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RESEARCH ARTICLE

Linear and Non-linear Impacts of Extent of Sustainability Disclosures on Real Sustainable Growth: Moderating Role of Board Independence

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ABSTRACT

This paper examines how the extent of economic, social, and environmental sustainability disclosures (ECON, SOC, and ENV) affects companies' real sustainable growth (Real_SGR) and the moderating role of board independence (BIND). It uses a balanced panel of 188 listed companies in the East African Community (EAC) and Southern African Development Community (SADC) from 2019 to 2023. It uses a two-step system generalized method of moments (Sys GMM) to address endogeneity and other econometric issues associated with panel data studies. Data is processed and analysed using STATA statistical software. The findings show that ECON and SOC have positive and significant impacts on Real_SGR, whereas the relationship between ENV and Real_SGR is significantly negative. In addition, the relationship between ECON and Real_SGR is inverted U-shaped, while the relationship between ENV and Real_SGR is U-shaped. The relationship between SOC and Real_SGR is monotonic, positive, and increasing. BIND, on its own, has a negative, insignificant effect on Real_SGR; however, it weakens the linear impacts of ECON and SOC on Real_SGR. It also weakens and ultimately reverses the initial negative relationship between ENV and Real_SGR. Furthermore, BIND shifts the turning points of ECON- and ENV-Real_SGR functions to lower sustainability disclosure levels. It also strengthens the non-linear effect of SOC on Real_SGR. Robustness checks confirm the stability of the findings. The research contributes to the sustainability reporting literature by demonstrating that disclosure-growth relationships are non-linear and that BIND influences their magnitude and functional form, with implications for corporate governance, investment, sustainability reporting, and regulatory practice.

1. Introduction

Sustainability and its disclosures have become increasingly important as firms strive to balance financial performance with economic, social, and environmental responsibilities. Growing stakeholder expectations and pressures, regulatory developments, and sustainability-related risks have pushed firms to integrate sustainability into their corporate strategies and reporting routines (Annesi et al., 2025; Battaglia et al., 2025). Consequently, sustainability disclosures have evolved into a strategic tool through which firms enhance transparency (Nasution et al., 2026; Fagbemi et al., 2025), strengthen stakeholder relationships (Nasution et al., 2026; Fagbemi et al., 2025), and demonstrate accountability for their long-term value creation (Freeman, 1984; Global Reporting Initiative [GRI], 2021; Nasution et al., 2026; Gerged et al., 2023), and firm's sustainable growth (SGR).

These developments are particularly relevant to listed companies in the East African Community (EAC) and Southern African Development Community (SADC), where capital markets' role in mobilising investment, supporting sustainable business practices, and sustainability disclosures is still embryonic. As sustainability reporting continues to gain prominence in both regions, firms are increasingly expected to disclose their ECON, SOC, and ENV. However, differences in institutional settings (Abozeid et al., 2025; Handoyo & Anas, 2024), corporate governance practices, and regulatory frameworks (Elmaghrabi et al., 2025; Almaqtari et al., 2023) across countries in these two regions may influence the effectiveness of sustainability disclosures in promoting the firms' Real_SGR.

Although prior studies generally suggest that sustainability disclosures enhance corporate outcomes, most of them have examined their impacts on conventional financial performance measures, such as return on assets (ROA) (Alodat et al., 2023; Dewi & Pinem, 2023), return on equity (ROE) (Cerciello et al., 2023; Alodat et al., 2023), and market value of firms (Alodat et al., 2023; Qureshi et al., 2020). Very few research focus on the impacts of sustainability disclosures on firms' SGR (Zhang et al., 2026; Naseer & Bagh, 2024; Igwe et al., 2023). Therefore, the empirical evidence of the effects of sustainability disclosures on firms' SGR remains scant. Consequently, studying the effects of sustainability disclosures on firms' growth is paramount. Moreover, most existing studies assume that the association between sustainability disclosures and companies' performance is linear, overlooking the possibility that the impacts of sustainability disclosures may change as disclosure levels increase, thus reflecting non-linearity (Zhang & Wang, 2023; Xie et al., 2018). In these limited studies, firms' SGR is measured in nominal terms without adjusting for the effects of inflation. Therefore, identical nominal SGR rates across countries with different inflation levels may not accurately reflect differences in firms' underlying growth capabilities.

Examining both the linear and non-linear impacts of the extent of ECON, SOC, and ENV may provide a more comprehensive understanding of their impacts on firms' Real_SGR. This notable research gap provides a strong justification for examining the linear and non-linear impacts of the extent of sustainability disclosures on firms' Real_SGR, particularly in the EAC and SADC, where empirical evidence on this relationship remains scarce.

Corporate governance mechanisms, such as, BIND may further shape these relationships (Sodsai et al., 2025). Agency theory suggests that BIND strengthens managerial oversight (Doku et al., 2023; Thenmozhi & Sasidharan, 2020), reduces agency conflicts

(Nguyen et al., 2026; Thenmozhi & Sasidharan, 2020), and promotes decisions that enhance long-term firm performance (Jensen & Meckling, 1976; Doku et al., 2023; Thenmozhi & Sasidharan, 2020).

Independent directors may thus strengthen the impact of sustainability disclosures on Real_SGR. However, the studies on BIND, especially its moderating role in the linear and non-linear relationship between sustainability disclosures and Real_SGR, remain scant (Kamarudin et al., 2025; Agarwala et al., 2023; Al-Jaifi et al., 2023).

Stakeholder, legitimacy, institutional, and agency theories offer the theoretical footing for the present study. Stakeholder theory argues that companies generate value for stakeholders by safeguarding their interests (Freeman, 1984; Kalra, 2024; Awa et al., 2024). Legitimacy theory posits that sustainability disclosures help companies gain societal licence to operate and legitimacy (Suchman, 1995; Akhter et al., 2023). Institutional theory stipulates that regulatory, competitive, and normative pressures shape sustainability practices (DiMaggio & Powell, 1983; Galleli & Amaral, 2026) and the way they can support Real_SGR. Agency theory argues that BIND oversees and supports managerial decision-making that aligns with the long-term interests of shareholders and other stakeholders (Jensen & Meckling, 1976; Bui & Krajcsák, 2024; Islam et al., 2023).

Despite the growth of studies on sustainability disclosure and firm growth, gaps still exist. First, very little research assesses the impact of disclosures that include all three sustainability dimensions (ECON, SOC, and ENV) on Real_SGR, especially in EAC and SADC. Second, studies on the linear and non-linear relationships between ECON, SOC, and ENV and Real_SGR remain scant, particularly in the EAC and SADC. Third, the moderating role of BIND in both the linear and non-linear functions between sustainability disclosures and SGR have received little empirical attention. Fourth, those scant studies on the firms' sustainable growth used sustainable growth on the nominal terms. Finally, many previous studies rely on static estimation techniques that may not adequately address endogeneity, unobserved heterogeneity, and the dynamic nature of firms' growth.

To fill in these research gaps, this study investigates the linear and non-linear impacts of ECON, SOC, and ENV on the Real_SGR of listed companies in the EAC and SADC. It further examines whether BIND moderates these relationships while controlling for financial leverage, dividend payout, liquidity, and the impacts of the COVID-19 pandemic.

Methodologically, the study employs a balanced secondary panel dataset and estimates the proposed relationships using the Sys GMM estimator. Sys GMM is suitable because it addresses dynamic persistence, endogeneity, and unobserved firm-specific effects, potentially present in studies related to accounting, finance, and sustainability studies (Ahmad et al., 2025; Khatib, 2025), thereby producing more reliable estimates for dynamic panel data models (Blundell & Bond, 2023; Blundell & Bond, 1998).

This research contributes to the literature in various ways. It extends the limited evidence on impacts of the extent of sustainability disclosures on companies' Real_SGR within the EAC and SADC, separately examines the ECON, SOC, and ENV dimensions of sustainability disclosures, incorporates both linear and non-linear associations, and evaluates the moderating role of BIND. By applying the Sys GMM estimator, the study also provides strong empirical evidence that informs managers, investors, regulators,

and policymakers seeking to promote the corporate Real_SGR within EAC and SADC capital markets.

The remainder of the paper is organised as follows. Section 2 deals with literature review and develops the hypotheses. Section 3 highlights the methodology, while the empirical results are presented and discussed in Section 4. Section 5 reports the robustness checks, Section 6 outlines the contributions, practical and policy implications of the study. Section 7 presents the limitations of the study and provides areas for further research, while Section 8 provides the conclusion.

2. Review of Literature and Hypotheses Development

2.1. Extent of Economic Sustainability Disclosures and Real Sustainable Growth

Stakeholder, legitimacy, and institutional theories collectively suggest that ECON enhance firms' Real_SGR. Stakeholder theory posits that transparent disclosure strengthens stakeholder trust (Fagbemi et al., 2025; Kalra, 2024), enhances information credibility (Abeysekera, 2022), and enables access to critical resources that back growth (Freeman, 1984; Uyar et al., 2024; Kandpal et al., 2024). Legitimacy theory argues that economic sustainability disclosures reinforce organisational legitimacy and stakeholder support (Suchman, 1995; Sharma, 2025), while institutional theory contends that firms adopt sustainability reporting to respond to regulatory and market pressures (Bhuiyan et al., 2023), thereby improving long-term competitiveness (DiMaggio & Powell, 1983; Bhuiyan *et al*., 2023). These support the Real_SGR.

