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# ESG Disclosure and Firm Value in Saudi Arabia: Evidence from Tadawul Listed Companies Using Dynamic GMM

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## Abstract

This study examines the impact of ESG disclosure, leverage, and profitability on firm value, measured by Tobin's Q, among 67 non-financial Tadawul-listed companies in Saudi Arabia over the period 2015–2024. ESG disclosure is captured through a manual content-analysis index that scores the proportion of expected environmental, social, and governance items reported by each firm. The study further investigates whether board independence moderates these relationships while controlling for liquidity, firm size, current ratio, capital expenditure, and board size. Methodologically, the study employs the two-step system generalized method of moments (system GMM) estimator, which addresses dynamic persistence, endogeneity, and unobserved heterogeneity. The findings reveal that ESG disclosure has a positive and significant effect on firm value, indicating that the Saudi market increasingly rewards firms that provide broader sustainability-related information. Profitability also exerts a positive influence on Tobin's Q, while leverage has a negative and significant effect, suggesting that higher debt weakens market valuation. Among the moderating effects, board independence significantly reduces the negative impact of leverage on firm value, although it does not significantly strengthen the positive ESG disclosure–firm value relationship. The results also show that liquidity, firm size, capital expenditure, and board size positively influence firm value. The study's novelty lies in being the first, to our knowledge, to integrate ESG disclosure, financial structure, profitability, and board independence within a single dynamic firm-value framework over a decade-long panel that brackets the Saudi Exchange's 2021 ESG disclosure guideline. In doing so, it advances emerging-market ESG research by showing that, under Saudi Arabia's largely voluntary disclosure regime and concentrated-ownership structure, board independence operates primarily as a risk-monitoring mechanism rather than as an amplifier of disclosure value. The findings imply that regulators should strengthen and progressively mandate ESG reporting frameworks, that investors should treat ESG transparency as value-relevant information, and that firms should view ESG transparency and prudent governance as strategic tools for enhancing market value in line with Vision 2030.

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**Keywords:** ESG disclosure; firm value; Tobin's Q; board independence; leverage; profitability; system GMM

## 1. Introduction

Over the past decade, environmental, social, and governance (ESG) disclosure has moved from a peripheral reporting practice to a central element of capital-market transparency. Globally, this shift has been reinforced by both investor demand and regulatory convergence. Ref. [1] reported that fund assets using responsible or sustainable investment approaches reached USD 16.7 trillion, up by nearly USD 5.5 trillion (49%) over the previous two years. At the corporate-reporting level, Ref. [2] shows that 96% of the world's 250 largest companies (G250) and 79% of the largest 100 companies in each country sample (N100) now report on sustainability. In parallel, Ref. [3] reported that, by September 2024, 30 jurisdictions were taking steps to introduce ISSB standards, together representing about 57% of global GDP and more than 40% of global market capitalization. These trends indicate that ESG disclosure is no longer merely reputational rhetoric; it is increasingly embedded in the information architecture of modern capital markets and investment decision-making.

This global momentum has stimulated a large and expanding body of research on whether ESG disclosure enhances firm value. The dominant theoretical logic is drawn from stakeholder theory, signaling theory, and agency theory. From a stakeholder perspective, ESG disclosure can strengthen legitimacy, stakeholder trust, and long-term corporate resilience. From a signaling perspective, it may reduce information asymmetry by communicating superior governance quality, strategic foresight, and lower non-financial risk. From an agency perspective, transparent ESG reporting can discipline management and improve monitoring. Empirically, however, the literature remains mixed. Meta-analytic and review evidence suggests that ESG is generally associated with stronger firm performance, yet the magnitude and direction of the relationship vary by market, disclosure quality, institutional setting, and measurement design [4,5]. Likewise, firm-level evidence shows that ESG performance is often positively associated with market value and profitability, but those effects are not uniform across ESG dimensions or across developed and emerging markets [6,7]. This inconsistency makes country-specific and governance-sensitive studies particularly important.

Saudi Arabia offers a highly relevant context for advancing this debate. The Saudi capital market has expanded rapidly under Vision 2030, which places strong emphasis on diversification, private-sector development, governance reform, and sustainable growth. The Saudi Exchange issued its ESG guide in January 2021 [8], and the market has since recorded a clear rise in sustainability disclosure. By the end of 2024, the total number of listed companies on the Saudi Exchange had reached 247 [9]. More importantly, the number of companies disclosing sustainability practices rose to 94 in 2024, while among the top 100 companies on the Main Market the sustainability disclosure rate increased to 65% in 2024, up from 58% in 2023 and only 8% in 2021 when the exchange introduced its ESG disclosure guidance [10]. These figures suggest that ESG disclosure in Saudi Arabia has shifted from a nascent reporting practice to a more visible strategic and market-facing phenomenon, making it increasingly relevant to investors' valuation of listed firms.

The Saudi literature has started to respond to this shift, but it remains fragmented. Earlier work focused mainly on CSR disclosure determinants and reporting quality rather than firm value outcomes [11]. Subsequent studies showed that governance mechanisms, board attributes, and governance reforms help explain ESG disclosure among Saudi firms [12]. Other studies found that environmental sustainability practices and ESG disclosure can

improve aspects of financial or market performance in Saudi Arabia [13]. More recent work has also examined ESG disclosure and firm value with specific committee-level governance moderators [14]. Even so, the evidence is still developing and three specific gaps remain unresolved. The first is a methodological gap: most Saudi ESG–value studies rely on static panel estimators (pooled OLS, fixed or random effects) over relatively short windows, which leaves firm-value persistence, endogeneity, and reverse causality between ESG disclosure and valuation largely unaddressed; a dynamic estimator applied to a longer panel is therefore needed. The second is a contextual–governance gap: although Saudi studies establish that board independence drives the level of ESG disclosure, no study has yet tested whether board independence conditions the way the market prices that disclosure in a dynamic valuation setting, leaving the credibility channel of Saudi corporate-governance reforms empirically open. The third is a specification gap: leverage and profitability are typically treated as routine controls rather than as substantive determinants whose valuation effects may themselves be governance-contingent, so their joint role with ESG disclosure and board independence within a single firm-value model has not been examined. Addressing these three gaps jointly is what distinguishes the present study from prior Saudi and emerging-market work.

These gaps define the core problem addressed in the present study. In an emerging market where ESG reporting is growing but still uneven, investors face a persistent question: does ESG disclosure actually create market value, and under what governance conditions is this effect stronger or weaker? This question is especially important in Saudi Arabia because disclosure remains largely voluntary, firm-level reporting quality may differ substantially, and governance credibility may determine whether ESG information is viewed as substantive rather than symbolic. In such a context, board independence is not merely another governance characteristic; it may be the mechanism that converts ESG disclosure into a credible signal for capital markets, while firms' leverage and profitability shape investor responses by reflecting financial discipline, risk exposure, and resource capacity. Drawing on stakeholder, signaling, and agency theory, the study expects ESG disclosure and profitability to be positively associated with firm value, leverage to be negatively associated with it, and board independence to strengthen the ESG–value and profitability–value relationships while weakening the adverse effect of leverage.

Against this background, the objective of this study is to examine the impact of ESG disclosure, leverage, and profitability on firm value, proxied by Tobin's Q, among 67 non-financial Tadawul-listed companies over 2015–2024, and to test whether board independence moderates these relationships. ESG disclosure is measured through a manual content-analysis index rather than a commercial rating: for each firm-year, the number of environmental, social, and governance items actually disclosed in the annual, governance, and standalone sustainability reports is divided by the total number of expected items, an approach widely used where commercial ESG scores offer limited coverage of emerging-market firms. Tobin's Q is adopted as the firm-value proxy because it is a forward-looking, market-based measure that captures investors' expectations about future growth and the value relevance of non-financial information, making it more suitable than backward-looking accounting returns for assessing whether the market prices ESG disclosure. Methodologically, the study employs the two-step system GMM estimator, which is appropriate because firm value is persistent over time and the ESG–value relationship is potentially affected by endogeneity, reverse causality, and unobserved heterogeneity that static panel estimators cannot address. The panel spans both the pre-guideline and post-guideline ESG environment, bracketing the Saudi Exchange's January 2021 ESG disclosure guideline.

