

Supply Chain Sustainability Disclosure and Firm Performance: Evidence from Saudi Listed Firms

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Abstract: The objective of this research is to find out if supply chain sustainability disclosure is related to firm performance among publicly traded companies in Saudi Arabia. A unique and valid Supply Chain Sustainability Disclosure Index (SCDI) that has six variables is measured based on the standards in the Global Reporting Initiative (GRI) (2019) which are GRI 204, GRI 308, and GRI 414 through a systematic content analysis of 142 annual accounts of 58 publicly-listed non-financial corporations on the Saudi stock exchange (Tadawul) from 2022 to 2025. This study uses several panel regressions with fixed effects with respect to firm and year while using clustered standard errors of classified at the firm level. The study did not discover any evidence of a statistically significant connection between disclosure rates of the Supply Chain Sustainability Disclosure Index (SCDI) and firm performance measured by Return on Assets (ROA) or Return on Equity (ROE) taking into consideration various models such as main, lagged, ESG- alternative and restricted samples of the gathered data. The findings illustrate that the SCDI was found to be 0.11 while it had a median value of zero which indicates very little disclosure of Supply Chain sustainability. Therefore, it was concluded that in this window of opportunity and market, disclosure is mostly linked to the process of legitimation rather than performance-based signaling, due to the lack of variation among the gathered sample.

Keywords: Supply Chain Sustainability Disclosure; Firm Performance; Return on Assets; Return on Equity; Saudi Arabia; Tadawul; Panel Data.

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I. INTRODUCTION

Because supply chains represent the majority of firms' environmental and social impacts, accountability for their management has become increasingly important as stakeholders seek transparency into how firms manage their supply chain [1], [2]. Sustainability reporting frameworks have created various supply chain-specific standards for the disclosure of procurement practices as well as environmental and social management of suppliers [3], [4], [5]. However, most empirical analyses conducted to explore the financial impacts of sustainability disclosures tend to rely on aggregate environmental, social, and governance (ESG) ratings. This means that supply chain-specific disclosure has not received much attention, particularly in emerging markets, where supply chains tend to exhibit the most severe sustainability-related risks and its regulation is still developing.

The rationale for focusing specifically on supply chain disclosures, instead of aggregate ESG scores, is intentional, given the fact that supply chain is where most firms face their strongest environmental and social pressures from suppliers, including the labor practices in the supply chain, as

well as upstream emissions and procurement integrity. Aggregate scores tend to combine dozens of different metrics and often reveal discrepancies across providers. On the contrary, specific disclosures provide information about practices that stakeholders can validate and account for [6], [7]. In the absence of notable sustainability disclosure impacts, it means that impacts would be likely to be identifiable specifically in the area of supply chain disclosures due to the foregoing reasons.

Saudi Arabia provides a perfect set of circumstances for this study to take place. According to Vision 2030, the country is making efforts to diversify its economy so as not solely rely on hydrocarbons and is further developing its capital markets. Moreover, it is promoting sustainable development and localization in every field of its economy. The implementation of programs like the In-Kingdom Total Value Add (IKTVA) and national local content requirements has officially put supplier development and local procurement into public policy. Also, the Saudi Exchange (Tadawul) has been pushing the publicly listed companies to improve their sustainability disclosure policies. Nevertheless, it is still unclear whether there is a positive correlation

between the disclosures about firms' supply chain sustainability and their economic impact. The currently available data from Saudi Arabia only cover total ESG disclosures [8], [9], as well as address perceptions about green supply chain management practices. There is not much empirical evidence regarding firm-specific disclosure about sustainability issues in supply chain management.

This study addresses that gap. It constructs a novel six-item Supply Chain Sustainability Disclosure Index (SCDI) grounded in the GRI Standards covering sustainable procurement policy, supplier codes of conduct, supplier environmental assessment, supplier social assessment, local-supplier development, and supplier auditing and monitoring and codes it through systematic content analysis of the annual reports of non-financial firms listed on Tadawul for fiscal years 2022–2025. It then tests, in a panel framework with firm and year fixed effects and firm-clustered standard errors, whether the SCDI is associated with accounting-based firm performance (return on assets and return on equity).