Recent empirical evidence largely supports this theoretical expectation. For example, Naciti (2019) finds that sustainability disclosures improve corporate value creation by strengthening governance and stakeholder confidence. Sustainable business practices (SBP) and their disclosure can enhance process efficiency (Zahra et al., 2025; GRI, 2023; Petrescu et al., 2020), reduce waste and operating costs, strengthen employee and customer loyalty (Kandpal et al., 2024; Petrescu et al., 2020), improve access to critical resources (Uyar et al., 2024; García-Sánchez et al., 2019; Shad et al., 2020), facilitate the identification of business opportunities and risks, and strengthen risk control (Zahra et al., 2025). Collectively, these benefits enhance long-term profitability and support firms' SGR (Naseer & Bagh, 2024).

Economic sustainability disclosures and their quality can enhance firm performance by reducing information asymmetry (Nasution et al., 2026; Sun et al., 2025), strengthening investor confidence (Nguyen & Duong, 2026), improve the decision-making and accountability (Choi et al., 2023), strengthening firms' resilience, and enhancing the value creation and reinvestment discipline (Song et al., 2025; Choi et al., 2023). These mechanisms support the firms to improve their capacity to achieve SGR.

In contrast, evidence supporting a negative relationship remains limited. For example, sustainability reporting may entail substantial implementation and reporting costs, which can reduce the net benefits derived from sustainability disclosures (Kunaifi et al., 2026; Al Amosh, 2025), which may reduce the firms' SGR. Excessive disclosure may increase reporting complexity and obscure, rather than clarify, information relevant to stakeholders' decision-making (Al Amosh, 2025). As a result, stakeholder support may weaken, thereby constraining firms' ability to achieve Real_SGR. From the theoretical and empirical support, the following hypothesis is put forth:

H1a: *The ECON positively and significantly affects Real_SGR.*

2.2. Extent of Social Sustainability Disclosures and Real Sustainable Growth

Stakeholder, legitimacy, and institutional theories collectively suggest that the SOC enhance firms' Real_SGR. Stakeholder theory posits that transparent disclosure of firms' social practices, such as human rights, employee welfare, customer responsibility, and community engagement, strengthens stakeholder trust and commitment (Ali et al., 2025; Awa et al., 2024), thereby enabling access to resources that support firms' growth (Freeman, 1984; Dzomonda, 2022; Shad et al., 2020). Legitimacy theory argues that social sustainability disclosures enhance organisational legitimacy by demonstrating conformity with societal expectations, leading to improved stakeholder support and corporate reputation (Suchman, 1995; Islam et al., 2021). Institutional theory argues that regulatory, market-competitive, and normative pressures drive increased disclosure of social sustainability information, which in turn strengthens companies' sustainable growth (DiMaggio & Powell, 1983; Sharma, 2026).

Recent studies support these theoretical arguments. Companies that implement and report sustainable business practices, including the those related to employees, can improve transparency (Sharma, 2026), reduce information asymmetry (Sun et al., 2025), attract highly skilled staff, improve staff satisfaction, enhance employees' trust and loyalty (Cuervo-Cazurra & Li, 2021), decrease staff turnover, enhance efficiency and productivity (Jin et al., 2021), enhance companies' resilience (Sharma, 2026, Zahra et al., 2025; Maheshwari et al., 2025; Audi & Yu, 2024), bring about strong corporate culture (Cuervo-Cazurra & Li, 2021), reduce staff-related costs (Sharma, 2026; Jin et al., 2021), enhance stakeholders' confidence (Njoku, 2024), and improve firms' social impact and reputation, generate stakeholders' value (Sharma, 2026; Zahra et al., 2025), which can result in SGR (Broadstock *et al*., 2020; Su et al., 2022). Together, these advantages support companies' Real_SGR. The companies that exhibit social responsibility may attract new markets, socially responsible customers, make customers loyal (Duque-Grisales & Aguilera-Caracuel, 2021). The foregoing theoretical and empirical arguments posit the following hypothesis:

H1b: *The SOC positively and significantly affects Real_SGR.*

2.3. Extent of Environmental Sustainability Disclosures and Real Sustainable Growth

Stakeholder, legitimacy, and institutional theories strongly support a positive relationship between ENV and Real_SGR. Stakeholder theory argues that transparent disclosure of environmental practices creates stakeholder confidence and support (Ali et al., 2025; Al Amosh & Khatib, 2025), enabling firms to obtain critical resources for Real_SGR (Freeman, 1984; Dzomonda, 2022; Zhang, 2021). Legitimacy theory argues that environmental disclosures strengthen organisational legitimacy by demonstrating responsible environmental stewardship and compliance with societal expectations (Nasution et al., 2026), thereby enhancing corporate reputation and stakeholder confidence (Suchman, 1995; Qureshi et al., 2020; Nasution et al., 2026). Institutional theory further stipulates that firms adopt environmental sustainability disclosures to respond to regulatory, competitive, and normative pressures, thereby improving organisational resilience (Dkhili, 2026) and long-term competitiveness (DiMaggio & Powell, 1983; Dkhili, 2026).

Recent empirical evidence largely provides support for this theoretical foundation. Timely environmental sustainability disclosures can strengthen government support, enhance firms' competitiveness, improve stakeholders' understanding of corporate operations, and reduce information asymmetry, thereby establishing a foundation for firms' SGR (Xie et al., 2019).

Environmental sustainability initiatives, including green energy adoption, low-carbon emissions, and climate change mitigation, together with supportive financial mechanisms, can enhance firms' financial performance, as reflected in ROA and return on sales (ROS). Improved financial performance can, in turn, alleviate financial constraints, enhance access to both external financing, and strengthen companies' creditworthiness (Zhang & Lucey, 2022). Jointly, these benefits support firms' SGR as stipulated by Liao et al. (2024).

Studies supporting the existence of a negative linear relationship between ENV and Real_SGR remains limited. For instance, Zahra et al. (2025) argue that although environmental sustainability initiatives generate cost savings and reduce risk in the long-term, they may impose transitional profitability challenges in the short-term. Likewise, Bhatnagar et al. (2023) and Xie et al. (2018) point out that disclosing environmental sustainability information can entail high compliance and implementation costs, especially when sustainability is not sufficiently integrated into business strategies and remains largely symbolic. These facts may constrain the Real_SGR. Based on the foregoing theoretical and empirical arguments, the following hypothesis is posited:

H1c: *The ENV positively and significantly affects Real_SGR.*

2.4. Squared Terms of Extent of Sustainability Disclosures and Real Sustainable Growth

Stakeholder, legitimacy, and institutional theories, together, propose that the association between disclosures ~~od~~ of sustainability information and Real_SGR may behave non-linearly rather than strictly linearly. Stakeholder theory suggests that initial enhancements to disclosures of sustainability information improve stakeholder trust (Fagbemi et al., 2025), lower down information asymmetry (Nasution et al., 2026; Sun et al., 2025), and enhance access to resources (Uyar et al., 2024; Kandpal et al., 2024; Shad et al., 2020). These advantages support growth of a company (Freeman, 1984). However, any disclosures exceeding an optimal level, results in diminishing marginal gains since these additional disclosures are beyond the stakeholders' information needs, increasing the reporting and compliance costs. Likewise, legitimacy theory argues that companies initially gain legitimacy resulting from improved disclosures, but disproportionate disclosures may not result in sufficiently extra legitimacy after meeting the society information needs (Suchman, 1995). In addition, institutional theory points out that companies adjust themselves to regulatory, normative, and market pressures through additional disclosures. But any disclosures exceeding the required levels, may result in inadequate disclosure benefits while increasing disclosure costs (DiMaggio & Powell, 1983). Collectively, the theories suggest the presence of a non-linear relationship between the sustainability disclosures and Real_SGR. Empirical studies, hitherto, supports the presence of the mentioned non-linear association between the ECON, SOC, and ENV and companies' performance, that includes the Real_SGR. For instance, Pu (2023) points out that ESG activities can enhance corporate image and

brand consciousness, enhance firms' competitive advantage. These advantages enhance companies' performance. However, beyond a certain threshold, excess ESG activities may result in weakening performance gains.

Matuszak and Różańska (2019) find a U-shaped association between human resource disclosures and firms' performance. This finding implies that disclosure costs initially exceed the associated benefits, resulting in a decline in firm performance until a minimum point is reached. Beyond this threshold, the benefits of human resource disclosures exceed their marginal costs, generating increasing net benefits and, consequently, improving firm performance. Matuszak and Różańska (2019) also find an inverted U-shaped association between the disclosure index of involvement of community (CI), the disclosure index of products and customers (PC), and firm performance. They argue that socially responsible firms can better address stakeholders' needs and expectations, thereby strengthening stakeholder trust, companies' reputation, and customer loyalty, decreasing the operational risks (Askarany et al., 2025) which ultimately enhance firm performance. However, beyond a certain threshold, additional disclosure related to community involvement and products and customers may impose costs that outweigh its benefits, resulting in declining firm performance. Askarany et al. (2025) find similar results that firm value increases with the extent of CSR disclosures; however, beyond a threshold of 0.806, additional CSR disclosure is associated with diminishing firm value. This finding suggests that excessive CSR disclosure may impose costs that outweigh its benefits, thereby reducing the value generated for firms.