This study makes three contributions. Theoretically, it advances the emerging-market ESG literature by integrating ESG disclosure, financial structure, profitability, and gov-

ernance credibility within a single dynamic firm-value framework, and by showing that board independence functions as a credibility channel whose effect is selective rather than uniform. Empirically, it deepens the Saudi evidence base by using a longer decade-long panel and a dynamic estimator that brackets the 2021 ESG guideline, thereby reconciling the mixed findings of earlier short-window Saudi studies on market-based valuation. Practically, it offers differentiated implications for regulators, investors, and firms seeking to understand whether better ESG disclosure is rewarded by the market in a rapidly transforming economy aligned with Vision 2030.

## 2. Related Studies

### *2.1. Theoretical Background*

Stakeholder theory provides the first foundation for this study because it explains why firms engage in ESG disclosure and how such disclosure can influence firm value. The theory argues that firms do not operate solely for shareholders; rather, they are accountable to a broader set of stakeholders, including investors, employees, customers, regulators, and society [15]. In this context, ESG disclosure can be viewed as a strategic response to stakeholder demands for transparency, accountability, and responsible conduct. Firms that disclose more comprehensive ESG information are more likely to gain legitimacy, strengthen stakeholder trust, and reduce reputational risk, which can ultimately enhance market valuation. In the Saudi Arabian context, where expectations for sustainability and governance reporting have increased alongside market reforms, stakeholder theory suggests that better ESG disclosure may positively affect Tobin's Q because it signals alignment with the interests of key stakeholders and the broader developmental agenda of the market [16].

Signaling theory forms the second pillar of the study by explaining how ESG disclosure and profitability can shape investor perceptions under conditions of information asymmetry. According to signaling theory, managers possess private information about the firm's quality and future prospects, and they use disclosure as a mechanism to transmit this information to external investors [17]. ESG disclosure may therefore function as a credible signal of sound management, lower long-term risk, and commitment to sustainable value creation. Likewise, profitability reflects the firm's underlying financial strength and may reinforce the positive market interpretation of ESG efforts by demonstrating that the firm has the resources to sustain such commitments. In this sense, investors may assign higher value to firms that are both profitable and transparent in their ESG practices. Thus, signaling theory supports the expectation that ESG disclosure and profitability are positively associated with Tobin's Q, especially when the disclosed information is perceived as credible and informative [18].

Agency theory provides the third theoretical lens and is particularly important for explaining the roles of leverage and board independence in this study. Agency theory argues that the separation between ownership and management creates conflicts of interest, making monitoring mechanisms essential for protecting shareholders and improving firm value [19]. From this perspective, board independence is a key governance mechanism because independent directors are expected to strengthen oversight, reduce managerial opportunism, and improve the credibility of corporate disclosure. This makes board independence especially relevant as a moderating variable in the relationship between ESG disclosure, leverage, profitability, and firm value. At the same time, leverage has a dual role under agency theory: moderate debt may discipline managers by exposing firms to external scrutiny, while excessive debt may increase financial risk and weaken market valuation. Accordingly, agency theory suggests that stronger board independence

can enhance the value relevance of ESG disclosure, mitigate the negative consequences of leverage, and strengthen the positive effect of profitability on Tobin's Q [19].

Firm Value: Concept and Measurement

Firm value refers to the overall market worth of a company and reflects investors' assessment of its current performance, future growth opportunities, risk profile, and governance quality. In corporate finance research, it is a central outcome variable because it shows how effectively firms convert their financial and strategic resources into shareholder wealth [20]. The literature generally measures firm value using three main approaches: market-based measures, such as Tobin's Q and the market-to-book ratio; accounting-based measures, such as return on assets (ROA) and return on equity (ROE); and hybrid value-based measures, such as economic value added (EVA) [21]. Each approach has trade-offs. Accounting-based measures are backward-looking and vulnerable to accrual management, so they capture realized rather than expected performance; value-based measures such as EVA require cost-of-capital estimates that are difficult to compute reliably for emerging-market firms. Tobin's Q, defined as the ratio of the market value of assets to their replacement (book) value, is preferred here on both economic and empirical grounds. Economically, a ratio above unity signals that the market expects the firm's assets to generate returns exceeding their cost, so Q embeds investors' forward-looking expectations about growth, intangible assets, and the value relevance of non-financial information such as ESG disclosure—information that may be priced well before it appears in accounting returns. Empirically, Tobin's Q is the dominant valuation proxy in the ESG–value literature and has been used in precisely the type of model adopted here, including in international ESG studies [22], in Saudi ESG studies estimating Tobin's Q with panel and GMM methods [23], and in the broader firm-value literature relating governance and ownership to Q [24]. Accordingly, Tobin's Q is adopted as the dependent variable through which the value implications of ESG disclosure, leverage, profitability, and board independence are assessed.

### *2.2. Empirical Literature Review*

Recent global evidence shows that the relationship between ESG disclosure and firm value is generally positive, but far from uniform across markets, measures, and model specifications. Using a large international sample, Ref. [7] found that overall ESG performance is positively associated with both firm value and profitability, although the effect is not equally strong across the three pillars, with the environmental dimension appearing weaker than the social and governance dimensions. Review-based studies reach a similar but more nuanced conclusion. Ref. [4], in a bibliometric and meta-analytic review, shows that the ESG–firm performance literature has expanded rapidly but remains methodologically fragmented, especially regarding the distinction between disclosure and performance, the treatment of endogeneity, and the choice between accounting-based and market-based outcomes. More recent review work also emphasizes that ESG effects are conditional rather than universal: institutional quality, risk profile, disclosure credibility, and governance architecture all influence whether the market rewards ESG information [25]. Collectively, these studies suggest that the central empirical issue is no longer whether ESG matters at all, but rather under what conditions and through which channels ESG disclosure becomes value relevant.

A second stream of global literature points to the importance of contextual and firm-level contingencies. Emerging-market evidence increasingly shows that ESG disclosure does not always translate into immediate market valuation gains, particularly where reporting quality is uneven or where investors remain uncertain about whether disclosure

reflects substantive practice or symbolic compliance. For instance, recent studies from emerging markets report that governance and social disclosure are often more consistently associated with financial outcomes than environmental disclosure, whose benefits may take longer to materialize or may be more costly in the short run. This pattern is visible in recent panel evidence from Vietnam, where social and governance disclosures improved profitability while environmental disclosure showed no significant short-term effect [26], and in other developing-market studies where profitability, firm size, and governance mechanisms shape the strength of ESG effects on value. Such findings are analytically important because they caution against treating ESG as a homogeneous construct and indicate that researchers must carefully model complementary firm characteristics rather than assuming a direct one-size-fits-all effect.

Another important lesson from the recent international literature is that corporate governance mechanisms influence not only the level of ESG disclosure but also its credibility and valuation consequences. Studies increasingly show that investors respond more favorably to ESG information when it is supported by stronger oversight structures, such as effective boards, audit committees, or sustainability committees [27]. This is consistent with the broader argument that market participants discount ESG disclosure when they suspect managerial opportunism or boilerplate reporting. Empirically, moderation studies have begun to show that governance quality can enhance the value relevance of ESG disclosure, although the evidence remains concentrated on audit committees, sustainability committees, or firm age rather than board independence specifically. The implication is that governance is not merely another control variable in ESG research; it is part of the mechanism through which disclosure becomes trustworthy and informative. This gap is particularly relevant for the present study, which focuses on board independence as a moderator rather than as a simple governance covariate [28].

