, institutions, and civil society organizations. These conditions encourage the reporting of sustainability information in a more standardized, comparable, and reliable manner. However, the literature also emphasizes that the existence of such institutional structures does not guarantee consistently high actual sustainability performance (Ioannou & Serafeim, 2019).

On the other hand, it is stated that having strong institutional structures at the national level does not directly guarantee sustainability. Institutional capacity often consists of a framework of incentives and constraints regarding sustainability disclosures. Current empirical studies conducted in Sub-Saharan Africa and the MENA region support this view. These studies show that the power of state sovereignty, media visibility, and legitimacy concerns, in particular, influence the scope of sustainability disclosures and the power of the powerful (Alshhadat, 2025; Dongmo & Tegofack, 2025).

These studies show that in markets with weak corporate structures, sustainability disclosures are often presented symbolically or with credentials. This type of operation allows businesses to use sustainability disclosures symbolically to meet the legitimacy expectations of their external partners. In contrast, in markets with stronger corporate structures, sustainability disclosures are implemented more systematically. Therefore, strong corporate sustainability reporting becomes better, more transparent, and more auditable.

Research Hypotheses

Sustainability disclosures are shaped by governance mechanisms, financial capacity, firm characteristics, and the organizational context. However, the impact of these mechanisms can vary depending on the organizational structure of the market in which businesses operate. In markets with strong regulatory structures, effective oversight mechanisms, and intense stakeholder pressure, sustainability statements are expected to be more comprehensive and institutionalized. Conversely, in environments with weak organizational structures, sustainability statements often have a symbolic character and can be used by businesses as a means of gaining legitimacy. Therefore, the factors determining sustainability statements are expected to differ in different market conditions. In this context, the following hypotheses have been developed in line with the approaches and findings in the literature.

H_1: The sustainability disclosure scores of firms operating in emerging markets are significantly influenced by corporate governance mechanisms, financial capacity, firm characteristics, and institutional context.

H_2: The sustainability disclosure scores of firms operating in world markets are significantly influenced by corporate governance mechanisms, financial capacity, firm characteristics, and institutional context.

H_3: The determinants of sustainability disclosure scores differ significantly between emerging markets and world markets.

RESEARCH METHODOLOGY

Data and Sample Selection

This research is based on an unbalanced panel dataset covering 85 firms from 23 countries included in the indices over the period 2016–2022, comprising a total of 595 firm-year observations. The sample consists of firms included in the DJSI. The DJSI was chosen as the sampling framework for identifying companies with high levels of corporate engagement in sustainability reporting and high public visibility.

In this study, firms were divided into two groups based on their market sophistication level: emerging markets and global markets. This classification is based on DJSI's market classification framework. This approach allows for a comparative analysis of sustainability disclosures under different corporate and market conditions.

Financial and firm-specific data used in the research were obtained from publicly available financial statements and international financial databases. Sustainability disclosure scores were obtained from the Refinitiv database. The Refinitiv database measures sustainability disclosures through standardized and internationally comparable indicators. Firms lacking data on key financial variables or whose sustainability disclosure scores for the analysis period were unavailable were excluded from the dataset during the sample creation process. This was done to ensure the consistency and reliability of the dataset.

Consequently, the final dataset obtained exhibits sufficient diversity in both cross-sectional and temporal terms. This structure allows for the reliable and robust application of panel data analysis.

Variables

Dependent Variable

In this study, the Sustainability Disclosure Score (Sust_Disclosure) was used as the dependent variable. Obtained from the Refinitiv database, this score, ranging from 0 to 100, indicates the extent to which companies systematically and regularly disclose information related to ESG areas.

This indicator does not directly measure companies' sustainability performance. Instead, it is used as a measure representing the quality and scope of sustainability disclosures. It also serves as an indicator of how well sustainability reporting is integrated into companies' corporate processes. The Refinitiv Sustainability Disclosure Score covers a wide range of firms, has a methodologically transparent structure, and allows for cross-country comparisons. Due to these features, it is frequently used as a metric in corporate governance and sustainability disclosure literature. This measurement tool aggregates different dimensions of sustainability disclosures under a single composite index. This allows for a comparative evaluation of

companies' approaches to sustainability disclosures. It also allows for comparisons between businesses operating in different corporate and market conditions.

Independent Variable

Corporate Governance Structure Variables

Based on the literature on corporate governance structures, this research incorporates various variables related to governance structure into the model. These include elements such as the structural characteristics of the board of directors, mechanisms related to audit processes, and corporate oversight arrangements. These variables are considered as governance elements that shape the sustainability disclosures of businesses.

These variables do not aim to directly measure the actual sustainability performance of businesses. Instead, these variables are considered as indicators reflecting the corporate governance structure, audit, and monitoring capacity of businesses. Therefore, these variables are used as indicators representing the corporate control and audit mechanisms that are effective in the formation of sustainability disclosures.