The study makes three contributions. First, it develops and validates a replicable, GRI-grounded instrument for measuring supply-chain sustainability disclosure from public annual reports, responding to repeated calls for disclosure measures that capture specific practices rather than aggregate ratings [6], [7]. Second, it provides among the first archival firm-level evidence on supply-chain disclosure in Saudi Arabia, documenting that such disclosure is at a nascent stage: the mean SCDI is 0.11 on a 0–1 scale, the median is zero, and three-quarters of the firm-year observations in the estimation sample disclose none of the six items. Third, it reports an honest null result: the SCDI shows no statistically significant association with ROA or ROE in any specification, including lagged-disclosure, full-ESG-index, and sample-restriction alternatives. Rather than a failure, this finding is informative it is consistent with disclosure being driven by early-stage legitimation rather than performance-linked signaling in this market and window, and it cautions against assuming that aggregate ESG–performance findings automatically extend to supply-chain-specific disclosure.

The remainder of the paper is organized as follows. Section II reviews the theoretical and empirical literature and develops the hypotheses. Section III describes the sample, the construction of the SCDI, variable measurement, and the empirical model. Section IV presents descriptive, correlational, and regression results with robustness checks and discusses their interpretation. Section V concludes with implications, limitations, and directions for future research.

II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

➤ *Theoretical Foundations*

The association between sustainability disclosure and organizational performance is elaborately explained using four theoretical approaches that yield specific predictions about the timing and the institutional context for the relationship [4]. In stakeholder theory, it is assumed that the company that caters to the needs of its customers, suppliers,

workforce, regulators, and the public will get the much-needed cooperation and resources to maintain its value now and in the future [11]. By ensuring transparency of its supply-chain processes, the company gets a chance to strengthen the language with its partners and customers who look for sustainable development strategies [12]. Disclosure of supplier standards and evaluate practices creates confidence in customers as to the risk of continuity and compliance, making it possible to assure suppliers of the stability of the commercial partnership supporting operational performance.

In legitimacy theory, disclosure is seen as a means of maintaining social legitimacy [2]. Companies that operate through legitimate channels have fewer constraints related to finance, reputation, and regulation [13]. In Saudi Arabia, legitimacy demand is especially visible as the government implements Vision 2030 and aligns the supply chains and procurement with national priorities [30]. Large publicly traded corporations use disclosures of compliance with the sustainability priorities in their legitimacy strategy.

In terms of signaling theory, it can be argued that credible voluntary disclosure decreases the information asymmetry between managers and investors [1]: there are organizations with truly sustainable supply chains that can signal unobservable quality to attract capital at favorable terms [14]. Prior studies show that credible disclosure of non-financial information makes it possible to reduce the cost of equity capital, emphasizing the quality of information that the market is willing to pay for [15][16].

Institutional theory completes the picture of why organizations fall into similar lines of reporting, in spite of the lack of any possible performance outcome [17]. Three forms of pressure encourage the spatial spread of disclosure practices: coercive pressures (laws and listing regulations); mimetic pressures (the practice of following one's visible rivals); and normative pressures (professional norms and global reporting standards). One of the expectations of institutional theory-related literature is the rapid implementation of low-cost, legitimacy-oriented disclosures, that is, those disclosure practices characterized by a decoupling between them and the organizational quality of performance.

The literature on voluntary disclosures brings in additional concerns to the discussion: managers weigh reporting from the point of benefits of going public with either the investors or regulators against the proprietary information costs involved with reporting and training of the staff to issue disclosures that the managers have in their own heads and that cannot be verified by others in the marketplace [1]. While there is evidence that credible non-financial reporting can help lower company's cost of equity [15], the pattern has been discovered to be that it is the quality of the disclosures that we care about and not the quantity [16]. By relying on various elements in annual reports, the study builds an index that joins two propositions; namely, companies issue disclosures on sustainability in their supply chain and that such disclosures are capable of

providing an indication of performance achievements through operational channels (i.e., better supplier relations, less risk of disruption and compliance issues) or academic channels (i.e., preference by investors or customers).

In sum, the aforementioned circumstances create the grounds for the positive link to exist between supply-chain sustainability disclosure-related aspects and performance through operational channels (i.e., better supplier relations, less risk of disruption and compliance issues) and reputational channels (i.e., preference by investors or customers).

➤ *Supply Chain Sustainability Disclosure*

The supply chain management process embraces both ecological and social factors in the supply chain governance system and design [12], [18]. Disclosure acts as the counterpart of this type of communication process. Companies have to disclose their procurement methods, benchmarks in their supplier evaluation processes, as well as how they evaluate the performance of their supply chains to help people assess their supply chain practices. Various content analyses of the corporations' social responsibility reports reveal that most reporting companies focus on three concepts: various codes of conduct that they utilize to govern the behavior of their supply chains, the supplier assessment process, and the idea to localize procurement activities [6]. There is also a body of evidence, based on the examination of the levels of CSR disclosure and sustainable supplier management, proving that companies disclose information on their suppliers based on strategic decisions rather than their current tendency to disclose it [19].