Within the Saudi context, empirical research has developed in stages. Earlier studies focused mainly on the determinants and quality of CSR or sustainability disclosure rather than on firm value. Ref. [11] showed that disclosure quantity and quality among Saudi non-financial firms were shaped by firm-specific governance and reporting characteristics, highlighting that disclosure practices in Saudi Arabia were still developing and uneven. More recent Saudi evidence shifted toward ESG-specific determinants and found that board-related factors matter strongly. Ref. [13] documented that corporate governance mechanisms are associated with ESG reporting in the Saudi stock market, while Ref. [14] found that board size and board independence positively influence ESG disclosure, especially in the context of corporate-governance reforms. This local body of work is important because it establishes that board structure is linked to ESG reporting behavior in Saudi Arabia; however, it leaves open a more substantive valuation question—namely, whether the market rewards such disclosure and whether board independence strengthens that reward mechanism.

Saudi studies that directly examine ESG disclosure and firm performance have produced mixed results, which reinforces the need for a more rigorous and longer-horizon design. Ref. [16], using Saudi listed firms, found that ESG disclosure significantly reduced Tobin's Q and had an insignificant association with ROE, suggesting that ESG reporting may have been interpreted by investors as costly, immature, or insufficiently credible during earlier stages of market development. In contrast, Ref. [17], using the top 100 non-financial Tadawul firms from 2017 to 2022 and applying fixed effects, random effects, and GMM estimators, reported that ESG disclosure positively affects ROA, ROE, and Tobin's Q. Similarly, Ref. [19] found positive valuation effects of ESG disclosure in Saudi Arabia and showed that committee-level governance characteristics condition this relationship. Sector-specific Saudi evidence also leans positive: Ref. [15] found that environmental sus-

tainability practices increase firm value and that independent directors strengthen this effect, while Ref. [20] reported that ESG disclosure enhances value creation among Saudi listed heavy-polluting firms. These contrasting findings suggest that the Saudi ESG–value nexus is sensitive to sample composition, period, ESG measurement, and governance structure, and therefore cannot yet be treated as empirically settled.

A further limitation in both global and Saudi studies is the way financial characteristics are handled. Leverage and profitability are often included as routine controls, but their roles may be more substantive than that, especially in emerging markets. Profitability may amplify the market's positive interpretation of ESG disclosure because profitable firms are better able to finance and sustain ESG initiatives, whereas leverage may either discipline firms or increase perceived risk, thereby affecting the valuation implications of ESG reporting. Yet much of the Saudi literature has not integrated ESG disclosure, leverage, and profitability within one dynamic firm-value framework. Moreover, although some Saudi studies have considered governance moderators such as audit committee characteristics or sustainability committees, direct evidence on board independence as a moderator of the relationships among ESG disclosure, leverage, profitability, and Tobin's Q remains limited. This is a meaningful omission because Saudi corporate governance reforms have explicitly elevated board oversight and disclosure accountability, making board independence a theoretically and empirically relevant conditioning factor.

The empirical literature points to three conclusions that motivate the present study. First, the global evidence broadly supports a value relevance of ESG, but the effect is heterogeneous and highly context dependent. Second, Saudi evidence is growing but still yields mixed conclusions, particularly for market-based outcomes such as Tobin's Q. Third, existing Saudi studies have not sufficiently examined the combined roles of ESG disclosure, leverage, and profitability, while also testing board independence as a moderator within a longer dynamic panel setting. By focusing on 67 Tadawul-listed firms over 2015–2024 and employing dynamic GMM, the present study responds directly to these gaps.

### Board Independence as a Governance Moderator

Because the present study assigns board independence a central conditioning role, this subsection reviews the evidence on independent directors more closely than a single control variable would warrant. Agency theory predicts that a higher proportion of independent directors strengthens monitoring, curbs managerial opportunism, and raises the credibility of corporate disclosure, all of which should make outsider-verified information more valuable to investors [29]. Empirically, board independence has been linked to higher disclosure quality and firm value in several settings, although the magnitude is context dependent: independent boards add the most value where ownership is concentrated and minority-investor protection is still developing, conditions that closely describe the Saudi market.

In the ESG field specifically, two complementary strands justify treating board independence as a moderator rather than a determinant. The first strand shows that board independence drives the level of ESG disclosure: Saudi evidence finds that board size and board independence increase ESG reporting, particularly after the corporate-governance reforms [30], and international work reaches similar conclusions [31]. The second strand, which is far thinner, concerns whether independent boards change how the market prices that disclosure. Most Saudi moderation studies to date examine audit-committee or sustainability-committee characteristics rather than board independence [32], while the closest direct evidence— [33]—shows that independent directors strengthen the link between environmental practices and firm value for a single ESG dimension. No Saudi study has yet tested board independence as a moderator of the joint relationships among ESG

disclosure, leverage, profitability, and Tobin's Q. Theory also gives reasons to expect the moderation to be uneven: independent directors may add little to ESG-pricing where the disclosure signal is already informative, yet add substantially to the oversight of financing decisions, implying that board independence could matter more for the leverage–value relationship than for the ESG–value relationship. This reasoning directly motivates the moderating hypotheses developed below and explains why a selective, rather than uniform, moderating pattern is theoretically plausible.

### *2.3. Hypothesis Development*

Drawing on stakeholder theory, signaling theory, and agency theory, this study argues that ESG disclosure, leverage, and profitability are key determinants of firm value, while board independence functions as an important governance mechanism that shapes the strength of these relationships. From the perspective of stakeholder theory, ESG disclosure enables firms to respond more effectively to the expectations of investors, regulators, customers, and society, thereby enhancing legitimacy and long-term market acceptance. Signaling theory further suggests that ESG disclosure conveys valuable information to external investors by reducing information asymmetry and indicating that the firm is better managed, more transparent, and more attentive to long-term sustainability risks and opportunities. In this way, firms that provide broader ESG information may be rewarded with stronger market valuation. Prior empirical studies that proxy firm value with Tobin's Q support this view, showing that ESG disclosure and related sustainability practices often improve market valuation, transparency, and investor confidence, particularly in markets where non-financial information is increasingly integrated into investment decisions [34].

By contrast, leverage is expected to affect firm value in a different way. Although debt can impose discipline on managers and reduce agency problems, excessive leverage may increase financial risk, reduce strategic flexibility, and raise the likelihood of financial distress. When investors perceive debt levels as too high, market valuation may decline because of heightened uncertainty regarding repayment capacity and future stability. In contrast, profitability is generally expected to exert a positive influence on firm value because it reflects operational efficiency, stronger earnings power, and greater capacity to generate future cash flows. Profitable firms are often viewed more favorably by investors because they signal stronger internal capability and better long-term growth prospects; studies measuring value with Tobin's Q likewise report a negative leverage effect and a positive profitability effect on valuation [35]. Based on these theoretical arguments and empirical insights, the study proposes the following direct hypotheses:

**H1.** *ESG disclosure has a positive and significant effect on Tobin's Q.*

**H2.** *Leverage has a negative and significant effect on Tobin's Q.*

**H3.** *Profitability has a positive and significant effect on Tobin's Q.*

The study further contends that the effects of ESG disclosure, leverage, and profitability on firm value are unlikely to be uniform across firms, but instead depend on the quality of corporate governance. In particular, board independence is expected to strengthen monitoring effectiveness, reduce agency conflicts, and improve the credibility of both managerial decisions and corporate disclosures. A more independent board may strengthen the positive market response to ESG disclosure by assuring investors that sustainability reporting is substantive rather than symbolic. Likewise, independent boards may mitigate the adverse effect of leverage by exercising stronger oversight over financing decisions and discouraging excessive risk-taking. At the same time, board independence may

reinforce the positive effect of profitability by ensuring that earnings are generated and utilized under stronger governance discipline, thereby increasing investor confidence in the sustainability of financial performance [36]. Accordingly, the following moderating hypotheses are advanced:

**H4.** *Board independence positively moderates the relationship between ESG disclosure and Tobin's Q, such that the positive effect of ESG disclosure on firm value becomes stronger when board independence is higher.*

**H5.** *Board independence negatively moderates the relationship between leverage and Tobin's Q, such that the negative effect of leverage on firm value becomes weaker when board independence is higher.*