- Board Size (board_size): Measured as the total number of board members at the end of the fiscal year.
- Board Gender Diversity (board_gender_div): Defined as the ratio of female board members to the total number of board members.
- Board Independence (indep_board): Measured as the ratio of independent board members to the total number of board members.
- CEO Duality (ceo_board): A dummy variable that takes a value of 1 if the CEO is also a board member, and 0 if they are not.
- Corporate Governance Committee (gov_comm): This dummy variable indicates whether a formal corporate governance committee exists within the company.
- Audit Committee Independence (audit_indep): Measured by the ratio of independent members to the total number of committee members.
- Audit Committee Expertise (audit_exp): This dummy variable takes a value of 1 if there is at least one financial expert on the audit committee, and 0 otherwise.
- Auditor Tenure (aud_tenure): This represents the number of years the current external auditor has served continuously at the company.
- Sustainability Assurance Auditor (csr_audit_name): This dummy variable takes a value of 1 if the company's sustainability disclosures have been verified by one of the Big Four audit firms, and 0 otherwise.
- Number of Employees (csr_emp_num): Representing the company's scale and stakeholder visibility, this variable is measured as the total number of full-time and part-time employees.

Corporate Financial Capacity Variables

The analysis incorporates various commonly used financial indicators to assess the financial capacity that enables firms to participate in sustainability disclosures. These variables reflect firms' access to resources, as well as their market visibility and financial constraints.

- Return on Assets (roa): Calculated as net income before financial expenses divided by total assets.
- Earnings per Share (eps): Represents statutory earnings per share.
- Debt-to-Equity Ratio (debt_equity): Measures financial leverage.
- Market Capitalization (mkt_cap): Reflects market-based firm value.
- Earnings Before Interest, Taxes, Depreciation, and Amortization (ebitda): is used as an indicator of operational profitability.
- CO_2 Emissions to Revenue Ratio (co2_rev): Measures total CO_2-equivalent emissions relative to firm revenues, capturing firms' emission intensity.
- R&D Intensity (rnd_dev_ta): is defined as research and development expenditures divided by total sales.

- Net Income (net_income): Represents firms' net profit after expenses. To improve normality, the variable is first scaled by dividing by 1,000,000,000 and then transformed using the natural logarithm.

Control Variables

Firm-level and country-level control variables are incorporated to account for structural and institutional factors that may influence sustainability disclosure practices.

- Firm Age (firm_age): is measured as the number of years since establishment.
- Firm Size (total_assets): is proxied by total assets. To ensure normality, total assets are first scaled by dividing by 1,000,000,000 and then log-transformed.
- World Governance Indicators (wgi): Represents institutional quality at the country level. This composite index is created by taking the arithmetic mean of six governance indicators published by the World Bank. These indicators consist of the dimensions of control of corruption, government effectiveness, political stability and absence of violence, rule of law, regulatory quality, and freedom of expression and accountability. The index ranges from -2.5 to +2.5, with higher values indicating stronger governance quality.

Methodology

This study uses panel data analysis to examine the corporate governance and financial determinants of sustainability disclosure outcomes in businesses. Panel data models are particularly suitable for this type of analysis because they include both cross-sectional and time-series dimensions. This approach allows for controlling for firm-specific heterogeneity that cannot be observed in the analysis, while also capturing temporal variations in sustainability disclosure practices (Baltagi, 2009; Hsiao, 2007). Observing the same firm over multiple years allows for more reliable and effective parameter estimations compared to analyses based solely on cross-sectional or solely on time series data.

The econometric framework is based on fixed effects (FE) and random effects (RE) panel regression models. The fixed effects model controls for firm-specific characteristics that are invariant over time and may be related to the explanatory variables. In contrast, the random effects model assumes that unobservable individual effects are randomly distributed and unrelated to the explanatory variables. To determine which model was more appropriate, the Hausman (1978) test was applied, and whether individual effects were systematically related to the explanatory variables was evaluated.

Considering the global scope of the sample and the possibility of common shocks, regulatory spillover effects, and simultaneous sustainability reporting practices occurring between firms and countries, the possibility of cross-sectional dependence was explicitly addressed in the analysis. Cross-sectional dependence was tested using the Pesaran (2004) CD test. If dependence was detected, the Driscoll and Kraay (1998) robust standard errors were used to correct for heteroskedasticity, autocorrelation, and cross-sectional dependence simultaneously. This approach allows for reliable statistical inferences in multi-country panel data structures.

Before proceeding to the estimation process, panel unit root tests were applied to assess the stationarity properties of the variables and reduce the risk of spurious regression. In this context, both the Im, Pesaran, and Shin (2003) test, a first-generation test, and the Pesaran (2007) CADF/CIPS test, a second-generation test considering cross-sectional dependence, were used. This two-way testing strategy reflects the heterogeneous and interconnected nature of the international panel dataset.

Additional diagnostic tests are performed to evaluate heteroskedasticity and serial correlation. Heteroskedasticity is assessed using likelihood-based tests, while serial correlation is examined using the Wooldridge (2002) test for panel data. Where violations of classical assumptions are detected, robust estimation techniques are employed to ensure consistency of the results.

Finally, separate panel regressions are estimated for emerging markets and world markets to facilitate a comparative analysis of sustainability disclosure determinants under different institutional conditions. Differences in coefficient estimates are interpreted in light of variations in institutional quality, regulatory enforcement, and market development, consistent with the institutional perspective underlying the study.