The Global Reporting Initiative is the most popular report grammar that companies prefer to use nowadays. The following three Global Reporting Initiative standards are appropriate for this research. First, GRI 204 (Procurement Practices) deals with the issue of payments that a company makes to local suppliers [3]; second, GRI 308 (Supplier Environmental Assessment) addresses the screening process of new suppliers based on environmental factors and risks related to the activities that companies perform in their supply chains [4]; and third, GRI 414 (Supplier Social Assessment) addresses the same social screening process [5]. The significance of this research is explained by its voluntary nature, since there are no active regulations that force any listed firms to make disclosures related to their performing of supplier assessments, and such information assurance is rare in Saudi Arabia as well. Thus, the Saudi 2022–2025 context enables conducting this research within the context of purely voluntary regimes.

This study has developed its measurement instrument and built it mainly based on the three above-mentioned Global Reporting Initiative standards, enriched by the items associated with supplier auditing and monitoring, sustainable procurement policy, and the development of local suppliers.

➤ *Sustainability Disclosure and Firm Performance: Empirical Evidence*

The large and heterogeneous field of ESG—performance literature contains multiple avenues toward building a clearer picture of how ESG ratings impact corporate returns. A meta-analysis based on over 2,000 empirical studies indicates a mostly neutral relation between ESG criteria and financial performance, although there is a good degree of regional difference, combined with divergences in measure and approach employed by different authors [20]. Moreover, studies distinguishing between disclosure and underlying sustainability actions also produce mixed findings; in some environments, improved environmental disclosure produces a superior environmental outcome, especially for certain industries, though in other places this correlation is weak or dependent on the credibility of the disclosure as well as whether or not assurance was given by an outside source. The consistent message is that, regardless of any headline result, context, measurement, and credibility all play an important role in moderating the studied relationships. Systematic review of the drivers of company reporting confirms that size, visibility, and institutions play an important role in determining the way that firms report [21], which must lead us to control for size and be cognizant of the institutional context in interpreting any disclosure–performance relationship.

Evidence from Saudi Arabia and the Gulf is growing but remains focused on aggregate ESG. ESG disclosure is positively associated with the performance of top Tadawul firms in recent work covering 2017–2022 [8], while other Saudi studies link sustainability disclosure to investment efficiency [9]. Survey-based research finds green supply chain management practices associated with business performance as perceived by Saudi industrial managers [10]. Recent work on Saudi-listed firms links ESG disclosure to profitability explicitly in the Vision 2030 context [22], while MENA-region evidence on ESG strategies and firm value growth spans nine countries over 2017–2022 [23].

Two measurement debates in this literature motivate the present design. First, aggregate ESG ratings aggregate dozens of indicators with opaque weights and disagree markedly across providers, so a null or positive "ESG—performance" finding is hard to interpret as a disclosure effect at all. Hand-coded, practice-specific indices of the kind built here trade scale for interpretability: every point on the SCDI corresponds to a named, GRI-grounded practice. Second, credibility moderates everything. Disclosure that is assured, GRI-referenced, or otherwise verifiable behaves differently from boilerplate [16], [7]; in the Saudi coded sample, not a single report references GRI 308 or 414 explicitly, which foreshadows the credibility problem the results confirm. What is missing, in Saudi Arabia and more broadly, is archival, firm-level evidence on supply-chain-specific disclosure the construct this study measures directly from annual reports rather than inferring it from aggregate ratings or managerial perceptions.

➤ Hypothesis Development

Drawing on stakeholder, legitimacy, and signaling arguments, firms that disclose more about supply-chain sustainability should enjoy stronger supplier and customer relationships, lower supply-chain risk, and reduced information asymmetry, translating into superior accounting performance. Institutional theory tempers this expectation for young disclosure regimes, but the directional prediction of the first three lenses remains positive. The first hypothesis is therefore:

- H1: Supply chain sustainability disclosure is positively associated with return on assets (ROA).

To the extent that disclosure also reaches equity investors and affects residual claims through the financing channel emphasized by signaling theory a parallel association should appear in return on equity. The second hypothesis is therefore:

- H2: Supply chain sustainability disclosure is positively associated with return on equity (ROE).

Both hypotheses are tested against the Saudi 2022–2025 evidence below; the conceptual framework is summarized in Fig. 1.