The association between environmental disclosures and SGR may behave in a non-linear and U-shaped fashion (Zhang & Wang, 2023; Xie et al., 2019). When a company implements sustainability, it initially needs to understand its requirements and adjust existing practices. As a result, it will incur adjustment, implementation, and compliance costs and face initial implementation challenges and learning barriers (Zahra et al., 2025; Zhang & Wang, 2023; Xie et al., 2019). Also, investing in sustainability can divert resources from potentially profitable opportunities that may support a firm's growth (Liu et al., 2021). However, sustainability investments exceeding a certain optimal level result in disclosure benefits that outweigh the associated costs. These benefits may arise through enhanced corporate reputation (Zhang & Wang, 2023), stronger market competitiveness (Dkhili, 2026; Maheshwari et al., 2025; Xie et al., 2019), greater government recognition and support (Zhang & Wang, 2023; Xie et al., 2019), reduced information asymmetry (Zahra et al., 2025; Sun et al., 2025; Xie et al., 2019), enhanced risk mitigation (Zahra et al., 2025; Ali et al., 2025), stronger stakeholder trust and support (Ali et al., 2025; Matuszak & Różańska, 2019), improved access to finance (Dzomonda, 2022; Chan et al., 2022; Shad et al., 2020), and greater operational efficiency (Ali et al., 2025).

Nollet et al. (2016) find a U-shaped association between companies' social performance (CSP) and financial performance in terms of accounting measures (ROA and ROE) and the market measure of excess returns of stock. Financial performance originally decreases as CSP increases but increases after a turning point. At the dimension level, the U-shaped relationship is significant for governance, whereas the non-linear relationships for environmental and social dimensions are insignificant. These findings suggest that CSR investments require a long-term perspective and sufficient resources, particularly for governance-related initiatives, to exceed the threshold at which they

begin to enhance shareholder value. From the arguments given, this study hypothesises the following:

H2a: *The ECON has a non-linear relationship with Real_SGR.*

H2b: *The SOC has a non-linear relationship with Real_SGR.*

H2c: *The ENV has a non-linear relationship with Real_SGR.*

2.5. Board Independence, Extent of Sustainability Disclosures, and Real Sustainable Growth

The regulatory authorities in the EAC and SADC are moderately to strongly established in overseeing corporate and sustainability reporting by listed companies, although enforcement capacity varies across countries (Gao et al., 2026; Shayo, 2024; Njenga et al., 2022). BIND can complement and supplement regulatory oversight by strengthening the credibility and quality of sustainability disclosures (Mok & Bakri, 2023), decreasing information asymmetry, and ensuring that sustainability is incorporated into firms' strategy (Wahba & Hathout, 2026). Consequently, stronger BIND can enhance the association of sustainability disclosure and firms' SGR through greater investor confidence, improved access to capital, and long-term value creation (Ramoeletsi, 2025; Mok & Bakri, 2023).

The relationship between the BIND and Real_SGR can be grounded by the agency theory and stakeholder theory. Agency theory argues that BIND strengthens board's oversight (Mok & Bakri, 2023), reduces agency conflicts, ensure credible and transparent sustainability disclosures, and promotes alignment of decision-making and shareholders' and other stakeholders' interests (Fama & Jensen, 1982; Jensen & Meckling, 1976). These benefits maximise the shareholder value generation (Nguyen et al., 2021; Fama & Jensen, 1983; Jensen & Meckling, 1976). Mismiwati (2025) finds that BIND discourages management opportunism and efficient allocation of resources. According to stakeholder theory BIND strengthens accountability, protects and balances interests of stakeholders, such as investors, employees, customers, suppliers, regulators, and communities (Freeman, 1984). This strengthens stakeholder confidence and trust (Nguyen et al., 2021), improves organisational legitimacy (Nordin et al., 2025), and facilitates the acquisition of resources necessary for Real_SGR. Also, consistent with stakeholder theory, BIND is characterised by a high degree of autonomy from management, enabling the board to exercise objective oversight and safeguard the interests of diverse stakeholder groups (Potharla & Amirishetty, 2021). Likewise, legitimacy theory suggests that independent directors encourage transparent disclosure practices that encourage firms' reputation, reinforce organisational legitimacy (social licence) (Hidayat et al., 2025) and stakeholder confidence, thus aiding firms to bring about larger SGR from their sustainability initiatives (Suchman, 1995; Hidayat et al., 2025; Lepore et al., 2023). Accordingly, companies with higher BIND are expected to translate extent of sustainability disclosures into superior SGR outcomes.

Asaolu et al. (2023) find that greater BIND enables directors to exercise greater autonomy in making objective decisions without undue managerial influence, particularly when addressing critical issues facing the firm, enhance firm's strategic resilience and long-term value creation (Bhateja & Jayantha, 2026; Azhar et al., 2025), improves company's responsiveness to technological disruptions and market

uncertainty (Bhateja & Jayantha, 2026). This greater decision-making independence can, in turn, support firms' SGR.

Lu (2021) points out that the positive impact of sustainability performance on corporate financial performance is higher among companies with stronger corporate governance. Badawy (2020) reports that internal audit quality, financial transparency, the level of compliance with rules and regulations, and risk reduction depends on the ability of the BIND to discuss issues and challenges the management without undue influence and pressures. Furthermore, BIND strengthens transparency in corporate reporting and accountability (Sodsai et al., 2025; Mok & Bakri, 2023), facilitates alignment of corporate strategies and firms' objectives and desired outcomes (Saeed et al., 2024; Mok & Bakri, 2023). The results of these advantages enhance stakeholder confidence (Sodsai et al. (2025), improves investor valuation, facilitates access to external financing (Uyar et al., 2024; Shad et al., 2020; Dzomonda, 2022), strengthens association between sustainability disclosures and firm value (Lu, 2021).

According to Alipour et al. (2019), BIND reinforces the association between environmental information disclosure and firms' performance. Because of higher BIND companies can effectively oversee the CEO and prevent managers from pursuing personal interests, thus disclosing environmental information more extensively. This results in improved firms' performance and reduced enterprise risk levels (Rezaee et al., 2021). Similarly, Ramoeletsi (2025) and Handoyo and Anas (2024) argue that environmental sustainability reporting without suitable incentives and supportive institutional structures like BIND, will not produce the adequate Real_SGR.

However, few studies indicate that BIND may limit companies' attainment of SGR. For instance, Mukherjee and Sen (2019) find that higher BIND can obstruct board functioning and effectiveness when decisions are not made in a timely manner and potential opportunities are lost due to frequent interventions by independent directors. Similarly, Mardini (2026) and Potharla and Amirishetty (2021) findings suggest that highly independent boards may become extremely cautious, delaying strategic decision-making in quickly changing business conditions. This finding may also imply that independent boards may lack sufficient firm-specific knowledge (Mardini, 2026) required to make informed decisions. The delays in decision-making may also increase monitoring costs (Mardini, 2026). Together, these findings may adversely affect company performance (Mardini, 2026; Potharla and Amirishetty, 2021). Based on the existing theoretical perspectives and empirical evidence, the following hypotheses are proposed:

H3: *BIND has a positive and significant relationship with Real_SGR.*

H4a: *BIND positively moderates the relationship between ECON and Real_SGR.*

H4b: *BIND positively moderates the relationship between SOC and Real_SGR.*

H4c: *BIND positively moderates the relationship between ENV and Real_SGR.*

2.6. Board Independence, Non-linear Extent of Sustainability Disclosures, and Real Sustainable Growth

BIND may moderate the non-linear association between the extent of sustainability disclosures and Real_SGR by: (i) shifting the turning point, or (ii) flattening or steepening a slope (altering the curvature), or (iii) doing both (i) and (ii). For an inverted U-shaped relationship, a rightward shift in the turning point delays the beginning of diminishing marginal benefits, whereas a leftward shift causes them to emerge earlier. Flattening the curve weakens the rate at which benefits diminish after the turning point, while steepening it strengthens this decline. BIND may therefore simultaneously shift the turning point and modify the strength of the diminishing effects. For a U-shaped relationship, a rightward shift in the turning point delays the transition from negative to positive disclosure-growth effects, whereas a leftward shift allows growth benefits to emerge earlier. Flattening the curve indicates a weaker transition from negative to positive effects, while steepening it indicates a stronger increase in Real_SGR beyond the turning point. Therefore, BIND may also change both the turning point and curvature (steepness or flatness) simultaneously, affecting when and how strongly disclosures of sustainability information affect Real_SGR.

According to stakeholder and legitimacy theories, sustainability disclosures initially boost organisational legitimacy and stakeholder trust, which in turn supports Real_SGR. The incremental gains, however, may diminish beyond an optimal level of disclosure since excessive disclosures raise reporting costs while producing little additional value for stakeholders (Freeman, 1984; Suchman, 1995; Omri & Guenichi, 2026). According to agency theory, independent directors improve strategic oversight and monitoring of a company, ensuring that disclosure decisions continue to be effective and in line with the interests of shareholders and other stakeholders (Dossa et al., 2026; Jensen & Meckling, 1976; Fama & Jensen, 1983). As a result, it is expected that BIND will have an impact on the turning point and the strength at which the disclosure benefits start to decline. Although research in this area is still in its early stages, recent empirical evidence generally confirms this expectation. For example, an inverted U-shaped relationship between ESG investment and business performance is reported by Dossa et al. (2026), suggesting that while excessive ESG investment may result in diminishing or even negative returns, moderate ESG investment enhances business performance. This implies that ESG investment only helps firms enhance their legitimacy, stakeholder trust, and innovation up to a certain optimal point, beyond which they will begin to diminish.