**H6.** *Board independence positively moderates the relationship between profitability and Tobin's Q, such that the positive effect of profitability on firm value becomes stronger when board independence is higher.*

## 3. Data Sources and Methodology

This study uses secondary panel data for 67 non-financial Tadawul-listed companies over 2015–2024. The sample was drawn from the population of companies listed on the Saudi Exchange Main Market through a purposive, data-availability screen rather than a random draw. Although the exchange listed roughly 247–269 companies by the end of the sample window, the effective population for this study is much smaller once consistent eligibility criteria are applied. First, banks, insurers, and other financial firms were excluded because their capital structure, leverage, and balance-sheet composition differ fundamentally from non-financial firms, which would distort Tobin's Q, leverage, and liquidity comparisons—a standard exclusion in firm-value research. Second, only firms continuously listed across the full 2015–2024 window were retained, so that a strongly balanced dynamic panel could be estimated; recently listed firms (including the many IPOs after 2019) and delisted firms were therefore dropped to avoid survivorship gaps and unbalanced lags. Third, firms had to publish sufficient annual, governance, and sustainability information to construct every variable for every year. Applying these screens yielded 67 firms with complete ten-year records, producing 670 firm-year observations. The retained firms span the principal non-financial sectors of the Main Market—materials and basic industries, energy and utilities, food and consumer staples, healthcare, telecommunications and technology, real estate, and industrial and consumer services—so the sample reflects the sectoral breadth of Saudi Arabia's non-financial real economy and is reasonably representative of the firms most affected by the post-2021 ESG disclosure reforms, even though it is not a statistical random sample of all listings. Data were collected from firms' annual reports, corporate governance reports, standalone ESG reports where available, and official Saudi Exchange disclosures and market data. This source base is appropriate because Saudi Exchange Ref. [8] provides issuer guidance on ESG disclosure and maintains official market information, while listed firms publish audited financial and governance information needed for firm-level panel analysis. Consistent with prior Saudi ESG studies, these sources are sufficient to construct a longitudinal dataset for market value, disclosure, financial, and governance variables. Figure 1 shows the research framework of this study.

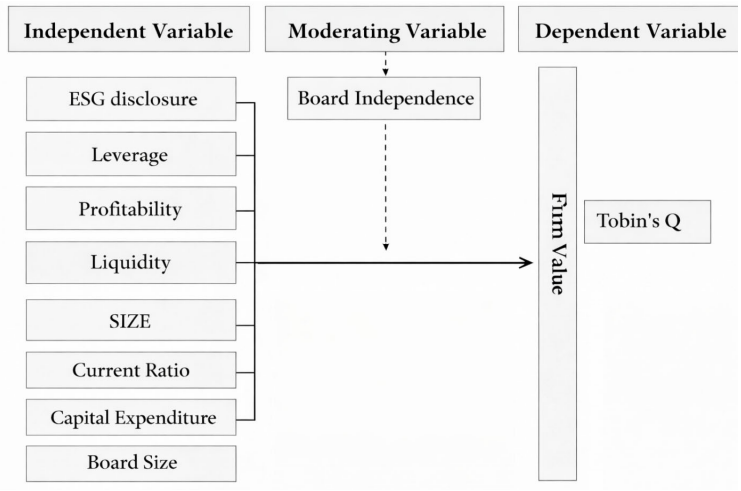



**Figure 1.** Research framework.

The dependent variable, Tobin's Q, was calculated using year-end market value of equity from Saudi Exchange market data Ref. [9] and total liabilities and total assets from annual reports. The independent variables—ESG disclosure, leverage, and profitability—were collected from annual, governance, and ESG reports. ESG disclosure was measured through manual content analysis using a structured disclosure checklist of expected environmental, social, and governance items, scored as the ratio of items disclosed to items expected for each firm-year, consistent with prior content-analysis-based ESG studies [37]. Board independence was measured as the proportion of independent directors on the board, following [38], while leverage and profitability were derived from audited financial statements. The moderating variable, board independence, and the control variable board size were obtained from corporate governance reports, whereas liquidity, firm size, current ratio, and capital expenditure were extracted from the financial statements and notes. Because the sample was deliberately restricted to firms with complete ten-year disclosure (see above), all variables were available for all 67 firms across the full 2015–2024 window, yielding a strongly balanced panel of 670 firm-year observations; no firm-year cell required imputation. The only adjustments at the data-cleaning stage were the correction of a small number of transcription inconsistencies against the audited source documents and the winsorization of the continuous financial variables at the 1st and 99th percentiles to limit the influence of extreme outliers. The cleaned panel was then estimated using system GMM, which is suitable for dynamic panel analysis with possible endogeneity and unobserved firm effects [39].

### *3.1. Variables Description*

Tobin's Q is employed in this study as the proxy for firm value because it reflects the market's forward-looking valuation of the firm relative to the book value of its assets. In contrast to purely accounting-based measures, Tobin's Q captures investors' expectations regarding future growth, strategic positioning, governance quality, and the value relevance of non-financial disclosures. This makes it especially suitable for studies examining ESG-related information, since market participants may price sustainability disclosure into the firm's valuation even before such effects are fully visible in accounting returns. Recent studies on ESG and corporate performance have similarly used Tobin's Q as a market-based indicator of firm value, particularly where the objective is to assess whether investors reward firms for greater transparency and better governance [40]. In the present study, Tobin's Q therefore serves as the dependent variable through which the value implications of ESG disclosure, leverage, profitability, and board independence are assessed.

The main explanatory variables of the study are ESG disclosure, leverage, and profitability. ESG disclosure refers to the extent to which a firm reports information relating to environmental, social, and governance practices, and it is treated as an indicator of non-financial transparency rather than a direct performance outcome. In the literature, more extensive ESG disclosure is generally viewed as a sign of greater accountability, lower information asymmetry, and stronger responsiveness to stakeholder expectations [41]. Leverage captures the extent of debt financing in the firm's capital structure and is important because it can affect firm value through both monitoring and risk channels; while debt may impose financial discipline, excessive leverage can also increase financial distress risk and weaken investor confidence. Profitability, by contrast, reflects the firm's ability to generate earnings from its asset base and is commonly interpreted as a signal of managerial efficiency, financial strength, and future cash-flow potential. Together, these three variables represent the study's core financial and disclosure-related determinants of firm value [42]. Table 1 presents the description of variables.

**Table 1.** Description of variables.

| Variable Type | Variable | Symbol | Measurement | Expected Result |
|---|---|---|---|---|
| Dependent Variable | Tobin's Q | TOBQ | (Market value of equity + total liabilities)/total assets | — |
| Independent Variable | ESG Disclosure | ESGD | ESG disclosure index = total ESG items disclosed/total ESG items expected | (+) |
| | Leverage | LEV | Total debt/total assets | (−) |
| | Profitability | PROF | Net income/total assets (ROA) | (+) |
| Moderating Variable | Board Independence | BIND | Number of independent directors/total number of directors | (+) |
| Control Variable | Liquidity | LIQ | Cash and cash equivalents/total assets | (+) |
| | Firm Size | SIZE | Natural logarithm of total assets | (+) |
| | Current Ratio | CR | Current assets/current liabilities | (+) |
| | Capital Expenditure | CAPEX | Capital expenditure/total assets | (+) |
| | Board Size | BSIZE | Total number of board members | (+) |

Board independence is introduced as the moderating variable because it reflects the quality of board oversight and the credibility of managerial disclosure and decision-making. It is measured as the ratio of independent (non-executive) directors to total board members, the standard operationalization used in prior Saudi and international governance research [43]. Independent directors are expected to improve monitoring, reduce agency conflicts, and strengthen investor confidence in both sustainability reporting and financial policy. For this reason, board independence may condition the effects of ESG disclosure, leverage, and profitability on firm value. In addition, the study includes liquidity, firm size, current ratio, capital expenditure, and board size as control variables, each chosen because

prior valuation research shows it independently influences Tobin's Q. Liquidity and the current ratio capture short-term financial strength and solvency, which reduce distress risk and have been linked to higher valuation [44]. Firm size, measured as the natural logarithm of total assets, reflects scale, market visibility, and access to capital, and is among the most consistently significant value determinants [44]. Capital expenditure proxies investment intensity and future growth orientation, signaling growth opportunities that the market typically rewards [44]. Board size controls for governance structure and decision-making capacity, which the corporate-governance literature relates to monitoring effectiveness and disclosure [45]. These controls are included to isolate the net effects of the main explanatory variables and to ensure that the estimated relationships are not driven by broader firm characteristics that also influence market valuation Refs. [13,14,17].