The framework additionally establishes the alternate prediction. If institutional isomorphism prevails, it suggests that firms will engage in disclosure in order to appear legitimate without changing any practices, in which case SCDI will not provide any signals regarding performance and coefficients will remain statistically insignificant. However, if signalling theory applies, disclosure will provide credible signals of superior supply chain management, and coefficients estimated will be positive. Therefore, the empirical assessment will determine throughout the study whether legitimation or signalling provides a more accurate explanation for early disclosures.

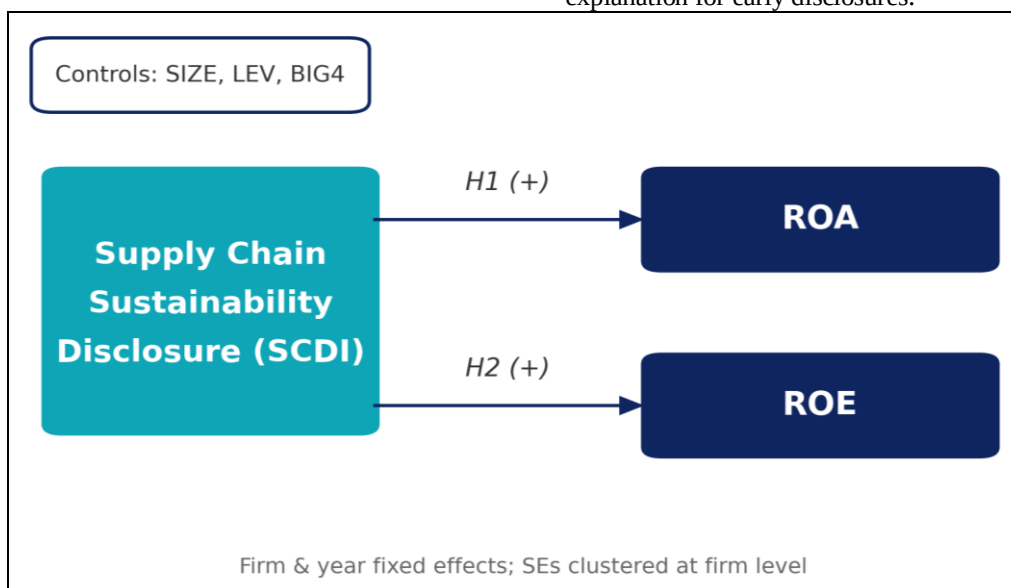


Fig 1 Conceptual Framework: Supply Chain Sustainability Disclosure and Firm Performance.

III. RESEARCH METHODOLOGY

➤ Sample and Data

The sample comprises non-financial firms listed on the Saudi Exchange (Tadawul) with English-language annual reports available for fiscal years 2022–2025. Financial firms are excluded because their reporting structures, leverage, and performance metrics are not comparable to those of industrial and service firms. Starting from 120 non-financial Main Market firms, the construction of the dataset proceeded in two filters. First, firms were retained only where an English-language annual report containing audited consolidated financial statements could be located for at least one sample year; Arabic-only reporters and firms with only interim or board-report disclosures were excluded at this stage. Second, firm-years were retained only where the financial statements contained a complete, GAAP-consistent set of inputs (total assets, total liabilities, net income attributable to shareholders). This yields an unbalanced panel of 62 firms and 180 firm-years (2022: 37; 2023: 45; 2024: 58; 2025: 40), spanning 19 GICS sectors led by Materials, Consumer

Services, and Commercial & Professional Services. The panel is unbalanced by design: firms enter when a usable English annual report exists and exit otherwise, and no firm-year is imputed. Financial and governance data are hand-collected from the consolidated financial statements and governance sections of the annual reports; every value is traceable to a specific report and page, recorded in the collection logs. The regression sample with complete data for the main specification (ROA, SCDI, SIZE, LEV, BIG4) is 118 firm-years across 52 firms and 18 sectors. The SCDI is coded for 142 firm-years across 58 firms; the 38 firm-years without SCDI codes lack a codable English narrative section.

➤ Measuring Supply Chain Sustainability Disclosure: The SCDI

The Supply Chain Sustainability Disclosure Index (SCDI) is a six-item binary index coded from the narrative sections of each firm-year's annual report. The items, grounded in the GRI Standards, are: (sc_01) a sustainable or responsible procurement policy [3]; (sc_02) a supplier code of conduct or supplier sustainability requirements; (sc_03)

environmental assessment or screening of suppliers [4]; (sc_04) social or labor assessment of suppliers [5]; (sc_05) local-supplier development, local content, or in-country value procurement; and (sc_06) supplier audits, monitoring, or corrective-action processes.