Based on this econometric framework, the following panel regression model is specified to examine the determinants of firms' sustainability disclosure outcomes.

$$Sust\_Disclosure_{it}=\beta_0+\beta_1 board\_size_{it}+\beta_2 board\_gender\_div_{it}+\beta_3 csr\_emp\_num_{it}+\beta_4 indep\_board_{it}+\beta_5 ceo\_board_{it}+\beta_6 gov\_comm_{it}+\beta_7 audit\_indep_{it}+\beta_8 audit\_exp_{it}+\beta_9 audit\_tenure_{it}+\beta_{10} csr\_audit\_name_{it}+\beta_{11} roa_{it}+\beta_{12} eps_{it}+\beta_{13} debt\_equity_{it}+\beta_{14} mkt\_cap_{it}+\beta_{15} ebitda_{it}+\beta_{16} co2\_rev_{it}+\beta_{17} rnd\_dev\_ta_{it}+\beta_{18} net\_income_{it}+\beta_{19} firm\_age_{it}+\beta_{20} total\_assets_{it}+\beta_{21} wgi_{it}+\epsilon_{it} \quad (1)$$

RESULTS AND DISCUSSION

This section presents research results on corporate governance and financial determinants of sustainability disclosure. The analysis uses firms included in the DJSI Emerging Markets and DJSI World Markets, allowing results to be reported separately for emerging and global markets. This comparative approach enables examination of how differences in institutional quality, market development, and regulatory environments influence sustainability disclosure outcomes across different market contexts.

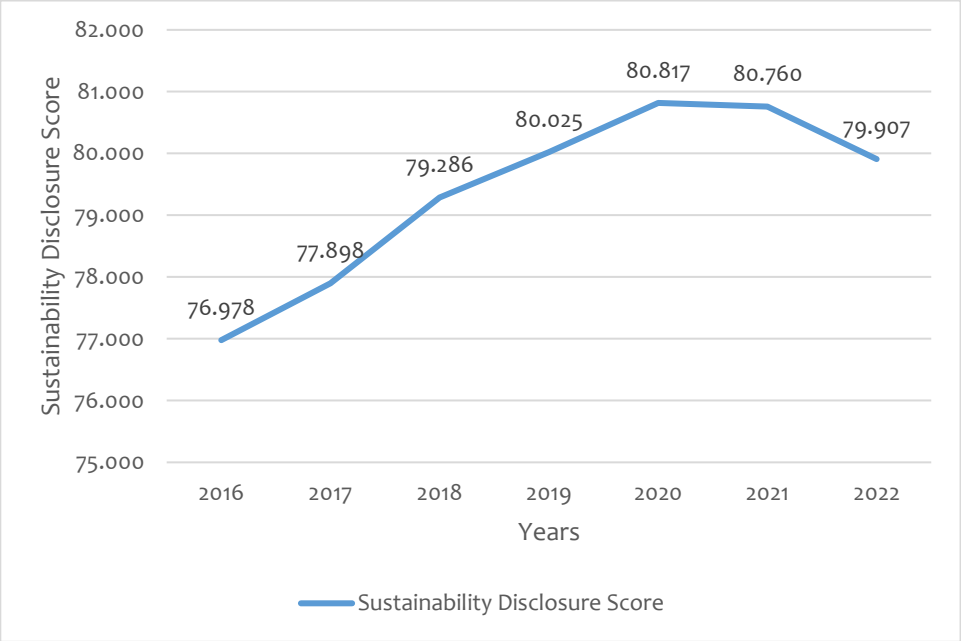

Figure 1: Average Sustainability Disclosure Scores of Firms Included in the Dow Jones Sustainability Indices (2016–2022)

Descriptive Analysis of Sustainability Disclosure Scores

Figure 1 illustrates the evolution of average sustainability disclosure scores for firms included in the Dow Jones Sustainability Indices over the 2016–2022 period. The results demonstrate a steady increase in sustainability disclosure scores from 2016 to 2020, suggesting a strengthening of sustainability reporting practices over time. Following this upward trend, a slight decline is observed in the post-2020 period.