Omri and Guenichi (2026) documented similar findings. They find that, up to a score of 70.10, ESG investment increases company performance; beyond that, further ESG investment has a negative impact on company performance. At the sustainability dimension level, firm performance rises with social and environmental performance up to scores of 63.01 and 62.85, respectively, after which additional increases are linked to diminishing and negative firm performance. In the governance dimension, firm performance rises to a score of 74, after which it starts to fall, albeit the effect is still positive.

Using a fixed-effects regression model, Schifilliti et al. (2025) establish an inverted U-shaped relationship between ESG performance and company value, indicating the existence of an optimal level of ESG investment beyond which further disclosure benefits diminish. They also record that BIND significantly moderates this non-linear

relationship. Apart from its positive direct impact on a company's value, BIND assists a company in avoiding both under- and over-investment in ESG activities.

These findings highlight how crucial corporate governance mechanisms are in shaping financial performance through ESG strategies. The following hypothesis is put out based on the theoretical and empirical justifications highlighted above:

H5a: *BIND moderates the non-linear relationship between economic sustainability disclosures (ECON_sq) and Real_SGR.*

H5b: *BIND moderates the non-linear relationship between social sustainability disclosures (SOC_sq) and Real_SGR.*

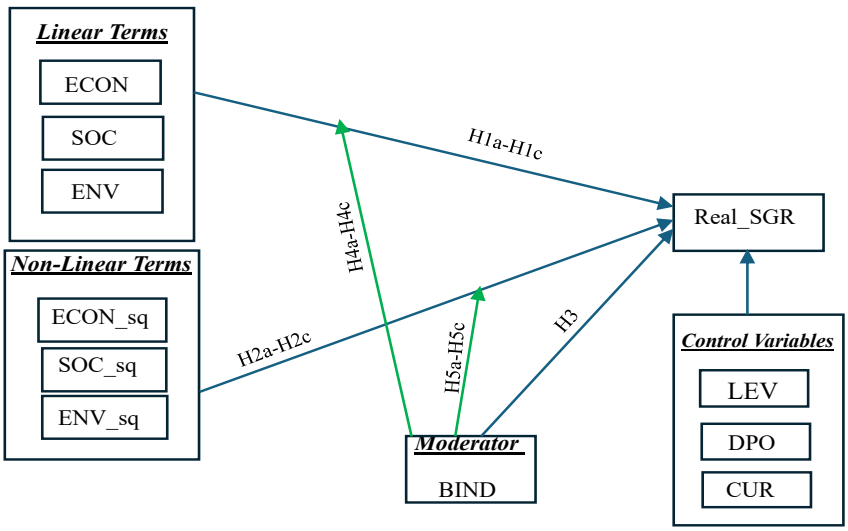
H5c: *BIND moderates the non-linear relationship between environmental sustainability disclosures (ENV_sq) and Real_SGR.*

2.7. Control Variables and Real Sustainable Growth

The present study uses financial leverage (LEV), dividend payout (DPO), and current assets ratio (CUR) as control variables. In a panel-data secondary study, control variables account for other factors affecting the dependent variable, helping isolate the main relationship, reduce omitted-variable bias, and improve estimate reliability (Wooldridge, 2010; Li, 2021; Bartram, 2021).

LEV is an important factor that can constrain Real_SGR as LEV may increase financial distress costs and constrain sustainable growth (Akhtar et al., 2022). Firms may also reduce DPO to retain more earnings and finance additional growth internally (Salamzadeh et al., 2022; Nor et al., 2020). Higher CUR indicates a company's liquidity and its capacity of supporting growth (Ndruru, 2025; Alshehadel et al., 2023); however, excessive liquidity may indicate under-utilisation of resources that could otherwise be invested in productive activities and contribute to firm growth (Vuković et al., (2022).
The variables indicated in section 3.4 are presented in Figure 1 as a conceptual framework.

Figure 1: Conceptual Framework



Source: Constructed based on empirical evidence and theoretical arguments.

3. Study's Methodology

3.1. Sampling Technique, Sample Size and Data Collection

The population of this paper comprises the listed companies in EAC and SADC that produce sustainability reports. This paper uses a non-probability sampling technique, namely purposive sampling, to select firms that meet the predefined inclusion criteria aligned with the research objectives. Only firms with complete and consistent data on Real_SGR, sustainability disclosures, BIND, and the control variables throughout the study period were included, while firms with missing observations were excluded. These criteria ensured a balanced panel dataset suitable for estimating the dynamic model using the Sys GMM, which captures the dynamic persistence of firms' Real_SGR.

The sample is chosen using predetermined inclusion criteria. First, companies based in countries without stock exchanges are not included. These countries are Democratic Republic of the Congo (DRC), Burundi, and South Sudan in the EAC and DRC, Comoros, and Madagascar in the SADC. Second, firms from non-English-speaking nations are eliminated in to ensure consistency in data extraction and interpretation. This leads to the removal of firms from Burundi and Democratic Republic of Congo. Third, firms from countries where no listed firms publish sustainability reports are not included. These companies are from Somalia in EAC and Lesotho in SADC. The study covers listed firms from 13 countries after these screening procedures: Kenya, Tanzania, Uganda, and Rwanda in EAC and Zambia, Malawi, Namibia, Zimbabwe, Botswana, Mauritius, Eswatini, Seychelles, and South Africa in SADC. To ensure completeness and comparability, companies with incomplete data in their annual and sustainability reports are further eliminated within these 13 nations.

A balanced secondary panel dataset spanning the years 2019-2023 is used in the study. There are 736 listed firms, 118 from the EAC and 618 from the SADC. Since Tanzania is also an EAC member, the SADC population was modified by eliminating 27 Tanzanian listed firms from the regional total of 645 to avoid double counting. The final sample, which includes 188 listed companies - 45 from EAC and 143 from SADC - generate a balanced panel of 940 observations once the data completeness criterion was applied. STATA statistical software is utilised to process and alayse the data. Table 1 shows the calculation of a final sample 1.

Table 1: Final Sample Calculation

	EAC	**SADC**	**Total**
Listed companies from English-speaking countries	118	618	736
Deduct: Companies without complete data in their reports	73	475	548
Final sample (number of listed companies)	**45**	**143**	**188**

3.2. Diagnostic Tests

Several of diagnostic tests are conducted to assess the presence of potential econometric issues, including non-normality, correlation, multicollinearity, heteroscedasticity, non-linearity and model misspecification, cross-sectional dependence, autocorrelation (serial correlation), endogeneity, and the potential structural break associated with the COVID-19 pandemic. This is done before estimating empirical models. Shapiro-Wilk and Shapiro-Francia tests are used to assess the normality of variables. Spearman's rank-order correlation coefficient (rho) is utilised to assess the correlation between variables,

whereas the variance inflation factor (VIF), its corresponding tolerance value (1/VIF), condition index and eigenvalue diagnostics are employed to check for the existence of multicollinearity. Breusch-Pagan (BP) test and White's test based on Cameron and Trivedi's IM-test decomposition are utilised to check for presence of heteroscedasticity. White's test and the Ramsey Regression Specification Error Test (RESET) are used to assess the presence of linearity and potential model misspecification. Pesaran CD test is used to examine the cross-sectional dependence, while serial correlation is assessed using the Wooldridge test for panel-data autocorrelation. Endogeneity is evaluated using the Hausman specification test.

Finally, the potential structural break arising from the COVID-19 pandemic was addressed by including a COVID-19 dummy variable as a control variable in the empirical models. The COVID-19 pandemic might have introduced a structural break affecting firms' performance during the 2020-2021 period. To account for this potential effect, the study includes a COVID-19 dummy variable as a control variable, assigning 1 for firm-year observations during the pandemic period (2020-2021) and zero otherwise. Alternative approaches, such as sample splitting, regime-specific estimation, and interaction terms, were not adopted because the relatively short study period (2019-2023) would reduce estimation efficiency or substantially increase model complexity resulting from excessive parameterisation of the empirical models. The inclusion of the dummy variable therefore provides a parsimonious and effective means of controlling for potential structural shifts associated with the pandemic, enabling a more robust assessment of the relationships between the study variables while preserving the full sample for estimation.

3.3. Mean-centering Squared Terms, Board Independence and Interaction Terms

To avoid collinearity issue between the linear terms and their corresponding squared terms, all the squared terms are obtained after mean-centering the linear terms before squaring them. Also to avoid collinearity between the main terms and their corresponding interaction terms, all the interaction terms are mean-centered in the form of, for example, cBIND_cECON and cBIND_cECON_sq, for interaction of linear terms and squared terms respectively.

3.4. Study Variables and their Measurement

Sub-section 3.4 highlights the variables used in the study and their measurement. Table 2 shows the operational definitions and variables' measurement.

3.4.1. Dependent Variable: Real Sustainable Growth

Real sustainable growth (Real_SGR) is used as the dependent variable. This is defined as the highest sales growth that a business can maintain without raising more equity capital or changing its current financial policies, such as dividend, financing, liquidity, and investment policies. Real_SGR is measured in real terms by adjusting the firm's nominal sales growth for the effects of inflation. The nominal sustainable growth of a firm (SGR) is measured as SGR=ROExR.

Where: SGR=nominal sustainable growth rate of a firm, ROE=return on equity, and R=retention rate.