Coding followed a keyword-assisted content-analysis protocol consistent with established practice in disclosure research [24], [6]. For each item, keyword searches (e.g., "sustainable procurement," "supplier code of conduct," "supplier audit," "local content," "IKTVA") were run over the extracted report text, and every hit was read in context before scoring keyword presence alone never determines a score. The coding rule was deliberately conservative, and three exclusion rules were applied uniformly. First, vague generic statements ("we manage our supply chain responsibly") do not score any specific item: each item requires a named practice. Second, accounting or auditor boilerplate containing the word "supplier" for example, IFRS notes on supplier-finance arrangements was rejected as non-disclosure of sustainability practice. Third, disclosures are strictly firm-year-specific: a practice disclosed in 2024 is not carried back to 2022, so the index captures the timing of disclosure, not merely its existence. The SCDI for a firm-

year is the mean of the six items, ranging from 0 to 1 in increments of one-sixth. Source pages for each scored item are recorded in the coding logs, making every value traceable to its report.

➤ Variable Measurement

Table 1 provides an overview of all variables. ROA stands for the net income (profit allocated to shareholders) divided by total assets according to the reviewed financial statements. ROE refers to net income divided by shareholders' equity (total assets minus total liabilities), which is the second performance indicator used in this study, as it reflects the residual interest of equity holders. The SCDI has been defined in the previous section. Other control variables stem from the performance-disclosure literature: SIZE is the natural logarithm of total assets; LEV refers to the amount of total liabilities to the sum of total assets; GROWTH reflects the growth of total assets during each year (information is available for 85 firm-years in the examined dataset and is used for the purposes of extended estimations); and BIG4 indicates the audits by one of the four big accounting firms (Deloitte, PwC, EY, or KPMG, including the firms based in Saudi Arabia).

Table 1 Variable Definitions and Measurement

Variable	Description	Source
SCDI	Mean of six binary supply-chain disclosure items (sc_01–sc_06); range 0–1	Annual reports; author coding
sc_01	Sustainable/responsible procurement policy (GRI 204)	Annual reports; author coding
sc_02	Supplier code of conduct / supplier sustainability requirements	Annual reports; author coding
sc_03	Supplier environmental assessment or screening (GRI 308)	Annual reports; author coding
sc_04	Supplier social/labor assessment (GRI 414)	Annual reports; author coding
sc_05	Local suppliers, local content, in-country value procurement	Annual reports; author coding
sc_06	Supplier audits, monitoring, corrective-action processes	Annual reports; author coding
ROA	Net income (attributable to shareholders) / total assets	Audited financial statements
ROE	Net income / shareholders' equity (assets – liabilities)	Audited financial statements
SIZE	Natural logarithm of total assets (SAR millions)	Audited financial statements
LEV	Total liabilities / total assets	Audited financial statements
GROWTH	Annual growth rate of total assets	Audited financial statements
BIG4	1 if audited by Deloitte, PwC, EY, or KPMG (incl. Saudi affiliates)	Annual reports

➤ Empirical Model

The hypotheses are tested with the following panel specification:

$$\text{Performance}(i,t) = \beta_0 + \beta_1 \cdot \text{SCDI}(i,t) + \gamma \cdot \text{Controls}(i,t) + \text{Firm}(i) + \text{Year}(t) + \varepsilon(i,t) \quad (1)$$

Where Performance is ROA (H1) or ROE (H2), while Controls is specified as the vector {SIZE, LEV, BIG4} (GROWTH is included in extended specifications), and Firm and Year are included as firm and year fixed effects. The standard errors are clustered at the firm level [25]. The fixed-effects specification accounts for all time-invariant characteristics of the firm, such as the industry, model, and general propensity to disclose information, in addition to common shocks which occur every year. The identification is based on the within-firm variation in the disclosure across years, and given the slow adjustment of disclosure practices, it sets a stringent test for the detection of performance

effects, which is warranted given the high potential of false correlations emerging from cross-sectional data. There are two important limitations regarding the identification method employed in this study. First, the identified relationship is an association, rather than a causation; time-varied characteristics that are not observable (changes in quality of management) could cause changes in both disclosure practice and performance. Secondly, due to the influence of measurement error introduced by a hand-coded index, its coefficients would be estimated conservatively and should be interpreted as lower bounds of any relationship. However, neither one of the two caveats can lead to spurious results; on the contrary, they make it even more challenging to identify a null-result that indicates a false relationship.