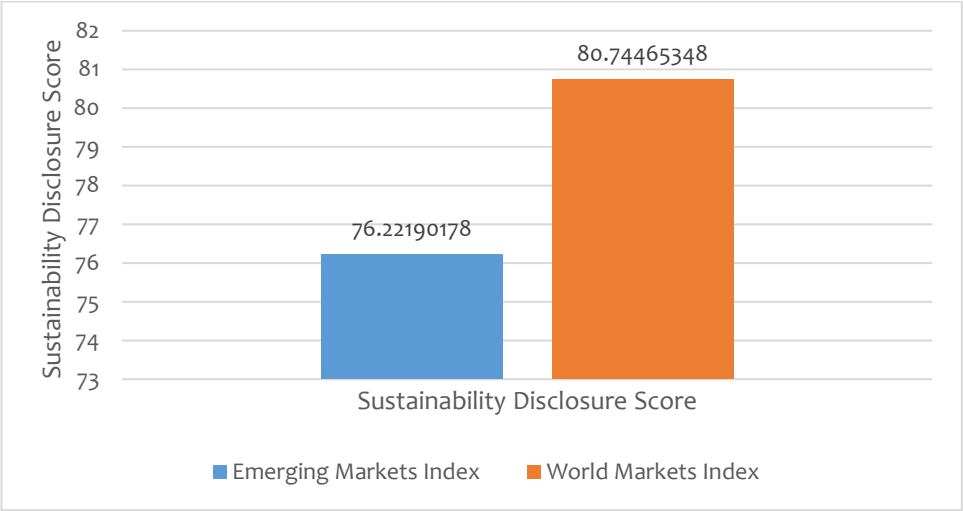

Figure 2: Comparison of Sustainability Disclosure Dimensions between the Dow Jones Sustainability Emerging Markets Index and the Dow Jones Sustainability World Index

The findings presented in Figure 2 show that companies included in the Dow Jones World Sustainability Index have higher sustainability disclosure scores compared to companies in the Emerging Markets Index. The average sustainability disclosure score for companies in the Emerging Markets Index is 76.22, while the average score for companies in the World Index is 80.74. This result reveals that sustainability reporting practices are more advanced and more strongly integrated into corporate structures in companies operating in world markets. The findings show that the level of market sophistication is a significant contextual determinant influencing sustainability disclosure. This finding indicates that sustainability reporting practices are significantly affected not only by firm-level characteristics but also by the corporate structure and sophistication level of the market in which they operate.

Table 1: Pesaran CD Test Results for Cross-Sectional Dependence in the Emerging Markets Index

Variables	Test Statistic	p-value
Sustainability Disclosure Score	2.39	0.02
Board Size	4.38	0.00
Board Gender Diversity	26.65	0.00
Number of Employees	20.83	0.00
Board Independence	0.49	0.62
Audit Tenure	16.40	0.00
Return on Assets (ROA)	3.14	0.00
Earnings per Share (EPS)	7.44	0.00
Debt-to-Equity Ratio	0.52	0.60
Market Capitalization	0.94	0.35
Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA)	15.23	0.00
Total CO_2 Equivalent Emissions-to-Revenue Ratio	17.90	0.00
R&D Intensity	17.76	0.00
Net Income	9.02	0.00
Firm Age	43.95	0.00
Firm Size	23.04	0.00
Country Governance Risk Score	5.71	0.00

Empirical Results for Emerging Markets

Cross-Sectional Dependence and Stationarity Tests

Cross-sectional dependence is examined using the Pesaran (2004) CD test. The results, reported in Table 1, demonstrate statistically significant cross-sectional dependence on the sustainability disclosure score and on

the most explanatory variables in the Emerging Markets Index sample. These results suggest that the assumption of cross-sectional independence is not satisfied in this panel.

In the presence of cross-sectional dependence, conventional panel estimators may lead to inconsistent standard errors and unreliable statistical inference. Accordingly, the subsequent regression analyses employ estimation techniques that are robust to cross-sectional dependence, specifically Driscoll–Kraay standard errors.

Panel unit root properties are examined using the Pesaran CADF test. As reported in Table 2, the sustainability disclosure score in the Dow Jones Sustainability Emerging Markets Index sample is non-stationary under the constant-only specification. However, when a deterministic time trend is included, the CADF test statistic becomes statistically significant, indicating that the variable is stationary around a deterministic trend. Accordingly, panel regression models incorporating time effects are employed in the subsequent analyses.

Table 2: Pesaran CADF Panel Unit Root Test Results for the Emerging Markets Index

Variables	Intercept-Only Model		Intercept-and-Trend Model	
	Test Statistic	p-value	Test Statistic	p-value
Audit Tenure	-2.86	0.00	-4.50	0.00
Board Gender Diversity	-4.04	0.00	-6.99	0.00
Board Size	-0.99	0.29	-3.64	0.03
Total CO_2 Equivalent Emissions-to-Revenue Ratio	-4.79	0.00	-5.45	0.00
Number of Employees	-2.44	0.01	-4.01	0.01
Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA)	-5.56	0.00	-6.03	0.00
Earnings per Share (EPS)	-3.77	0.00	-5.32	0.00
Sustainability Disclosure Score	-0.81	0.36	-4.98	0.00
Firm Age	-1.88	0.06	-3.48	0.04
Net Income	-3.37	0.00	-3.74	0.02
R&D Intensity	-3.50	0.00	-3.76	0.02
Return on Assets (ROA)	-3.62	0.00	-6.09	0.00
Firm Size	-4.05	0.00	-4.36	0.00
Country Governance Risk Score	-3.78	0.00	-3.84	0.02

Table 3: IPS Panel Unit Root Test Results for the Emerging Markets Index

Variables	Intercept-Only Model		Intercept-and-Trend Model	
	Test Statistic	p-value	Test Statistic	p-value
Debt-to-Equity Ratio	-7.76	0.00	-125.91	0.00
Board Independence	-4.14	0.00	-2.00	0.00
Market Capitalization	-3.06	0.00	-8.13	0.00

Panel unit root properties are further examined using the Im–Pesaran–Shin (IPS) test. As reported in Table 3, the firm-level variables examined in the Dow Jones Sustainability Emerging Markets Index sample are stationary under both the constant-only and constant-plus-trend specifications. Accordingly, these variables are directly included in the panel regression models without further transformation.