The real sustainable growth of a firm is measured as:

$$\text{Real SGR} = \frac{1 + \text{SGR}}{1 + \text{f}} - 1$$

Where: Real SGR=real sustainable growth of a firm; f=annual inflation rate of a country.

The adjustment of SGR into Real_SGR removes the effect of inflation, allowing comparisons across years with different inflation rates and offering a more accurate evaluation of a company's capacity for sustainable growth. Empirical studies measuring sustainable growth in real terms remain scant. Notable exceptions include Wang *et al*. (2019) and Smith et al., (2003). In contrast, most prior research measure sustainable growth in nominal terms, including El Madbouly (2022), Ramli et al. (2022); Sunardi et al. (2021), and Akhtar et al. (2021).

3.4.2. Independent Variables: Extent of Sustainability Disclosures

In the current study, the extent of sustainability disclosures is measured using three independent variables: the ECON, SOC, and ENV. Index for each variable is constructed using a content analysis of companies' sustainability reports. The index is constructed using reporting requirements spelt out for each sustainability indicator in the Global Reporting Initiative (GRI) Standards. For each linear independent variable, the disclosure index is computed by taking the total reporting requirements disclosed by a firm (attained reporting requirements) divided by to the total applicable reporting requirements specified under the relevant GRI Standards.

The ECON is constructed based on seven GRI economic sub-dimensions: "GRI 201 (Economic Performance), GRI 202 (Market Presence), GRI 203 (Indirect Economic Impacts), GRI 204 (Procurement Practices), GRI 205 (Anti-corruption), GRI 206 (Anti-competitive Behaviour), and GRI 207 (Tax)". Collectively, these comprise seven sub-dimensions, 16 disclosure indicators, and 58 reporting requirements. The ECON index is therefore calculated as the proportion of the 58 economic reporting requirements disclosed by each firm.

The SOC is constructed using the 18 GRI social sub-dimensions: "GRI 401 (Employment), GRI 402 (Labour Management Relations), GRI 403 (Occupational Health and Safety), GRI 404 (Training and Education), GRI 405 (Diversity and Equal Opportunity), GRI 406 (Non-discrimination), GRI 407 (Freedom of Association and Collective Bargaining), GRI 408 (Child Labour), GRI 409 (Forced or Compulsory Labour), GRI 410 (Security Practices), GRI 411 (Rights of Indigenous Peoples), GRI 412 (Human Rights Assessment), GRI 413 (Local Communities), GRI 414 (Supplier Social Assessment), GRI 415 (Public Policy), GRI 416 (Health and Safety of Customers), GRI 417 (Marketing and Labelling), and GRI 418 (Customers Privacy)". These encompass 18 sub-dimensions, 36 disclosure indicators, and 142 reporting requirements. Accordingly, the SOC index is computed as the proportion of the 142 social reporting requirements disclosed by each firm.

The ENV is constructed based on the GRI environmental standards covering "GRI 301 (Materials), GRI 302 (Energy), GRI 303 (Water and Effluents), GRI 304 (Biodiversity), GRI 305 (Emissions), GRI 306 (Effluents & Waste), GRI 306 (Waste), GRI 307 (Environmental Compliance), and GRI 308 (Supplier Environmental Assessment)".

These standards include nine environmental sub-dimensions, 37 disclosure indicators/items, and 168 reporting requirements. As a result, the ENV index is

computed as total environmental sustainability disclosures requirements made by a company divided by 168 environmental reporting requirements (total environmental disclosures requirements).

Overall, the three disclosure indices (ECON, SOC, and ENV) are constructed from 58 economic, 142 social, and 168 environmental reporting requirements, making a total of 368 reporting requirements. Each index has a range of 0 to 1, where a value closer to 1 shows a higher extent of disclosure for a corresponding sustainability dimension. This approach is known as the content analysis and is commonly used in sustainability reporting research. It provides a comprehensive and standardised measure of the extent of sustainability disclosures. Orazalin and Mahmood (2020), Amidjaya and Widagdo (2020), and Al-Naser et al. (2021) use the same approach to measure sustainability disclosures by creating disclosures indices.

3.4.3. Moderating Variable: Board Independence

The current study's moderating variable, BIND, is measured by dividing the total number of independent directors by the total number of board members, including the chair. The measurement ranges from 0 to 1. The higher values indicate a greater degree of BIND. Other studies that used the same measurement include Alta'any et al. (2026), Zhu et al. (2024), and Pucheta-Martínez & Gallego-Álvarez (2020).

3.4.4. Control Variables: Financial Leverage, Dividend Payout, Current Ratio, and COVID-19 Dummy Variable

Financial leverage (LEV) is measured as the total liabilities divided by the total assets. This is consistent with the approach adopted by Maniruzzaman (2023), Akhtar et al. (2021), and Khaled et al. (2021). Dividend payout (DPO) is measured as the net profit after tax divided by the number of issued equity shares. The same measure is used by Halim and Alsadan (2026), Sawitri and Eprianto (2025), and Oduro (2024). The current ratio (CUR) is measured as the total current assets divided by the total current liabilities, which is consistent with Erawati et al. (2025), Isayas (2021), and Reschiwati et al. (2020). The COVID-19 dummy variable (COVID) is measured using binary numbers, which assigns a value of 1 to the COVID-19 period (2020 to 2021) and 0 to pre-COVID and post-COVID periods. This measurement is also used by Läger et al. (2025) and Athira et al. (2024).

Table 2: Variables and their Measurement

S/N	Variable	Unit of Measure	Measurement	Data Source
Dependent Variable				
1	Real sustainable growth (winsorized)	Real_SGR_w	Nominal sustainable growth =SGR=ROE x Retention Rate $\text{Real SGR} = \frac{1 + \text{SGR}}{1 + \text{f}} - 1$	Calculate from financial statements. World Bank Report (July 2025) for annual inflation rates.
Independent Variables				
2	Extent of economic	ECON	Total scores of	Firms'

	sustainability disclosures		ECON attained by a firm divided by the total score attainable (ECON index).	Sustainability Reports
3	Extent of social sustainability disclosures (residualised)	SOC_resid	Total scores of SOC_resid attained by a firm divided by the total score attainable (residualised SOC index).	Firms' Sustainability Reports
4	Extent of environmental sustainability disclosures	ENV	Total scores of ENV attained by a firm divided by the total score attainable (ENV index).	Firms' Sustainability Reports.
5	Squared term of ECON	cECON_sq	Mean-centered ECON squared	Calculated.
6	Squared term of SOC_resid	cSOC_resid_sq	Mean-centered ECON squared	Calculated.
7	Squared term of ENV	cENV_sq	Mean-centered ENV squared	Calculated.
Moderating Variable				
8	Board independence	BIND	Total number of independent directors divided by total number of board members, including the Chair.	Firms' Annual Reports.
Control Variables				
9	Financial leverage	LEV	Total liabilities divided by total assets	Calculated from financial statements.
10	Dividend payout	DPO	Total dividends distributed divided by net profit after tax	Calculated from financial statements.
11	Current ratio (winsorised)	CUR_w	Total current assets of a company divided by its total current liabilities.	Calculated from financial statements.
12	COVID-19 dummy variable	COVID	Assign 1 for structural break years, 2020 and 2021 and assign 0 otherwise.	Assigned

3.5. Model Specification

To respond to the present study's questions and attain the research objectives, the following two econometric models are specified and estimated:

Empirical Model 1: Direct Relationship Empirical Model

$$Real\_SGR\_w_{it}=\beta_0+\beta_1 Real\_SGR\_w_{it-1}+\beta_2 ECON_{it}+\beta_3 SOC\_resid_{it}+\beta_4 ENV_{it}+\beta_5 cECON_{it}^2+\beta_6 cSOC\_resid_{it}^2 +\beta_7 cENV_{it}^2+\phi_1 LEV_{it}+\phi_2 DPO_{it}+\phi_3 CUR\_w_{it}+\phi_4 COVID_{it}+\varepsilon_{it} \quad (1)$$

Empirical Model 2: Moderation Empirical Model

$$Real\_SGR\_w_{it}=\lambda_0+\lambda_1 Real\_SGR\_w_{it-1}+\lambda_2 ECON_{it}+\lambda_3 SOC\_resid_{it}+\lambda_4 ENV_{it}+\lambda_5 cBIND_{it}+\lambda_6 cECON_{it}^2 +\lambda_7 cSOC\_resid_{it}^2 +\lambda_8 cENV_{it}^2+\lambda_9 cECON_{it}*cBIND_{it}+\lambda_{10} cSOC\_resid_{it}*cBIND_{it}+\lambda_{11} cENV_{it}*cBIND_{it}+\lambda_{12} cECON_{it}^2*cBIND_{it} +\lambda_{13} cSOC\_resid_{it}^2*cBIND_{it}+\lambda_{14} cENV_{it}^2*cBIND_{it}+\Phi_1 LEV_{it}+\Phi_2 DPO_{it}+\Phi_3 CUR\_w_{it}+\Phi_4 COVID+\varepsilon_{it} \quad (2)$$

Empirical Model 1 is utilised to test the hypotheses H1a to H1c and H2a to H2c, whereas Empirical Model 2 is utilised to test the hypotheses H3, H4a to H4c, and H5a to H5c.