IV. RESULTS AND DISCUSSION

➤ Descriptive Statistics

Descriptive statistics regarding the key regression sample have been presented in table 2 (118 firm-years and 52 firm years). The average ROA is equal to 7.9% while the average ROE is equal to 20.4%; as is often the case, the accounting returns are positively skewed. With respect to the SCDI, its mean, median, and standard deviation are equal to 0.11, 0.0, and 0.23, respectively: it can be observed that, in the estimation-sample, the disclosure principle inherits its skewness from the fact that more than 75 percent of firm-years had zero scores across all six items. The SCDI and item-wise disclosure ratios can be located in figure II for the

full coded sample (n=142). The item least disclosed upon refers to supplier environmental assessment (sc_03, 4.1%), and the absence of supplier social assessment (sc_04, 3.5%). There is no single occurrence in the coded sample that mentions GRI 308 or 414. The analysis demonstrates that reporting practices concerning sustainability disclosures in relation to the supply chain in Saudi Arabia is in the early stages, since the firms only report information that is both inexpensive as well as policy-compatible. No upward movement towards reporting sustainability disclosures has been registered, since the mean SCDI has undergone a transformation from 0.08 in 2022 to 0.07 in 2023, 0.17 in 2024, and 0.09 in 2025.

Table 2 Descriptive Statistics (Main Regression Sample, n = 118)

Variable	Mean	Std. dev.	Min	Median	Max
ROA	0.079	0.070	-0.211	0.076	0.237
ROE	0.204	0.223	-0.460	0.178	1.461
SCDI	0.112	0.233	0.000	0.000	1.000
SIZE	7.894	0.833	6.223	7.746	10.636
LEV	0.526	0.211	0.047	0.551	1.140
GROWTH (n = 85)	0.094	0.182	-0.364	0.058	0.760
BIG4	0.610	0.490	0.000	1.000	1.000

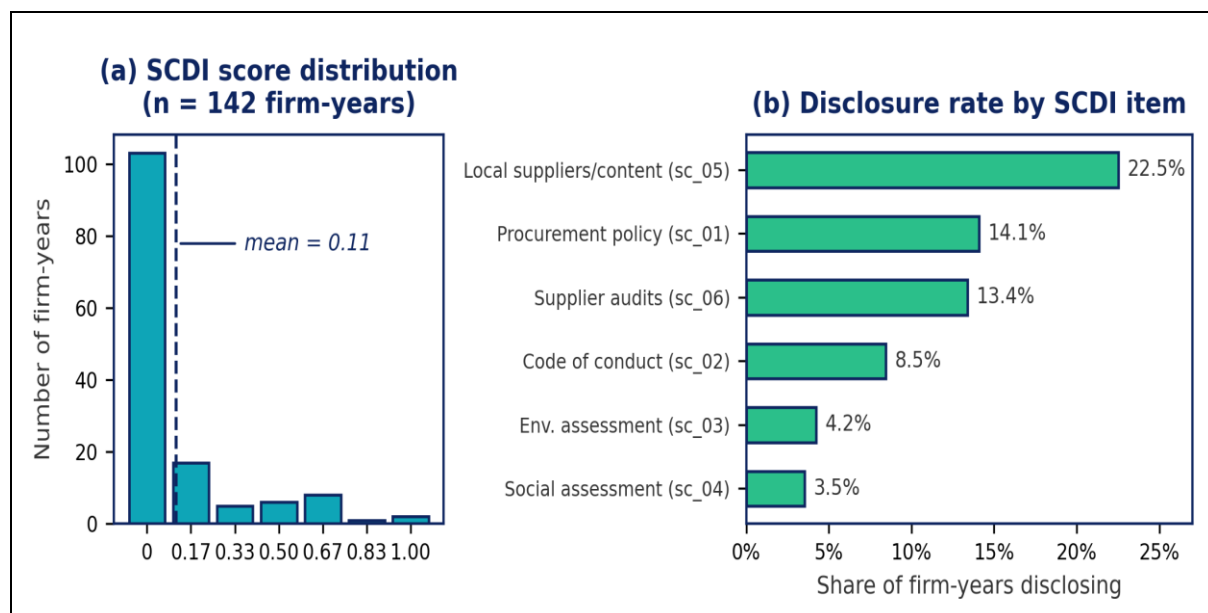


Fig 2 SCDI Distribution: (a) Histogram of Firm-Year SCDI Scores (n = 142); (b) Disclosure Rate by Item.