Table 4: Hausman Test Results for the Emerging Markets Index

Dependent Variable	Test Statistic	p-value
Sustainability Disclosure Score	37.62	0.07

Model Selection

Table 4 presents the results of the Hausman test conducted for the Emerging Markets Index. The Hausman test results show that the null hypothesis is rejected at the 10% significance level. Therefore, the use of a fixed effects model was deemed appropriate.

Panel Regression Results for Emerging Markets

Table 5 shows the panel regression results for the sustainability disclosure scores of firms included in the DJSI Emerging Markets. Estimation results are reported for both the standard panel data model and the model using Driscoll–Kraay robust standard errors to account for heteroskedasticity, autocorrelation, and cross-sectional dependence.

The findings show that most corporate governance variables are statistically insignificant effect on sustainability disclosure scores in emerging markets. Board size, gender diversity, board independence, CEO duality, corporate governance committee, and audit committee characteristics (audit_indep, audit_exp, csr_audit_name) were not found to be statistically significant in either model specification. These findings demonstrate that formal governance structures alone are insufficient to explain the differences in sustainability disclosure performance among firms operating in emerging markets.

Table 5: Panel Regression Results for the Emerging Markets Index

	Standard Model			Driscoll–Kraay Robust Model		
Variables	**Coef.**	**Std. Error**	**p-value**	**Coef.**	**Std. Error**	**p-value**
board_size	-0.114	0.357	0.750	-0.114	0.301	0.706
board_gender_div	0.047	0.066	0.480	0.047	0.049	0.337
csr_emp_num	0.000	0.000	0.085	0.000	0.000	0.141
indep_board	0.037	0.060	0.534	0.037	0.040	0.351
ceo_board	-0.541	2.267	0.812	-0.541	0.833	0.517
gov_comm	-0.672	1.797	0.709	-0.672	2.092	0.749
audit_indep	0.042	0.075	0.577	0.042	0.100	0.674
audit_exp	0.433	1.200	0.719	0.433	1.104	0.696
audit_tenure	-0.485	0.170	0.005	-0.485	0.106	0.000
csr_audit_name	1.725	1.476	0.245	1.725	1.240	0.167
roa	0.007	0.169	0.968	0.007	0.056	0.904
eps	-0.002	0.001	0.231	-0.002	0.000	0.000
debt_equity	0.003	0.019	0.867	0.003	0.014	0.827
mkt_cap	0.000	0.000	0.467	0.000	0.000	0.011
ebitda	0.001	0.001	0.447	0.001	0.001	0.284
co2_rev	-0.001	0.001	0.534	-0.001	0.001	0.402
rnd_dev_ta	-0.627	1.672	0.708	-0.627	1.171	0.594
net_income	0.001	0.002	0.565	0.001	0.001	0.252
firm_age	-0.024	0.275	0.931	-0.024	0.107	0.822
total_assets	0.000	0.000	0.541	0.000	0.000	0.421
wgi	9.251	9.586	0.336	9.251	10.301	0.371
factor(time)2017	1.776	1.127	0.118	1.776	0.781	0.025
factor(time)2018	1.859	1.133	0.104	1.859	0.616	0.003
factor(time)2019	2.396	1.103	0.032	2.396	0.639	0.000
factor(time)2020	1.762	1.137	0.124	1.762	0.729	0.017
factor(time)2021	0.484	1.222	0.693	0.484	0.437	0.271
F-Test	1.298		0.174			
R^2	0.222					
Wald Test for Heteroskedasticity	33.755		0.141			
Wooldridge Test for Autocorrelation	18.638		0.009			
Pesaran CD Test for Cross-Sectional Dependence	-1.452		0.147			

Among governance-related factors, only auditor tenure consistently emerges as a significant predictor. This variable shows a negative and statistically significant correlation with sustainability disclosure scores in both the standard model and the Driscoll–Kraay specification ($p < 0.01$). Long-term relationships between auditors and companies may weaken auditor independence, thereby reducing the extent of sustainability disclosures.

From a financial perspective, the earnings per share (eps) variable is found to have a negative and statistically significant effect. This finding suggests that increases in short-term profitability may be related to a decrease in the scope of sustainability disclosures. Conversely, a positive and significant relationship was found between firm market capitalization (mkt_cap) and sustainability disclosure scores. This indicates that companies with higher market capitalization, which attract greater investor attention, tend to include more extensive sustainability reporting.

There is no significant relationship between CO_2 Emissions to Revenue Ratio (co2_rev), representing environmental impact, and sustainability disclosures. This result suggests a potential decoupling between actual environmental performance and reported sustainability disclosures.

Time dummy variables show a significant increase in sustainability disclosures during the 2017–2020 period. This increase can be attributed to the rise in global sustainability and the widespread adoption of reporting standards.