### *3.2. Estimation Method*

This study employs the system generalized method of moments (system GMM) estimator because the empirical relationship under investigation is dynamic in nature and potentially affected by endogeneity. In firm-level panel data, current firm value is often influenced by past firm value because market valuation tends to persist over time due to reputation, investor expectations, and strategic continuity. Once a lagged dependent variable is included in the model, conventional estimators such as pooled ordinary least squares (OLS), fixed effects, and random effects become biased and inconsistent because the lagged dependent variable is correlated with the error term [46]. This issue is especially relevant in the present study, which uses panel data for 67 Tadawul-listed companies over 2015–2024, where the dynamic behavior of Tobin's Q is expected to be substantial. System GMM is therefore appropriate because it is specifically designed for dynamic panel models with a lagged dependent variable and helps produce more consistent estimates than static panel estimators Refs. [36,37].

A second major reason for applying system GMM is the possibility of endogeneity and reverse causality among the study variables. In this study, ESG disclosure, leverage, profitability, and board independence may influence firm value, but firm value itself may also affect managers' incentives to improve ESG reporting, adjust capital structure, maintain profitability, or strengthen governance arrangements. Such simultaneity creates bias if standard estimation techniques are used. System GMM addresses this problem by using the internal instruments generated from lagged values of the explanatory variables, thereby reducing biases arising from reverse causality and omitted variables Refs. [36,37]. This feature is particularly important in the present study because ESG disclosure and governance quality are unlikely to be strictly exogenous in the Saudi corporate setting, where firms differ in reporting maturity, governance discipline, and market visibility. By instrumenting potentially endogenous regressors with their own lagged values, system GMM provides a more reliable framework for estimating the effect of ESG disclosure, leverage, and profitability on Tobin's Q.

A further justification for using system GMM is its ability to control for unobserved firm-specific heterogeneity and to improve efficiency when variables are highly persistent. Saudi listed firms may differ in time-invariant characteristics such as managerial culture, ownership structure, governance orientation, industry position, and disclosure philosophy. If these unobserved characteristics are correlated with the explanatory variables, then coefficient estimates from conventional estimators may be biased. System GMM removes these firm-specific effects while also addressing the weak-instrument problem commonly associated with difference GMM when variables are persistent over time Ref. [37]. Because variables such as firm value, ESG disclosure, leverage, profitability, and board independence usually change gradually rather than abruptly, the system GMM

estimator is preferred over difference GMM. As Ref. [37] showed, system GMM combines equations in first differences and levels, using lagged levels as instruments for differenced equations and lagged differences as instruments for level equations, thereby improving efficiency and finite-sample performance. This makes the estimator especially suitable for the present study.

The significance of using system GMM in this study is both econometric and substantive. Econometrically, it enables the model to deal simultaneously with dynamic persistence, endogeneity, and unobserved heterogeneity, which are central challenges in firm-level corporate-finance research [47]. Substantively, it enhances the credibility of the findings by ensuring that the estimated relationship between ESG disclosure and firm value is not merely driven by reverse causality or omitted time-invariant firm characteristics. This is particularly important in the Saudi context, where ESG reporting practices have evolved considerably over time and where firms differ in governance quality and financial strength. Moreover, the use of system GMM allows the study to model the moderating role of board independence in a dynamic framework, which is essential for understanding whether governance quality strengthens or weakens the effects of ESG disclosure, leverage, and profitability on Tobin's Q.

To ensure the validity of the system GMM estimates, the model should be evaluated using standard diagnostic tests. Following Ref. [48], the study should report the AR(1) and AR(2) tests for serial correlation in the first-differenced residuals. While first-order serial correlation is normally expected, the absence of significant second-order serial correlation is necessary for the validity of the instruments. In addition, the Hansen test of overidentifying restrictions should be reported to assess overall instrument validity Ref. [47]. Since the conventional two-step GMM estimator tends to produce downward-biased standard errors in finite samples, the study should apply the Ref. [49] finite-sample correction to obtain robust two-step standard errors. It is also important to avoid instrument proliferation by limiting lag depth and collapsing the instrument matrix, because an excessive number of instruments may overfit endogenous variables and weaken the Hansen test [50].

In line with the study framework, the baseline dynamic model is specified as follows:

$$TOBQ_{it} = \alpha + \rho TOBQ_{it-1} + \beta_1 ESGD_{it} + \beta_2 LEV_{it} + \beta_3 PROF_{it} + \beta_4 LIQ_{it} + \beta_5 SIZE_{it} + \beta_6 CR_{it} + \beta_7 CAPEX_{it} + \beta_8 BSIZE_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

where $TOBQ_{it}$ denotes firm value for firm i in year t, $TOBQ_{it-1}$ is the lagged dependent variable, ESGD is ESG disclosure, LEV is leverage, PROF is profitability, LIQ is liquidity, SIZE is firm size, CR is the current ratio, CAPEX is capital expenditure, and BSIZE is board size. The term $\mu_i$ captures unobserved firm-specific effects, $\lambda_t$ denotes year effects, and $\varepsilon_{it}$ is the idiosyncratic error term. The inclusion of the lagged dependent variable reflects the dynamic nature of firm value and justifies the use of system GMM rather than conventional panel techniques [37,45].

To test the moderating role of board independence, the extended model is specified as:

$$\begin{aligned} TOBQ_{it} = {} & \alpha + \rho TOBQ_{i,t-1} + \beta_1 ESGD_{it} + \beta_2 LEV_{it} + \beta_3 PROF_{it} + \beta_4 BIND_{it} \\ & + \beta_5 (ESGD_{it} \times BIND_{it}) + \beta_6 (LEV_{it} \times BIND_{it}) + \beta_7 (PROF_{it} \times BIND_{it}) \\ & + \beta_8 LIQ_{it} + \beta_9 SIZE_{it} + \beta_{10} CR_{it} + \beta_{11} CAPEX_{it} + \beta_{12} BSIZE_{it} \\ & + \mu_i + \lambda_t + \varepsilon_{it} \end{aligned}$$

In this equation, BIND represents board independence, while the interaction terms (ESGD × BIND), (LEV × BIND), and (PROF × BIND) are included to test whether board independence modifies the effect of ESG disclosure, leverage, and profitability on firm value. A positive coefficient on the interaction between ESG disclosure and board inde-

pendence (ESGD × BIND) would indicate that independent boards strengthen the value relevance of ESG disclosure. A positive coefficient on the interaction between leverage and board independence (LEV × BIND) would suggest that stronger board independence weakens the adverse effect of leverage on Tobin's Q. Likewise, a positive coefficient on the interaction between profitability and board independence (PROF × BIND) would imply that governance quality reinforces the beneficial effect of profitability on firm value. Estimating these models using system GMM is appropriate because the estimator allows these potentially endogenous relationships to be analyzed in a dynamic panel setting using internal instruments derived from the data structure itself Refs. [36,37].

## 4. Results and Analysis

Table 2 reports the descriptive statistics where the mean value of Tobin's Q (2.575) indicates that, on average, the sampled firms are valued above the book value of their assets, while the observed range (1.121–4.200) suggests substantial cross-sectional and temporal variation in firm value. ESG disclosure has an average score of 0.486, implying moderate disclosure intensity across firms, whereas leverage averages 0.402, indicating that debt accounts for about 40% of total assets. Profitability shows a mean of 0.096, reflecting generally positive earnings performance, while board independence averages 0.528, suggesting that independent directors constitute slightly more than half of board membership on average. Among the control variables, liquidity (0.115), firm size (10.235), current ratio (1.737), capital expenditure (0.066), and board size (8.958) all exhibit reasonable dispersion, with no indication of extreme outliers.