➤ Correlation Analysis

The Pearson correlations for the main sample are given in Table 3. The SCDI is virtually uncorrelated with ROA ($r = 0.05$) and, as will be shown in the next section, with ROE, suggesting that the predicted relationships may not be realized. The SCDI is, however, positively correlated with the size of the firm ($r = 0.43$); thus it is controlled for in all estimations to avoid any biases in the SCDI coefficients derived as a result of its correlation with size. The negative

correlation between SIZE and ROA (-0.27) serves as a reminder that fixed-effects estimates are based on changes within firms, rather than differences across firms. The other control variables show much lower degrees of correlation. The largest correlations are between ROA and BIG4 (0.27) and ROA and GROWTH (0.27, pairwise $n = 85$). The variance inflation factors for all regressors are below 1.3, indicating that multicollinearity is not a problem.

Table 3 Pearson Correlation Matrix (n = 118; GROWTH Pairwise n = 85)

	ROA	SCDI	SIZE	LEV	GROWTH	BIG4
ROA	1.00					
SCDI	0.05	1.00				
SIZE	-0.27	0.43	1.00			
LEV	-0.15	0.06	0.09	1.00		
GROWTH	0.27	0.01	-0.04	-0.11	1.00	
BIG4	0.27	-0.05	0.02	0.06	0.25	1.00

➤ Regression Results

Table 4 presents the findings from the panel regressions, which include the fixed effects for firms and years and standard errors clustered at the firm level. For instance, firm-level SCDI as determined using ROA analysis (first column, n=118) is with -0.007 (p-value 0.85) does not show any statistical significance. For Column 2 (n=85) analysis including asset growth shows that SCDI does not have any statistical significance ($\beta = 0.036$, $p = 0.20$). Further as per ROE analysis (Table V, First Column, n=118) again shows lack of significance ($\beta = -0.053$, $p = 0.56$).

Hypothesis 1 and Hypothesis 2 were not supported in the above study as both estimates had economic as well as statistical significance. For instance, ROA analysis shows that change (around -0.7 percentage points) is caused by moving from complete disclosure to no disclosure at all which is quite underwhelming when it comes to ROA standard deviation (about 7). Other variables considered in the study were also insignificant in all the models used. Further, ROE study is very much the same as our findings in the other models used.

Table 4 Panel Regressions: SCDI and ROA (Firm and Year Fixed Effects; SEs Clustered at Firm)

Variable	(1)	(2)	(3)	(4)
SCDI	-0.007 (0.037)	0.036 (0.028)		
SCDI (lagged)			-0.041 (0.040)	
ESG index				-0.039 (0.059)
SIZE	0.030 (0.068)	-0.020 (0.110)	-0.058 (0.074)	0.037 (0.069)
LEV	-0.255 (0.161)	-0.167 (0.115)	-0.316*** (0.095)	-0.250 (0.159)
GROWTH		0.051 (0.064)		
BIG4	-0.037 (0.056)	-0.092 (0.074)		-0.037 (0.054)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	118	85	66	118
Firms	52	43	34	52
R ² (within)	0.12	0.37	0.48	0.13

- Notes: (1) main specification; (2) adds GROWTH; (3) lagged SCDI; (4) ESG index replaces SCDI. Standard errors clustered at firm in parentheses.

➤ Robustness Checks

The null result is validated through three robustness checks. First, when the SCDI variable is replaced with the comprehensive 28-item ESG disclosure index for firms to ascertain if the null result is due to the different measurement instrument employed from the previous period, the coefficient is insignificant ($\beta = -0.039$, $p = 0.51$, $n = 118$).

Second, when one-year-lagged SCDI is used thus allowing for the disclosure to have an impact on the performance of the firm, however, this too yields an insignificant value ($\beta = -0.041$, $p = 0.32$, $n = 66$). Thirdly, removing the two Jarir observations coded from the board reports that do not contain complete audited financial reports nonetheless leaves the results unaltered ($\beta = -0.007$, $p = 0.85$, $n = 116$). Additionally, the ROE specification and verification checks are in Table 5.

Table 5 ROE Results and Sample-Restriction Robustness

Variable	(1) ROE	(2) ROA excl. Jarir
SCDI	-0.053 (0.092)	-0.007 (0.037)
SIZE	-0.384 (0.329)	0.030 (0.069)
LEV	0.573 (0.900)	-0.255 (0.161)
BIG4	-0.074 (0.101)	-0.037 (0.056)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	118	116
Firms	52	51
R ² (within)	0.13	0.12

- Notes: Standard errors clustered at the firm level in parentheses. ***, *, denote significance at the 1%, 5%, and 10% levels. All specifications include firm and year fixed effects. R^2 is the within R-squared from the two-way within transformation.