Generally, the findings suggest that sustainability disclosures in emerging markets are largely shaped by external audit mechanisms and the market visibility of firms. In contrast, the influence of internal governance characteristics and financial capacity appears to be relatively limited. These results indicate that institutional structure and market dynamics play a critical role in understanding sustainability reporting behavior in emerging economies.

Table 6: Pesaran CD Cross-Sectional Dependence Test Results for the World Markets Index

Variables	Test Statistic	p-value
Audit Tenure	17.36	0.00
Board Gender Diversity	36.26	0.00
Board Size	26.66	0.00
Total CO_2 Equivalent Emissions-to-Revenue Ratio	38.05	0.00
Number of Employees	1.66	0.10
Debt-to-Equity Ratio	8.06	0.00
Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA)	12.86	0.00
Earnings per Share (EPS)	11.03	0.00
Sustainability Disclosure Score	17.75	0.00
Firm Age	113.18	0.00
Board Independence	22.53	0.00
Market Capitalization	11.60	0.00
Net Income	6.73	0.00
R&D Intensity	8.68	0.00
Return on Assets (ROA)	6.94	0.00
Firm Size	50.66	0.00
Country Governance Risk Score	24.79	0.00

Empirical Results for World Markets

Cross-Sectional Dependence and Stationarity Tests

Cross-sectional dependence is first examined using the Pesaran (2004) CD test. The results, reported in Table 6, show statistically significant cross-sectional dependence for the sustainability disclosure score in the Dow Jones Sustainability World Markets Index sample. This finding suggests that the assumption of cross-sectional independence is violated.

Given the presence of cross-sectional dependence, standard panel estimators may yield biased inferences. Accordingly, the subsequent regression analyses employ estimation techniques that are robust to cross-sectional dependence, specifically Driscoll–Kraay standard errors.

Table 7: Pesaran CADF Panel Unit Root Test Results for the World Markets Index

Variables	Intercept-Only Model		Intercept-and-Trend Model	
	Test Statistic	p-value	Test Statistic	p-value
Audit Tenure	-4.04	0.00	-6.61	0.00
Board Gender Diversity	-3.05	0.00	-8.33	0.00
Board Size	-1.85	0.06	-7.25	0.00
Total CO_2 Equivalent Emissions-to-Revenue Ratio	-5.78	0.00	-6.70	0.00
Number of Employees	-4.78	0.00	-6.20	0.00
Debt-to-Equity Ratio	-6.20	0.00	-8.77	0.00
EBITDA	-6.70	0.00	-7.11	0.00
Earnings per Share (EPS)	-7.33	0.00	-7.91	0.00
Sustainability Disclosure Score	-0.74	0.39	-8.15	0.00
Firm Age	-3.51	0.00	-6.12	0.00
Board Independence	-1.68	0.09	-6.66	0.00
Market Capitalization	-7.00	0.00	-7.63	0.00
Net Income	-7.68	0.00	-8.12	0.00
R&D Intensity	-5.59	0.00	-6.13	0.00
Return on Assets (ROA)	-5.09	0.00	-7.90	0.00
Firm Size	-5.80	0.00	-5.92	0.00
Country Governance Risk Score	-2.03	0.04	-5.82	0.00

Panel unit root properties are examined using the Pesaran CADF test. As reported in Table 7, the sustainability disclosure score in the World Markets Index sample is non-stationary under the constant-only specification. However, when a deterministic time trend is included, the CADF test statistic becomes statistically significant, indicating that the variable is stationary around a deterministic trend.

Table 8: Hausman Test Results for the World Markets Index

Dependent Variable	Test Statistic	p-value
Sustainability Disclosure Score	117.74	0.00

Model Selection

Finally, the Hausman test is applied to determine the appropriate panel estimation framework. The test results, presented in Table 8, support the use of the fixed-effects specification for the World Markets Index sample.

Table 9: Panel Regression Results for the World Markets Index

Variables	Standard Model			Driscoll–Kraay Robust Model		
	Coef.	Std. Error	p-value	Coef.	Std. Error	p-value
board_size	-0.223	0.171	0.192	-0.223	0.107	0.038
board_gender_div	-0.003	0.037	0.940	-0.003	0.029	0.924
csr_emp_num	0.000	0.000	0.279	0.000	0.000	0.098
indep_board	0.088	0.032	0.005	0.088	0.037	0.017
ceo_board	0.358	1.294	0.783	0.358	0.773	0.644
gov_comm	-2.801	1.170	0.017	-2.801	0.755	0.000
audit_indep	0.038	0.025	0.120	0.038	0.025	0.123