4. Findings and Discussion Thereof

4.1. Descriptive Statistics

Table 3 indicates the descriptive statistics of the present study variables. Real_SGR records a mean of 0.0635 (SD=0.0911) with a wide range (-0.1674 to 0.7414) and exhibits substantial positive skewness (2.9818) and extreme kurtosis (17.9961), indicating pronounced right-tailed non-normality driven by a few high-growth observations. Despite significant cross-firm heterogeneity, the sustainability disclosure indices, ECON (mean=0.4899), SOC (0.4610), and ENV (0.4907), exhibit moderate disclosure levels with similar dispersion (SD≈0.22), slight negative skewness, and kurtosis values near normality, suggesting relatively symmetric distributions. Mean for BIND is 0.4973. The control variables show significant variation between firms, with means of 0.5202 for LEV, 0.3036 for DPO, and 1.3527 for CUR. All control variables are near normal except for Real_SGR and CUR whose skewness and kurtosis exceed the conventional thresholds of ±2 and ±3, respectively. These findings suggest the potential need to transform data for Real_SGR and CUR and utilise robust estimators in further analyses. The non-normal distribution of Real_SGR and CUR is further discussed in Sub-sections 4.2.1 and 4.2.3.

Table 3: Descriptive Statistics

Variable	Obs	Mean	Std. dev.	Min	Max	Skewness	Kurtosis
Real_SGR	940	0.063535	0.091133	-0.16741	0.74136	2.981769	17.99613
ECON	940	0.4898615	0.216871	0.02839	0.88527	-0.3467299	2.116266
SOC	940	0.4610403	0.2218727	0.02296	0.96292	-0.26413	2.137231
ENV	940	0.4907174	0.2269182	0.00699	0.89952	-0.3617001	2.28251
BIND	940	0.497252	0.1895163	0.000	0.900	-0.1194724	2.461129
LEV	940	0.5202262	0.2186152	0.01734	0.92776	-0.0381945	2.079249
DPO	940	0.3036443	0.3072449	-0.71053	1.05853	0.259158	2.192344
CUR	940	1.352699	0.8269073	0.00338	3.92376	0.8389857	3.416521

4.2. Diagnostical Tests Results

4.2.1. Normality Tests and Data Transformation

Table 4 presents the Shapiro-Wilk and Shapiro-Francia normality tests results. The Shapiro-Wilk (W) and Shapiro-Francia (W') statistics are above 0.90 for all variables, except Real_SGR, which reports W=0.75196 and W'=0.74993. Although perfect

normality is indicated by W and W' equal to 1.0, empirical studies in accounting, sustainability disclosures, governance, and firm growth rarely achieve perfect normality (Nazlioglu et al., 2022; Samunderu & Murahwa, 2021). Therefore, the results suggest that all variables approximate normal distribution, except for Real_SGR, which deviates from normality.

Table 4: Normality Tests Results

Variable	Shapiro-Wilk		Shapiro-Francia	
	Statistic (W)	Prob>z	Statistic (W′)	Prob>z
Real_SGR	0.75196	0.00000	0.74993	0.00001
ECON	0.96218	0.00000	0.96350	0.00001
SOC	0.96403	0.00000	0.96523	0.00001
ENV	0.96485	0.00000	0.96619	0.00001
BIND	0.99087	0.00001	0.99201	0.00011
LEV	0.96998	0.00000	0.97122	0.00001
DPO	0.94259	0.00000	0.94302	0.00001
CUR	0.94623	0.00000	0.94710	0.00001

Skewness and kurtosis statistics indicate that Real_SGR and CUR are non-normally distributed (Table 3), whereas the Shapiro-Wilk and Shapiro-Francia tests identify only Real_SGR as non-normal (Table 4). Furthermore, Sub-section 4.2.3 and Table 7 indicate that both Real_SGR and CUR exhibit non-linear relationships. To address non-normality, Real_SGR and CUR are winsorized at the 8th-92nd percentiles (0.08) and 3rd-97th percentiles (0.03), respectively, thereby reducing skewness and kurtosis to within the acceptable thresholds of ±2 and ±3. Following winsorization, Real_SGR_w indicates a skewness of 0.4987, kurtosis of 2.6852, Shapiro-Wilk, W of 0.96314 (p=0.0000), and Shapiro-Francia, W′ of 0.96324 (p=0.00001), while CUR_w reports a skewness of 0.7105, kurtosis of 2.9781, Shapiro-Wilk, W of 0.95621 (p=0.00000), and Shapiro-Francia, W′ of 0.95649 (p=0.00001) indicating that both variables fall within acceptable normality thresholds.

4.2.2. Correlation Analysis and Multicollinearity Tests

The coefficient of Spearman's rank-order correlation (rho, ρ) is employed to examine the correlation among study variables. This measure is appropriate where relationships are monotonic but not necessarily linear (Berry et al., 2025). The results shown in Table 5 indicate that there are no significant collinearity issues because the pairwise correlations are typically below the traditional cutoff of 0.8 (Wisniewski & Brannan, 2024; Kennedy, 2008). The correlation between ECON and SOC is the only exception; it shows a value of 0.8470 (p=0.0000), which is marginally higher than the recommended benchmark of 0.8.

Table 5: Variables Correlation Matrix and Variance Inflation Factor

	Variables Correlation Matrix								Variance Inflation Factor	
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**VIF**	**Tolerance (1/VIF)**
(1) Real_SGR_w	1.0000									
	.									
(2) ECON	0.2338	1.0000							4.52	0.221022
	0.0000	.								
(3) SOC	0.2376	0.8470	1.0000						4.65	0.214894
	0.0000	0.0000	.							
(4) ENV	0.1734	0.7563	0.7682	1.0000					3.11	0.321801
	0.0000	0.0000	0.0000	.						
(5) BIND	-0.0368	0.1664	0.1481	0.2615	1.0000				1.1	0.911886
	0.2590	0.0000	0.0000	0.0000	.					
(6) LEV	-0.0295	-0.1335	-0.1316	-0.1589	0.0181	1.0000			1.45	0.689482
	0.3660	0.0000	0.0001	0.0000	0.5800	.				
(7) DPO	-0.0847	-0.0089	-0.0661	-0.0133	0.0641	-0.1139	1.0000		1.04	0.961276
	0.0094	0.7862	0.0428	0.6847	0.0494	0.0005	.			
(8) CUR_w	0.0293	0.1536	0.1795	0.1647	0.0900	-0.5465	0.1319	1.0000	1.46	0.686257
	0.3689	0.0000	0.0000	0.0000	0.0058	0.0000	0.0001	.		
Mean VIF									2.48	

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Spearman's correlation coefficient evaluates the pairwise relationship between two variables, whereas the VIF, its accompanying tolerance value (1/VIF), condition index, and eigenvalue diagnostics are used to analyse multicollinearity within the entire collection of regressors. With matching tolerance levels of 0.214894 and 0.221022, respectively, SOC (VIF=4.65) and ECON (VIF=4.52) have the greatest VIF values (see Table 5). These statistics are less than accepted benchmark of 5 (tolerance=0.20) and a more lenient cut-off of 10 (tolerance=0.10). Put together, the diagnostic tests show that multicollinearity is not a serious issue at the model level.

Based on the eigenvalues of the scaled cross-products matrix, Table 6 presents a maximum condition index of 18.08. This statistic indicates that there is no severe multicollinearity at the model level and falls within the acceptable range of $10 \leq \kappa < 30$ (Sulaiman et al., 2021; Gujarati, 2021). Analysis of the variance-decomposition proportions (VDPs) reveals that most variables have VDPs below the conventional cutoff of 0.50 under the same condition index. ECON and SOC are the exceptions, with VDPs of 0.74 and 0.64, respectively, under $\kappa=18.08$, indicating the existence of collinearity between these two variables (see Table 6).

Table 6: Results for Condition Indexes and Variance-Decomposition Proportions

	Condition Index	_cons	Real_SGR_w	ECON	SOC	ENV	BIND	LEV	DPO	CUR_w
1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	3.53	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.52	0.01
3	4.54	0.00	0.74	0.00	0.00	0.01	0.01	0.00	0.28	0.00
4	4.73	0.00	0.00	0.00	0.00	0.00	0.01	0.16	0.00	0.20
5	5.51	0.01	0.01	0.02	0.02	0.03	0.03	0.01	0.14	0.29
6	8.44	0.01	0.03	0.00	0.01	0.01	0.78	0.17	0.00	0.12
7	13.53	0.00	0.00	0.12	0.16	0.95	0.09	0.01	0.00	0.00
8	16.48	0.77	0.01	0.11	0.15	0.01	0.07	0.51	0.04	0.28
9	18.08	0.21	0.00	0.74	0.64	0.00	0.00	0.13	0.00	0.10

The results from both Spearman's rank-order correlation, and condition index and eigenvalue diagnostics show that collinearity exists between ECON and SOC. As a corrective action for the detected collinearity issue, SOC is residualised (orthogolised) to reduce the shared variance while maintaining the substantive interpretation of the variable. This residualisation procedure is recommended by Garcia et al. (2020).