➤ Discussion

The lack of strong relationship is an important finding, instead of one that can be disregarded. In line with the evidence from Saudi Arabia between 2022 and 2025, a total of three separate explanations stand out, and are explained in greater detail in section two.

The first is the limited scope of information disclosure. From an average SCDI of 0.11 and a median of zero, 75% of observations gave no indication of changes in performance because of the scores. With one of the statistical tools, fixed-effects estimation utilized different methods of estimating performance based on the temporal situation.

In the second stage of journal output, companies' disclosures seem to be for legitimization processes, rather than for signals. Corporations disclose local-content and procurement policies corresponding with Vision 2030 priorities because these are what regulators and the public will most readily notice, whereas the costly and verifiable actions that investors might be pricing based on supplier environmental and social audits have almost no disclosure (less than 5% disclosure in each case). This is what is known as decoupling, as predicted by institutional theory [17]; isomorphic adoption of legitimate reporting formats without taking any action. If these disclosures are deemed unworthy, signaling theory predicts that any effect will be muted [14][16].

Third, the four-year time frame for the analysis may be too short for the results to reflect the true potential of supply chain sustainability practices as adopted by companies. Supplier development and auditing programs, as well as supply chain transformations, impact costs first before they then affect income. Indeed, any performance signatures from these efforts tend to appear over a longer time horizon than 2022 to 2025.

This study's findings may not contradict the broader findings on ESG performance [20] or the recent findings from studies conducted in Saudi Arabia regarding overall ESG disclosures [8]. However, they do caution that just because data are aggregated does not mean the results will extend to supply-chain-specific disclosures. In this vein, it is important to articulate how this reading could be overturned. If we were to observe Saudi firms providing verified supplier assessments based on the GRI standards and then those assessments would begin to coincide with firm performance over time this would demonstrate that the signaling channel is viable and the null finding of the present study would indeed stand as a time-specific finding.

For regulators, the implication is that guidance and assurance around supply-chain disclosures notably supplier

assessment aligned with GRI 308 and 414 must precede any expectation of decision-useful signaling. Mandating the disclosure without the assurance infrastructure risks producing more boilerplate, not more information. For managers, the findings suggest that boilerplate supply-chain language is unlikely to move performance metrics; substantive, auditable supplier programs are the margin that matters and disclosing them credibly is the precondition for any market reward. For investors, the message is that current Saudi supply-chain disclosures contain little priced information a gap that standardization and assurance could close, at which point the disclosure–performance link deserves re-testing.

V. CONCLUSION

This study developed a new supply chain sustainability disclosure index (SCDI) based on the GRI (Global Reporting Initiative) standards, and examined its relationship with firm performance within the context of listed firms in Saudi Arabia for the years 2022-2025. The analysis revealed that firms in Saudi Arabia have only begun to disclose supply chain sustainability (mean SCDI of 0.11 with a median of zero; three-quarters of the sample firms providing no disclosure whatsoever). The SCDI does not appear to be statistically related to either return on assets or return on equity (as tested in fixed effects panel regressions as well as in reliability assessments using lagged and ESG-alternative indices). Given these results, there is no evidence in the literature on the importance of GRI-based supply chain disclosure as it applies to Saudi Arabia.

Some limitations deserve mention. Considering that the sample is unbalanced and the four-year time frame is short in nature, this lack of anything other than preliminary results limits the power of this analysis to detect any simultaneous change in customer value. Despite the foregoing limitations, studies in other contexts do support the positive association between the size of firms and supply chain disclosure (correlation of $SCDI=0.43$). Due to the context of the research involving firms that have English language reports, the SCDI is more biased toward larger, internationally oriented firms than others. In addition, there are no governance variables that provide an explanation for the discrepancy in codes for all of the observations.

Future studies should consider extending the research based on the maturation of SCDI. The research should also introduce assurance status and utilizing explicit GRI reference as moderators of the credibility of disclosure. Possible explanations for the influence of legitimacy on signaling will be provided within institutional theory; it will be established which guarantees have been met and what impact they have on SCDI-performance association. In order to gauge the legitimacy of Saudi firms' disclosures, However, prior studies have indicated that legitimate firms must continue to engage in various types of economic activity even if they are able to substantiate any claims made.

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- Data Availability: All data are hand-collected from publicly available annual reports of firms listed on the Saudi Exchange (Tadawul). The dataset and coding logs are available from the corresponding author upon reasonable request.
- Ethics: This study uses publicly available archival data only and involves no human subjects, so no ethical approval was required. The authors disclose that AI tools were used for language editing; all analysis, coding decisions, and interpretations are the authors' own.

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