Variables	Standard Model			Driscoll–Kraay Robust Model		
	Coef.	Std. Error	p-value	Coef.	Std. Error	p-value
audit_exp	0.502	0.887	0.572	0.502	0.834	0.548
audit_tenure	-0.299	0.067	0.000	-0.299	0.087	0.001
csr_audit_name	-1.057	1.006	0.294	-1.057	1.308	0.419
roa	-0.114	0.083	0.170	-0.114	0.064	0.078
eps	0.000	0.000	0.423	0.000	0.000	0.057
debt_equity	-0.016	0.002	0.000	-0.016	0.001	0.000
mkt_cap	0.000	0.000	0.171	0.000	0.000	0.017
ebitda	-0.002	0.001	0.004	-0.002	0.001	0.016
co_2_rev	0.000	0.001	0.877	0.000	0.002	0.917
rnd_dev_ta	-0.031	0.237	0.896	-0.031	0.190	0.871
net_income	-0.001	0.002	0.496	-0.001	0.001	0.136
firm_age	0.716	0.138	0.000	0.716	0.129	0.000
total_assets	0.000	0.000	0.032	0.000	0.000	0.060
wgi	1.105	3.556	0.756	1.105	5.076	0.828
factor(time)2017	-0.042	0.597	0.944	-0.042	0.486	0.931
factor(time)2018	1.351	0.574	0.019	1.351	0.212	0.000
factor(time)2019	1.080	0.569	0.058	1.080	0.208	0.000
factor(time)2020	1.853	0.583	0.002	1.853	0.159	0.000
factor(time)2021	1.588	0.605	0.009	1.588	0.492	0.001
F-Test	8.382		0.000			
R^2	0.391					
Wald Test for Heteroskedasticity	217.940		0.000			
Wooldridge Test for Autocorrelation	29.207		0.000			
Pesaran CD Test for Cross-Sectional Dependence	-1.217		0.223			

Panel Regression Results for World Markets

Table 9 presents the panel regression results for the sustainability disclosure scores of firms included in the DJSI World Markets. Estimation results are reported for both the standard fixed effects model and the Driscoll–Kraay robust standard errors model to account for heteroskedasticity, serial correlation, and cross-sectional dependence.

The analysis findings indicate that corporate governance mechanisms have a more significant impact on the formation of sustainability disclosures in global markets compared to emerging markets. There is a negative correlation between the sustainability of a governing body and its sustainability statements. This suggests that coordination among larger boards of directors may be reduced, and effective sustainability decision-making processes may be hindered. Another significant result is that a positive correlation was found between the level of sustainability disclosure and the independence of the board of directors (indep_board). This shows that independent board members contribute to sustainability reporting disclosures by increasing transparency and accountability. A negative relationship was found between the corporate governance committee (gov_comm) and sustainability disclosure scores. This unexpected result suggests that in some advanced markets, these committees may function in a more symbolic.

The study reveals a negative and significant correlation between auditor tenure (audit_tenure) and sustainability disclosures. This suggests that long-term relationships between auditors and companies may weaken auditor independence and consequently reduce the effectiveness of external audit mechanisms, even in developed markets.

When financial indicators were examined, a negative and significant relationship was found between the debt-to-equity ratio and sustainability disclosures. This finding suggests that companies with more limited financial resources may prioritize short-term financial stability and therefore place less emphasis on sustainability reporting.

On the other hand, positive relationships were found between sustainability disclosures and the variables of firm market value (mkt_cap) and EBITDA. This result indicates that firms with greater market visibility and

strong operational performance feel more intense stakeholder pressure and are therefore more willing to disclose non-financial information.

Another noteworthy finding is that no statistically significant relationship is found between CO_2 emission intensity (co2_rev) and sustainability disclosures, indicating a potential decoupling between environmental performance and reported disclosures even in developed markets.

When examining firm-level control variables, the results show that larger and more mature firms exhibit higher sustainability disclosure scores. This can be explained by the reporting experience that businesses have gained over time, as well as being a result of being more closely monitored by global investors and regulatory bodies.

Results regarding time dummy variables show a significant increase in sustainability disclosures, particularly between 2018 and 2021. This increase can be explained by the more widespread adoption of sustainability reporting standards globally and the growing interest in ESG issues in international capital markets.

Comparative Discussion: Emerging versus World Markets

The findings show that the factors influencing sustainability disclosures vary depending on the market context. While the impact of corporate governance remains limited in emerging markets, it becomes more pronounced in developed markets.

In particular, significant relationships exist between the size and independence of the board of directors and the level of sustainability disclosure. This result indicates that governance mechanisms are more effectively integrated into corporate decision-making processes and reporting practices. Furthermore, stronger regulatory oversight, more intensive stakeholder oversight, and more developed accountability mechanisms in developed markets strengthen the impact of governance quality on the credibility of sustainability disclosures.

A common finding for both market groups is that auditor tenure has a negative impact on sustainability disclosures in both markets. This result demonstrates that auditor independence is an important external audit mechanism. Long-term relationships between auditors and firms can weaken the credibility of disclosures. This situation is similar in both developing and developed markets. Additionally, long-term relationships can reduce audit effectiveness and pose a threat of familiarity.

Financial characteristics, however, differ between the two market groups. In developing markets, the relationships between sustainability disclosures and financial indicators are weak and inconsistent. This indicates that sustainability disclosures have not yet been fully integrated into the strategic and financial structures of firms.

In contrast, sustainability disclosures in global markets are systematically correlated with many financial variables. Firm size, market capitalization, leverage ratio, profitability, and firm age all show a correlation with sustainability disclosures. This indicates that financially strong firms with high market visibility are under greater pressure. It also suggests that these firms have the capacity to undertake comprehensive sustainability reporting.