4.2.3. Heteroscedasticity

Heteroscedasticity exists when the variance of error terms is not constant across observations, resulting to inefficient estimators and biased standard errors, leading to distortion of coefficient estimates and hypotheses testing (Kumar, 2023). The Breusch-Pagan (BP) test and White test are used to check the presence of heteroscedasticity. Table 7 indicates the Chi-square statistics for empirical models 1, 62.71 (p-value =0.0000) and empirical model 2, 66.44 (p-value =0.0000). These findings render the null hypothesis of homoscedasticity rejected, thus confirming the existence of

heteroscedasticity for both empirical models. Significant heteroscedasticity is confirmed using White's test based on Cameron and Trivedi's IM-test decomposition. Empirical model 1 reports χ^2=127.08 (p=0.0000), while empirical model 2 reports χ^2=185.95 (p=0.0000). These findings indicate that variance of error term is non-constant, justifying the use of heteroscedasticity-robust standard error estimators. In addition, the skewness and kurtosis elements show significant deviation from normality. In empirical model 1 skewness and kurtosis are χ^2=51.91, p=0.0000 and χ^2=6.67, p=0.0000 respectively. Skewness is also significantly high with empirical model 2 (χ^2=62.89, p=0.0000), while kurtosis is significant at 5% level (χ^2=5.32, p=0.0210). These results show that the residuals in both models are asymmetric and non-normally distributed, which underscores the requirement for a robust estimator. Table 7 presents the Breusch-Pagan test and White's test results.

Table 7: Results from Breusch-Pagan and White's Tests

	Breusch-Pagan Heteroscedasticity Test			**White Test (Cameron & Trivedi's Decomposition of IM-test)**							
	Chi-square	**p-value**	**Decision**	**Heteroscedasticity**	**p-value**	**Skewness**	**p-value**	**Kurtosis**	**p-value**	**Total**	**p-value**
Empirical Model 1	62.71	0.0000	Reject H0	127.08	0.0000	51.91	0.0000	6.67	0.0000	185.66	0.0000
Empirical Model 2	66.44	0.0000	Reject H0	185.95	0.0000	62.89	0.0000	5.32	0.0000	254.16	0.0000

4.2.4. Linearity and Model Specification Tests

The current paper utilises the White's test and the Ramsey (Regression Specification Error Test) to assess the presence of linearity and potential model misspecification. These tests are important to decide whether the empirical models are specified appropriately and whether to introduce non-linear terms in the empirical models. The results from these diagnostic tests further enlighten whether a robust estimator is required to ensure that the parameter estimates are reliable and consistent. The empirical models 1 and 2 show the Ramsey RESET statistics of 3.28 (p-value=0.0203) and 2.07 (p-value=0.0321), respectively, with p-values for each model being less than 0.05. The results render the rejection of null hypothesis that function form of models is correct. Thus, the results indicate the potential violations of linearity and potential model misspecification. The squared terms are introduced to address the detected non-linearity, and robust estimators are utilised to address the potential omission of relevant variables and heteroscedasticity. The White test (Cameron & Trivedi, 1990) IM-test decomposition also shows non-linearity in both empirical models, since the p-values for heteroscedasticity, skewness, and kurtosis are less than 0.05. These results are highlighted in Sub-section 4.2.3 and presented in Tables 7 and 8.

Table 8: Results for Ramsey RESET Test

Empirical Model	**Test Statistic**	**p-value**	**Decision**
Empirical Model 1	3.28	0.0203	Reject H0
Empirical Model 2	2.07	0.0321	Reject H0

4.2.5. Cross-Sectional Dependence

The Pesaran CD test (Pesaran, 2021) is used to assess cross-sectional and temporal interdependence to ascertain whether common economic or policy shocks collectively impact company performance across panels. The diagnostics detect significant cross-sectional dependence for the following variables: Real_SGR_w (CD=12.167, p<0.001), ECON (CD=146.482, p<0.001), ENV (CD=163.167, p<0.001), BIND (CD=2.972, p=0.003), LEV (CD=4.134, p<0.001), and DPO (CD=5.178, p<0.001) (see Table 9). The findings show the existence of unobserved common factors, such as macroeconomic conditions or regional policies, which simultaneously impact these variables across companies. The SOC_resid (CD=-1.125, p=0.261) and CUR_w (CD=-1.18, 0.238) show no such dependence. These findings underscore the importance of using robust model estimation techniques.

Table 9: Results for Pesaran Cross-Sectional Dependence (CD) Test

Variable	CD Test Statistic	p-value	Interpretation
Real_SGR_w	12.167	0.000	Strongly positive cross-sectional dependence
ECON	146.482	0.000	Strongly positive cross-sectional dependence
SOC_resid	-1.125	0.261	No significant cross-sectional dependence
ENV	163.167	0.000	Strongly positive cross-sectional dependence
BIND	2.972	0.003	Strongly positive cross-sectional dependence
LEV	4.134	0.000	Strongly positive cross-sectional dependence
DPO	5.178	0.000	Strongly positive cross-sectional dependence
CUR_w	-1.18	0.238	No significant cross-sectional dependence

4.2.6. Autocorrelation (Serial Correlation) Tests

This test is utilised to assess whether the serial correlation exists in the panel data. In other words, this diagnostic examines whether an empirical model's residuals are correlated over time within individual firms. The results from this test indicate significant serial correlation (autocorrelation) in both empirical models (Empirical Model 1: F = 24.831, p = 0.000; Empirical Model 2: F = 25.327, p = 0.000), rendering non-support for the null hypothesis of no autocorrelation. Thus, the results confirm the presence of within-firm serial dependence. These findings imply that there is a necessity to employ the empirical model estimator which accounts for autocorrelation to ensure consistent and efficient inference. The results from autocorrelation tests are presented in Table 10.

4.2.7. Model Endogeneity Test

Model endogeneity is assessed using the Hausman test. The Chi-square statistic results from the Hausman test for empirical models 1 and 2 are 65.41 (p=0.000) and 65.55 (p=0.000) respectively (see Table 10). Thus, null hypothesis for both models is rejected. This hypothesis posits the non-existence of model endogeneity. These also support the fixed-effects estimator over the random-effects estimator. However, the presence of other econometric issues suggests the use of Sys GMM.

Table 10: Results for Wooldridge Test for Autocorrelation and Hausman Test for Endogeneity

Wooldridge Test for Autocorrelation					**Hausman Test for Endogeneity**			
Model	F-Statistic	p-value	Decision	Interpretation	Chi2 Statistic	p-value	Decision	Interpretation
Model 1	24.831	0.0000	Reject H0	Significant autocorrelation	65.41	0.0000	Reject H0	Positive significant endogeneity
Model 2	25.327	0.0000	Reject H0	Significant autocorrelation	65.55	0.0000	Reject H0	Positive significant endogeneity

4.3. Effects of Structural Break resulting from COVID-19 Pandemic

The number of firm-year observations for pre-COVID-19, COVID-19, and post-COVID-19 periods, respectively are 188, 376, and 376 (see Table 11). Table 12 among other things shows the effect of COVID-19 pandemic on the Real_SGR_w. These results are discussed in Section 4.4.

Table 11: Number of Observations for Pre-COVID-19, COVID-19, and Post-COVID-19 Effects

Year	**COVID**		**Total**
	0	**1**	
2019	188	0	188
2020	0	188	188
2021	0	188	188
2022	188	0	188
2023	188	0	188
Total	564	376	940

4.4. Model Estimation Technique, Results, and Discussion

The two-step Sys GMM estimator is used because of the panel structure (188 businesses across five years), heteroscedasticity, autocorrelation, cross-sectional dependency, endogeneity, non-linearity, and model misspecification. Sys GMM uses internal instruments to handle endogeneity, first differencing to eliminate firm-specific effects, the lagged dependent variable to account for dynamic persistence, and squared terms to capture non-linear interactions. As a result, under the specified diagnostic settings, Sys GMM offers consistent and efficient parameter estimates. The independent variables utilised are ECON, SOC_resid, and ENV and their squared terms, while LEV, DPO, CUR_w, and COVID-19 are incorporated as control variables. The robustness analysis replaces DPO with the DIVDM.

4.4.1. Results and Discussion for Empirical Model 1: Direct Relationships

The two-step Sys GMM results confirm a valid dynamic specification. The coefficient of lagged dependent variable is significantly positive (β_1=0.1525, p<0.001). This result indicates the persistence in Real_SGR_w. The Wald χ^2 of 2375.29 (p<0.001) shows that empirical model 1 is jointly significant. The Arellano-Bond tests detect first-order autocorrelation (AR(1): p<0.001) but no second-order autocorrelation (AR(2): p = 0.449). Instrument validity is supported by the Sargan test (χ^2 = 140.98, p = 0.058),

Hansen test (χ^2=110.17, p = 0.073), and Difference-in-Hansen tests for the GMM-style (p = 0.051) and IV-style COVID (p = 0.867) instruments. The estimation is based on 752 firm-year observations after one-year lagging (940 firm-year observations).

ECON exhibit a positive linear effect (ECON: β_2 = 0.0693, p <0.001) and a negative squared effect (cECON_sq: β_5 = -0.2127, p < 0.001), confirming an inverted U-shaped relationship with Real_SGR_w and supporting both H1a and H2a. The estimated turning point is:

$$-\frac{\beta 2}{2(\beta 5)} = -\frac{0.0693057}{2(-0.2127086)} = 0.163,$$

above the mean-centred ECON, corresponding to an original ECON value of 0.6529 (mean 0.4899+0.163). Since this threshold lies within the observed range (0.02839 to 0.88527), the extent of economic sustainability disclosures enhances firms' Real_SGR_w up to the threshold, after which the marginal benefits decline. This results supports stakeholder theory and agency theory, suggesting that economic disclosures initially improve transparency (Salem, 2026; Gupta & Das, 2024), reduce information asymmetry (Nguyen et al., 2026; Gupta & Das, 2024), and strengthen stakeholder confidence (Salem, 2026; Agarwala et al., 2024; Pu, 2023), but excessive disclosures eventually generate diminishing benefits because reporting and compliance costs exceed incremental benefits (Salem, 2026; Pu, 2023). The results align with those of Salem (2026), Pu (2023), and Buallay et al. (2022), who found diminishing disclosure-growth benefits from excessive disclosures. The findings suggest that economic sustainability disclosures should be strategically balanced to maximise growth while avoiding excessive reporting costs within the EAC and SADC, where companies regularly operate under institutional and financial constraints (Shayo, 2024; Dzomonda, 2022; Njenga et al., 2022) (Nguyen et al., 2026; Pu, 2023).