**Table 2.** Descriptive statistics.

| Variable | Obs. | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| TOBQ | 670 | 2.575 | 0.647 | 1.121 | 4.2 |
| ESGD | 670 | 0.486 | 0.11 | 0.176 | 0.776 |
| LEV | 670 | 0.402 | 0.131 | 0.112 | 0.645 |
| PROF | 670 | 0.096 | 0.037 | 0.008 | 0.191 |
| BIND | 670 | 0.528 | 0.122 | 0.283 | 0.754 |
| LIQ | 670 | 0.115 | 0.05 | 0.01 | 0.24 |
| SIZE | 670 | 10.235 | 0.897 | 8.335 | 12.09 |
| CR | 670 | 1.737 | 0.442 | 0.799 | 2.783 |
| CAPEX | 670 | 0.066 | 0.03 | 0.005 | 0.14 |
| BSIZE | 670 | 8.958 | 1.923 | 5 | 13 |

Table 3 presents the pairwise correlation matrix where ESG disclosure (ESGD) is positively correlated with profitability (r = 0.211), board independence (r = 0.296), and firm size (r = 0.260), indicating that firms with stronger profitability, more independent boards, and larger size tend to disclose more ESG information. By contrast, ESG disclosure is negatively associated with liquidity (r = −0.084) and current ratio (r = −0.194), although these relationships are weak. Leverage (LEV) shows a weak positive correlation with board independence (r = 0.201) and firm size (r = 0.136), but a negative relationship with profitability (r = −0.119), liquidity (r = −0.175), and current ratio (r = −0.109), implying that more leveraged firms tend to have lower internal financial strength. Profitability (PROF) is positively related to liquidity (r = 0.135) and firm size (r = 0.083), but negatively correlated with board size (r = −0.134). Among the remaining variables, the highest absolute correlation is observed between board independence and current ratio (r = −0.320), which remains below commonly accepted multicollinearity thresholds.

**Table 3.** Matrix of correlations.

| Variables | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| ESGD | 1.000 | | | | | | | | |
| LEV | 0.020 | 1.000 | | | | | | | |
| PROF | 0.211 | −0.119 | 1.000 | | | | | | |
| BIND | 0.296 | 0.201 | −0.006 | 1.000 | | | | | |
| LIQ | −0.084 | −0.175 | 0.135 | −0.008 | 1.000 | | | | |
| SIZE | 0.260 | 0.136 | 0.083 | −0.085 | −0.072 | 1.000 | | | |
| CR | −0.194 | −0.109 | 0.006 | −0.320 | 0.053 | 0.118 | 1.000 | | |
| CAPEX | 0.000 | 0.005 | −0.007 | 0.093 | 0.057 | 0.044 | −0.020 | 1.000 | |
| BSIZE | 0.076 | −0.124 | −0.134 | 0.007 | −0.092 | 0.035 | 0.060 | −0.059 | 1.000 |

Table 4 reports the variance inflation factor (VIF) results where the findings indicate that multicollinearity is not a concern in the model, as all VIF values are very low and well below the commonly accepted threshold levels of 5 or 10. The highest VIF is recorded for ESG disclosure (1.323), followed by board independence (1.287) and firm size (1.178), while the remaining variables also show similarly low values, ranging from 1.021 for capital expenditure to 1.164 for current ratio. In addition, the mean VIF of 1.155 further confirms that the independent, moderating, and control variables do not exhibit problematic linear dependence. Therefore, the VIF results provide strong evidence that the regression estimates are unlikely to be distorted by multicollinearity, supporting the appropriateness of including all variables in the subsequent system GMM analysis.

**Table 4.** Variance inflation factor.

| | VIF | 1/VIF |
|---|---|---|
| ESGD | 1.323 | 0.756 |
| BIND | 1.287 | 0.777 |
| SIZE | 1.178 | 0.849 |
| CR | 1.164 | 0.859 |
| LEV | 1.157 | 0.864 |
| PROF | 1.119 | 0.893 |
| LIQ | 1.076 | 0.929 |
| BSIZE | 1.073 | 0.932 |
| CAPEX | 1.021 | 0.979 |
| Mean VIF | 1.155 | . |

The system GMM results in Table 5 show that ESG disclosure has a positive and statistically significant effect on Tobin's Q, indicating that firms with stronger ESG transparency tend to enjoy higher market valuation. This finding suggests that investors in the Saudi market increasingly view ESG disclosure as value-relevant information rather than as symbolic reporting. The result is consistent with prior studies that report a positive association between ESG-related disclosure and firm value or firm performance, particularly in settings where sustainability reporting is becoming more institutionalized Refs. [7,17,19]. In contrast, leverage has a negative and significant effect on firm value, implying that higher debt levels reduce market valuation, likely because investors associate excessive leverage with greater financial risk and lower strategic flexibility. By comparison, profitability exerts a positive and significant effect on Tobin's Q, confirming that more profitable firms are valued more highly by the market due to stronger earnings capacity and better future prospects. This result is also in line with the earlier literature emphasizing profitability as a major driver of market-based firm valuation Refs. [7,17].

**Table 5.** GMM result for baseline model.

| TOBQ | Coef. | St. Err. | t-Value | *p*-Value | [95% Conf] | [Interval] | Sig |
|---|---|---|---|---|---|---|---|
| Lag | −0.113 | 0.022 | −5.21 | 0 | −0.156 | −0.071 | *** |
| ESGD | 2.725 | 0.121 | 22.58 | 0 | 2.488 | 2.962 | *** |
| LEV | −0.775 | 0.085 | −9.12 | 0 | −0.942 | −0.609 | *** |
| PROF | 3.219 | 0.318 | 10.12 | 0 | 2.595 | 3.842 | *** |
| LIQ | 0.695 | 0.231 | 3.00 | 0.003 | 0.241 | 1.148 | *** |
| SIZE | 0.084 | 0.013 | 6.61 | 0 | 0.059 | 0.108 | *** |
| CR | −0.133 | 0.026 | −5.19 | 0 | −0.184 | −0.083 | *** |
| CAPEX | 2.885 | 0.364 | 7.92 | 0 | 2.171 | 3.599 | *** |
| BSIZE | 0.027 | 0.006 | 4.78 | 0 | 0.016 | 0.039 | *** |
| Constant | 0.406 | 0.149 | 2.72 | 0.006 | 0.114 | 0.698 | *** |
| Mean dependent var | | 2.573 | | SD dependent var | | 0.649 | |
| Number of obs. | | 660 | | Chi-square | | 1214.192 | |
| Sargan | | 0.1042 | | | | | |
| Hansen | | 0.2415 | | | | | |
| AR (1) | | 0.0025 | | | | | |
| AR (2) | | 0.2461 | | | | | |
| Number of Instruments | | 39 | | | | | |

*** $p < 0.01$.

With regard to the control variables, liquidity, firm size, capital expenditure, and board size all have positive and statistically significant effects on Tobin's Q. These findings imply that firms with stronger short-term financial flexibility, larger scale, greater investment intensity, and broader board structures tend to achieve higher market valuation. The positive effect of capital expenditure, in particular, suggests that the market interprets investment in long-term assets as a favorable signal of growth opportunities and strategic development. However, the current ratio shows a negative and significant relationship with firm value, which may indicate that excessive current assets relative to current liabilities are interpreted as inefficient resource allocation rather than operational strength. The lagged dependent variable is also statistically significant, confirming the dynamic nature of firm value and supporting the suitability of the system GMM estimator.