Finally, environmental performance indicators were examined. The CO_2 equivalent emission rate relative to revenue did not show a significant impact on sustainability disclosures in either market group. This result suggests a possible disconnect between firms' actual environmental impacts and their disclosures. This suggests that sustainability reporting may, in some cases, be driven more by legitimacy than performance. This may be more pronounced in environments where verification and auditing mechanisms are limited.

Furthermore, it was determined that the WGI variable, representing the quality of governance at the national level, did not show a statistically significant effect in either market group. This result suggests that corporate quality indicators establish a certain basic framework of expectations across the market. However, the fact that firms included in the DJSI Emerging and DJSI World indices are already subject to high levels of disclosure pressure may have limited the capacity of this indicator to explain differences among large-scale businesses. In this context, it can be considered that national-level governance differences may have a relatively weaker impact within established and institutionalized reporting processes at the firm level.

Overall, the comparative analysis findings reveal that sustainability disclosures are shaped by different corporate dynamics in different markets. This underscores the importance of considering contextual conditions in interpreting sustainability reporting. Moreover, the results are consistent with current multi-level research suggesting that sustainability disclosures are shaped by the interaction of macro, meso, and micro-level pressures in different corporate environments (Ali & Wilson, 2024).

CONCLUSION

This research examines the key factors that determine sustainability disclosures. The analysis compares firms included in the DJSI Emerging Markets Index and the DJSI World Markets. The findings indicate that sustainability disclosures are not determined by a single mechanism, but are largely influenced by the corporate governance structures, financial capacity, and organizational conditions. Furthermore, the level of organizational sophistication and the conditions of the market structure in which it operates also play a significant role in this process (Fernando & Lawrence, 2014; Ioannou & Serafeim, 2019). Therefore, improvements in management quality or strengthening financial capacity do not lead to the same level of sustainability statements in all organizational environments.

The findings under Hypothesis 3 reveal that the factors influencing sustainability disclosures may differ between developed and developing markets. In particular, corporate governance structures and financial resources are more strongly reflected in sustainability disclosures in developed markets. This can be explained by stronger regulatory frameworks, effective accountability mechanisms, and intensive stakeholder oversight (Clarkson et al., 2008; Khan et al., 2013). However, the results indicate that this effect may vary depending on the characteristics of the corporate environment in which businesses operate.

When the emerging market index is examined, that sustainability disclosures have not yet been fully institutionalized within formal governance structures. This suggests that some firms may use sustainability disclosures to gain legitimacy or strengthen their corporate image rather than for actual implementation (Delmas & Burbano, 2011; Michelon, Pilonato, & Ricceri, 2015). Furthermore, the negative relation between auditor tenure and sustainability disclosures in both market groups shows that auditor independence is a critical element for the reliability of sustainability reporting. This finding is consistent with previous studies showing that long-term relationships between auditors and the entity can weaken the perception of the reliability of the disclosed information (Reimsbach, Hahn, & Gürtürk, 2018; Simnett et al., 2009).

Overall, the study provides a contextual contribution to the sustainability and accounting literature by demonstrating that sustainability disclosures are strongly influenced by the corporate context. The findings show that formal governance mechanisms are not reflected uniformly in sustainability disclosures across different institutional environments. In emerging markets, governance structures may not have sufficient enforcement power to transform reporting practices into an institutionalized level of transparency. This suggests that in institutionally weaker environments, sustainability disclosures may be partly symbolic. Most previous studies have either focused on single-country samples or presented systematic literature reviews of the determinants of sustainability disclosures (Arkoh et al., 2024; Seow, 2024). In contrast, empirical evidence based on comparative panel data analyses in different institutional settings is quite limited. This study demonstrates that sustainability reporting rules should not be applied uniformly across all countries. Because developing and developed markets have different institutional structures, sustainability disclosure systems should be designed to take these differences into account.

This study has some limitations. First, sustainability disclosures were measured using a single composite sustainability score obtained from the Refinitiv database. This may limit the detailed reflection of the sub-components of sustainability reporting. Second, the analysis was limited only to firms included in the Dow Jones Sustainability Indices. Since the sustainability practices of these firms are relatively more advanced, the generalization of the findings to businesses outside the index may be limited.

Future research could analyze the determinants of sustainability disclosures by examining larger firm samples, using different databases, and alternative indicators. Furthermore, separately examining the ESG sub-

dimensions of sustainability scores could contribute to obtaining more detailed and comprehensive results regarding sustainability reporting.

FUNDING: This project was supported by the Osmaniye Korkut Ata University Scientific Research Projects Coordination Office (OKUBAP) under project number OKUBAP-2023-PT2-029.
INSTITUTIONAL REVIEW BOARD STATEMENT: Not applicable.
TRANSPARENCY: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.
COMPETING INTERESTS: The authors declare that they have no competing interests.
AUTHORS' CONTRIBUTIONS: Both authors contributed equally to the conception and design of the study. Both authors have read and agreed to the published version of the manuscript.
DISCLOSURE OF AI USE: The author used OpenAI's ChatGPT (GPT-4) to edit and refine the wording of the Results and conclusion. All outputs were thoroughly reviewed and verified by the author.

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