Table 6 reports the system GMM results for the moderation model and shows that ESG disclosure retains a positive and statistically significant effect on Tobin's Q, indicating that greater ESG transparency continues to enhance firm value even after the moderating role of governance is introduced. This finding is consistent with prior evidence showing that ESG disclosure improves market valuation by reducing information asymmetry and strengthening investor confidence, both globally and in Saudi Arabia Refs. [7,17,19]. Leverage remains negative and significant, confirming that higher debt burdens reduce firm value, while profitability remains positive and significant, suggesting that financially stronger firms are rewarded with higher market valuation. With regard to the moderating variable, board independence has a negative but statistically insignificant direct effect on Tobin's Q, implying that board independence alone does not directly influence firm value in this specification. More importantly, the interaction between ESG disclosure and board independence is positive but insignificant, which indicates that although independent boards may improve the credibility of ESG reporting, they do not significantly strengthen the ESG–firm value relationship in this sample. This result contrasts with the broader governance literature that often expects stronger board oversight to amplify the value relevance of disclosure, but it is not entirely inconsistent with evidence showing that the benefits of governance depend on the specific institutional and firm context Refs. [13,14]. By contrast, the interaction between leverage and board independence is positive and statistically significant, suggesting that stronger board independence weakens the adverse

effect of leverage on firm value. This finding supports the agency-based argument that independent directors improve monitoring of financing decisions and reduce investor concerns over debt-related risk. However, the interaction between profitability and board independence is negative and significant, implying that the positive effect of profitability on firm value becomes weaker when board independence is higher. One possible interpretation is that highly independent boards may constrain aggressive profit-driven strategies or lead investors to place greater emphasis on governance quality than on current earnings alone. This result suggests that governance may not always reinforce profitability effects in a straightforward way, especially in emerging-market corporate settings.

**Table 6.** GMM result of moderation model.

| TOBQ | Coef. | St. Err. | t-Value | *p*-Value | [95% Conf | Interval] | Sig |
|---|---|---|---|---|---|---|---|
| Lag | −0.073 | 0.021 | −3.50 | 0 | −0.113 | −0.032 | *** |
| ESGD | 1.766 | 0.435 | 4.06 | 0 | 0.913 | 2.619 | *** |
| LEV | −4.117 | 0.355 | −11.60 | 0 | −4.813 | −3.422 | *** |
| PROF | 7.64 | 1.271 | 6.01 | 0 | 5.148 | 10.132 | *** |
| BIND | −0.546 | 0.531 | −1.03 | 0.304 | −1.588 | 0.495 | |
| ESGDxBIND | 0.834 | 0.807 | 1.03 | 0.301 | −0.747 | 2.415 | |
| LEVxBIND | 5.702 | 0.658 | 8.66 | 0 | 4.412 | 6.992 | *** |
| PROFxBIND | −6.547 | 2.441 | −2.68 | 0.007 | −11.331 | −1.763 | *** |
| LIQ | 0.767 | 0.228 | 3.36 | 0.001 | 0.32 | 1.214 | *** |
| SIZE | 0.111 | 0.012 | 9.05 | 0 | 0.087 | 0.136 | *** |
| CR | 0 | 0.025 | 0.02 | 0.986 | −0.049 | 0.05 | |
| CAPEX | 1.712 | 0.348 | 4.92 | 0 | 1.03 | 2.394 | *** |
| BSIZE | 0.033 | 0.005 | 6.00 | 0 | 0.022 | 0.044 | *** |
| Constant | 0.365 | 0.326 | 1.12 | 0.262 | −0.273 | 1.003 | |
| Mean dependent var | | 2.573 | | SD dependent var | | 0.649 | |
| Number of obs. | | 660 | | Chi-square | | 1725.916 | |
| Sargan | | 0.1258 | | | | | |
| Hansen | | 0.2317 | | | | | |
| AR (1) | | 0.0007 | | | | | |
| AR (2) | | 0.1891 | | | | | |
| Number of Instruments | | 39 | | | | | |

*** $p < 0.01$.

Regarding the control variables, liquidity, firm size, capital expenditure, and board size all exert positive and statistically significant effects on Tobin's Q, indicating that firms with stronger financial flexibility, larger scale, greater investment activity, and broader board structures tend to achieve higher market valuation. These results are broadly in line with prior empirical work showing that investors reward firms that demonstrate stronger internal resources, visible growth orientation, and governance capacity Refs. [17,19]. In contrast, the current ratio becomes statistically insignificant in the moderation model, suggesting that once governance interactions are introduced, short-term solvency in this broader sense no longer explains additional variation in firm value. The lagged dependent variable remains negative and significant, confirming dynamic adjustment in firm value and supporting the continued appropriateness of the system GMM framework. Overall, the moderation results provide only partial support for the expected governance mechanism: board independence meaningfully mitigates the negative impact of leverage, but it does not significantly strengthen the positive role of ESG disclosure and instead weakens the profitability–firm value relationship. These findings suggest that, in the Saudi context, the governance role of board independence is more pronounced in monitoring financial risk than in amplifying the market rewards of sustainability disclosure.

## 5. Discussion

The findings offer strong support for the study's central proposition that firm value in Saudi Arabia is shaped jointly by sustainability disclosure, financial structure, profitability, and governance conditions. The positive and significant effect of ESG disclosure on Tobin's Q indicates that the market rewards firms that provide broader ESG information, which is consistent with stakeholder theory and signaling theory. From a stakeholder perspective, richer ESG disclosure can strengthen legitimacy, trust, and responsiveness to investor and societal expectations; from a signaling perspective, it reduces information asymmetry by conveying that the firm is better governed and more attentive to long-term non-financial risks. This interpretation is aligned with prior international evidence showing that ESG performance is positively associated with firm value and profitability [50], as well as Saudi evidence documenting a positive association between ESG disclosure and market-based firm outcomes Refs. [17,19,20]. More specifically, the positive ESG–Tobin's Q coefficient found here corroborates the GMM-based result of [17] for the top 100 non-financial Tadawul firms and the committee-moderated valuation effects reported by [51], and it extends the sector-specific evidence of [20] on heavy-polluting firms to a broader, decade-long cross-sector panel. At the same time, the result reverses the negative ESG–Tobin's Q association documented by Ref. [16] in an earlier and shorter Saudi window. This reversal is informative rather than contradictory: it is consistent with the argument that ESG reporting was initially viewed as costly or insufficiently credible in the pre-guideline period, but came to be priced positively once disclosure became more institutionalized after the Saudi Exchange's 2021 ESG guidance. The result therefore suggests that ESG disclosure in the Saudi market is increasingly interpreted as economically meaningful rather than merely symbolic, and that the timing and maturity of the disclosure regime help explain the mixed findings in earlier Saudi work.

The negative and significant effect of leverage supports the risk-side prediction of agency theory and capital-structure reasoning. Although debt can discipline managers, the present findings suggest that, in this sample, investors place greater weight on the financial risk, inflexibility, and potential distress associated with higher leverage. By contrast, the positive effect of profitability indicates that firms with stronger earnings capacity are valued more highly by the market, which is consistent with signaling theory because profitability communicates operational strength, efficient resource use, and stronger future cash-flow expectations. The positive coefficients on liquidity, firm size, capital expenditure, and board size further reinforce the idea that investors reward firms with stronger internal flexibility, greater market presence, clearer growth orientation, and broader governance capacity, while the negative effect of the current ratio suggests that excessive short-term asset holdings may be interpreted as inefficient deployment of resources rather than financial strength. The significant lagged dependent variable confirms that firm value adjusts dynamically over time, which further justifies the use of system GMM in this setting. These patterns echo prior firm-value studies: the negative leverage effect is consistent with capital-structure evidence that high debt depresses Tobin's Q in emerging markets, the positive profitability and firm-size effects mirror the determinants reported by Sudiyatno et al. [15], and the positive ESG and governance-capacity coefficients align with the Saudi findings of [52] and Ref. [19]. The negative current-ratio coefficient is less commonly emphasized but is consistent with the view that excessive liquid-asset hoarding can signal inefficient capital deployment rather than financial strength. Overall, these findings are broadly consistent with prior Saudi and international studies linking ESG, governance, and core financial attributes to firm valuation, while adding dynamic-panel evidence that earlier static Saudi studies could not provide.

The moderation results provide a more nuanced governance story that is best read against the specific features of the Saudi market. The direct effect of board independence is not significant, and the interaction between ESG disclosure and board independence is positive but insignificant, implying that independent boards do not materially strengthen the valuation effect of ESG disclosure in this sample. Rather than a weakness of the design, this insignificance is itself substantively informative. Three features of the Saudi setting help explain it. First, disclosure remains largely voluntary, so the ESG signal investors price is the disclosure itself; once a firm chooses to report, additional assurance from board composition adds little incremental credibility at the margin. Second, ownership in Saudi listed firms is highly concentrated, often around founding families, the state, or large institutions, so monitoring is exercised substantially through dominant owners rather than through independent directors, diluting the marginal monitoring contribution of board independence to disclosure credibility. Third, board-independence requirements were introduced relatively recently through the corporate-governance reforms, so independent directors may still be establishing the de facto authority needed to shape how the market interprets sustainability reporting. This reading is consistent with evidence that the value of independent boards is contingent on institutional maturity and ownership structure Refs. [13,14], and it complements—rather than contradicts—Ref. [15], whose moderating effect was identified for a single environmental dimension rather than the composite ESG index used here. However, the positive and significant interaction between leverage and board independence indicates that independent directors play an important monitoring role in debt-related decisions, reducing the market penalty associated with leverage. This result fits agency theory particularly well, because independent boards appear to mitigate financing-related agency problems and reassure investors about debt oversight—a function that is harder for concentrated owners to substitute for and therefore remains visibly value-relevant. By contrast, the negative interaction between profitability and board independence suggests that the valuation benefit of profitability becomes weaker when boards are more independent. One plausible interpretation is that highly independent boards constrain short-term earnings orientation and shift investor attention toward governance quality and the sustainability of performance rather than current profits alone, which is consistent with monitoring-oriented boards discouraging aggressive profit maximization. Taken together, the moderation findings imply that in Saudi Arabia board independence matters more as a mechanism for containing financial risk than for amplifying the market rewards of ESG disclosure, adding nuance to recent Saudi evidence on governance-conditioned ESG effects Refs. [15,19,48].

These findings carry particular weight for the Saudi context and contribute to the literature in ways that a generic emerging-market study could not. Saudi Arabia is undergoing a deliberate institutional transition under Vision 2030, in which capital-market deepening, governance reform, and sustainability are explicit national objectives rather than market-led trends. Three features make the Saudi setting analytically distinctive. First, ESG disclosure is still largely voluntary, so the finding that the market already rewards it provides early evidence that valuation incentives are forming ahead of any mandate—precisely the behavioral response regulators hope to elicit before tightening requirements. Second, governance reforms are recent and ongoing, so observing that board independence is value-relevant for financial-risk monitoring but not yet for ESG-signal amplification offers a real-time reading of how far the reforms have penetrated firm-level credibility. Third, ownership in Tadawul firms is highly concentrated, which reshapes the agency problem from classic manager–shareholder conflict toward majority–minority conflict; in such a setting independent directors matter most where they protect against risk-shifting (as in the leverage channel) rather than where dominant owners already internalize the

benefits of disclosure. By documenting these patterns over a decade that brackets the 2021 ESG guideline, the study shows that the Saudi ESG–value relationship is not a static fact but an evolving outcome of the Vision 2030 institutional reforms, and that the contribution of governance mechanisms is conditional on how far those reforms have matured.

## 6. Conclusions

This study examined the effects of ESG disclosure, leverage, and profitability on firm value, measured by Tobin's Q, for 67 Tadawul-listed companies over the period 2015–2024, while also testing the moderating role of board independence using system GMM estimation. The findings show that ESG disclosure has a positive and significant effect on firm value, suggesting that the Saudi capital market increasingly rewards firms that provide broader and more transparent sustainability-related information. This result indicates that ESG disclosure is becoming an economically meaningful element of corporate reporting rather than merely a symbolic practice. In contrast, leverage exerts a negative effect on firm value, implying that investors view higher debt levels as a source of financial risk and reduced flexibility. Profitability, however, shows a strong positive effect, confirming that financially stronger firms achieve higher market valuation. The study also reveals that several control variables are important in explaining firm value. Liquidity, firm size, capital expenditure, and board size positively affect Tobin's Q, while the current ratio shows a negative or weaker role once governance interactions are introduced. These findings imply that investors favor firms with stronger internal financial flexibility, larger scale, growth-oriented investment, and broader governance capacity. The moderation analysis provides partial support for the governance argument. Although board independence does not significantly strengthen the positive ESG disclosure–firm value relationship, it plays an important role in reducing the negative effect of leverage on firm value. At the same time, the interaction between profitability and board independence is negative, indicating that the governance role of independent boards may be more complex than initially expected. The study contributes to the growing literature on ESG and firm value in emerging markets by providing evidence from Saudi Arabia in a dynamic panel setting. It highlights that firm value is influenced not only by sustainability disclosure but also by financial structure, profitability, and governance quality. The findings offer useful implications for regulators, corporate managers, investors, and boards seeking to understand how disclosure and governance practices shape market valuation in the context of Saudi Arabia's evolving capital market.

### *6.1. Policy Recommendations*

For policymakers and regulators. Regulatory authorities, particularly the Saudi Exchange and the Capital Market Authority, should continue strengthening the ESG reporting framework by moving toward more structured and standardized disclosure requirements. Since ESG disclosure was found to improve firm value, clearer ESG guidance, sector-specific reporting templates, and stronger disclosure monitoring would help improve consistency, comparability, and investor confidence. Over time, regulators may also consider a phased progression from voluntary guidance toward more formal ESG disclosure obligations, especially for large listed firms, thereby reinforcing the market-based incentives already emerging under Vision 2030.

For firms and corporate boards. Listed companies should treat ESG disclosure as a strategic value-creation tool rather than a compliance exercise. Firms should improve the quality, depth, and credibility of ESG reporting by integrating sustainability issues into annual reporting, risk management, and long-term corporate planning. The positive link between profitability and firm value also suggests that firms should align ESG initiatives with

operational efficiency and long-term financial performance, ensuring that sustainability actions are supported by strong internal capabilities rather than symbolic reporting alone. Because board independence is most value-relevant in disciplining financing decisions, boards should also avoid excessive reliance on debt, maintain balanced capital structures, and strengthen the effectiveness of independent directors through better training, clearer responsibilities, and stronger governance processes.

For society. The evidence that the market rewards ESG transparency has wider social value because it aligns private incentives with the public-interest objectives of Vision 2030. As more firms find that credible sustainability reporting is financially rewarded, society benefits from improved environmental stewardship, fairer labor and community practices, and more accountable corporate behavior. To reinforce this, standard-setters, professional bodies, universities, and the financial press should promote ESG literacy and awareness, so that employees, consumers, and local communities can interpret and demand higher-quality sustainability information. Strengthening public understanding of ESG turns disclosure from a narrow investor signal into a broader instrument of social accountability and sustainable development.

Finally, investors and market analysts should incorporate ESG disclosure and governance quality more systematically into firm evaluation models. Since board independence appears particularly effective in reducing the harmful effects of leverage, investors should pay closer attention not only to the extent of ESG disclosure but also to the governance environment in which such disclosure is produced.

### *6.2. Limitations and Future Research Directions*

The limitations of this study are: firstly, it focuses only on 67 Tadawul-listed companies in Saudi Arabia, which may limit the generalizability of the findings to other sectors, smaller firms, or different institutional contexts; and secondly, the use of an ESG disclosure index captures reporting extent rather than the actual quality or effectiveness of ESG practices. Future research may expand the sample, compare Saudi Arabia with other GCC markets, incorporate alternative governance moderators such as audit committees or ownership structure, and distinguish between ESG disclosure quality and actual ESG performance.

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