SOC_resid shows a positive linear impact (SOC_resid: β_3 = 0.0434, p = 0.001) and positive squared impact (cSOC_resid_sq: β_6 =0.3004, p <0.001), suggesting a monotonically increasing relationship with Real_SGR_w. The lack of significant turning point suggests that, within the studied range, higher levels of social sustainability disclosures generate progressively larger growth benefits. These findings support both H1b and H2b. This finding supports stakeholder and legitimacy theories, suggesting that continuous investment in social disclosures strengthens stakeholder relationships (Al-Asfour, 2025; Njoku, 2024; Siddiqui & Hassan, 2023), enhances legitimacy of a company (Khan et al., 2024; Kandpal et al., 2024), and improves firms' Real_SGR_w (Haladu & Bin-Nashwan, 2022; Wachira *et al*., 2020). The finding is consistent with previous studies reporting positive impacts of social sustainability reporting on company's performance (Chung et al., 2024; Lee et al., 2023; Haladu & Bin-Nashwan, 2022). In the EAC and SADC, where firms operate in settings characterised by diverse stakeholder expectations (Eliakim, 2025), community engagement (Mamba & Beharry-Ramraj, 2025), and increasing social accountability, sustained social performance reporting appear to strengthen stakeholder confidence and support Real_SGR_w.

ENV exhibit a negative linear effect (ENV: β_4 = -0.0381, p = 0.049) and a positive squared effect (cENV_sq: β_7 = 0.1408, p = 0.022), confirming a U-shaped relationship with Real_SGR_w, and rendering H1c rejected but H2c supported. The estimated turning point is:

$$-\frac{\beta 4}{2(\beta 7)} = -\frac{-0.0381318}{2(0.1407529)} = 0.135,$$

above the mean-centred ENV, corresponding to an original ENV value of 0.6257 (mean 0.4907+0.135). Since this threshold lies within the observed range (0.00699 to 0.89952), environmental sustainability disclosures initially reduce firms' Real_SGR_w because implementation, compliance, and reporting costs exceed the immediate benefits (Ramoeletsi, 2025; Kalia & Aggarwal, 2023; Xie et al., 2018). However, beyond the threshold, the long-term benefits outweigh these initial costs (Gupta & Das, 2024; Agarwala et al., 2024; Xie et al., 2018), resulting in positive-growth effects. This finding supports legitimacy and institutional theories and is in line with Agarwala et al., (2024), Zhang & Wang (2023) and Xie et al. (2018), who found that environmental sustainability investments create long-term competitive advantages despite their short-term costs. For firms in the EAC and SADC, where environmental regulations and sustainability expectations continue to evolve (Wachira et al., 2020; Njenga et al., 2022; Shayo, 2024), maintaining disclosures of environmental dimension of sustainability beyond the identified threshold may enable firms to improve legitimacy (Lin & Qamruzzaman, 2023; Zhang & Wang, 2023), strengthen stakeholder confidence (Agarwala et al., 2024; Lin & Qamruzzaman, 2023), enhance access to finance (Dzomonda, 2022) and ultimately enhance Real_SGR_w (Zhang & Wang, 2023).

Overall, the findings demonstrate that the three sustainability disclosure dimensions influence firms' Real_SGR_w through distinct non-linear mechanisms.

Regarding the control variables, COVID has a positive but insignificant association with Real_SGR_w indicating that the COVID-19 pandemic did not have a significant impact on companies' Real_SGR_w after controlling for other factors. LEV impact on the Real_SGR_w is negative and is weakly significant at the 10%. The impact of DPO on Real_SGR_w is negative and highly significant. This result indicates that higher DPO is associated with lower Real_SGR_w. In contrast, the association between CUR_w and Real_SGR_w is positive and significant. This suggests that greater liquidity is associated with higher Real_SGR_w.

Table 12: Results for Primary and Robustness Check Estimations

	Empirical Model 1				**Empirical Model 2**			
	Primary Results		**Robustness Check Results**		**Primary Results**		**Robustness Check Results**	
Real_SGR_w	**Coefficient**	**p-value**	**Coefficient**	**p-value**	**Coefficient**	**p-value**	**Coefficient**	**p-value**
L.Real_SGR_w	0.1525387*** *(0.0263798)*	0.000	0.1420082*** *(0.0273148)*	0.000	0.1271833*** *(0.0188824)*	0.000	0.1225651*** *(0.0211287)*	0.000
ECON	0.0693057*** *(0.0160251)*	0.000	0.073249*** *(0.0167613)*	0.000	0.0633354*** *(0.0096164)*	0.000	0.0590224*** *(0.0101085)*	0.000
SOC_resid	0.0433917*** *(0.0135886)*	0.001	0.0630225*** *(0.0154762)*	0.000	0.0677632*** *(0.0139069)*	0.000	0.068935*** *(0.0132682)*	0.000
ENV	-0.0381318** *(0.0193765)*	0.049	-0.038798* *(0.0206853)*	0.061	-0.0031578** *(0.00959)*	0.042	-0.147555** *(0.0737777)*	0.045
cECON_sq	-0.2127086*** *(0.0573262)*	0.000	-0.218274*** *(0.049786)*	0.000	-0.0703593** *(0.03399)*	0.040	-0.0846808** *(0.0407372)*	0.038
cSOC_resid_sq	0.3004069*** *(0.0432687)*	0.000	0.2955509*** *(0.0472053)*	0.000	0.3738247*** *(0.080751)*	0.000	0.4989985*** *(0.082836)*	0.000
cENV_sq	0.1407529** *(0.0616367)*	0.022	0.1749815** *(0.0806639)*	0.030	0.4481818** *(0.203719)*	0.028	0.0765985** *(0.0355296)*	0.031
cBIND	N/A	N/A	N/A	N/A	-0.0225406 *(0.0140374)*	0.108	-0.0263288* *(0.0148399)*	0.076
cECON_cBIND	N/A	N/A	N/A	N/A	-0.1700208*** *(0.0634215)*	0.007	-0.1525766*** *(0.0593366)*	0.010
cSOC_resid_cBIND	N/A	N/A	N/A	N/A	-0.169572** *(0.0700618)*	0.016	-0.1626186** *(0.0663854)*	0.014
cENV_cBIND	N/A	N/A	N/A	N/A	0.0473782** *(0.0585551)*	0.018	0.1195902** *(0.0481825)*	0.013
cECON_sq_cBIND	N/A	N/A	N/A	N/A	-0.5785074*** *(0.145341)*	0.000	-0.6041383*** *(0.1442626)*	0.000
cSOC_resid_sq_cBIND	N/A	N/A	N/A	N/A	2.381723*** *(0.4325668)*	0.000	2.636529*** *(0.4178201)*	0.000
cENV_sq_cBIND					0.2529377*	0.052	0.2413041**	0.018

	N/A	N/A	N/A	N/A	*(0.1767793)*		*(0.1019882)*	
	0.0013165	0.479	0.0029177	0.148	0.0027287*	0.079	0.002262	0.192
COVID	*(0.0018617)*		*(0.0020165)*		*(0.0015528)*		*(0.0017354)*	
	-0.0170472*		-0.0255481**	0.046	-0.0112528	0.184	-0.0127863	0.171
LEV	*(0.0101773)*	0.094	*(0.0127981)*		*(0.0084791)*		*(0.0093293)*	
	-0.0289349***		-0.0062864**	0.036	-0.0229827***	0.000	-0.0120005*	0.058
DPO & DIVDM	*(0.0050899)*	0.000	*(0.0030045)*		*(0.0044476)*		*(0.0063374)*	
	0.0055986**		0.0054734**	0.035	0.0038044**	0.031	0.0042196**	0.037
CUR_w	*(0.0024308)*	0.021	*(0.0025968)*		*(0.0017627)*		*(0.0020192)*	
	0.0434748***		0.040547***	0.002	0.0271139***	0.003	0.0275778***	0.002
_cons	*(0.0103288)*	0.000	*(0.0130097)*		*(0.0090099)*		(0.0091177)	

The table presents the regression coefficients, standards errors (in italics and parentheses), and significance levels 1%, 5%, and 10% (***, **, and *) respectively. N/A stands for not applicable.

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4.4.2. Results and Discussion for Empirical Model 2: Moderation Effects

The coefficient-based interaction terms and conditional effects [non-linear combination of estimators (nlcom)] are used to examine the moderating impact of BIND on the relationship between sustainability disclosures and Real_SGR_w. The interaction terms determine whether BIND alters the strength and shape of the disclosure-growth association, while the conditional effects examine how the association varies across -1 SD (low), mean, and +1 SD (high) BIND levels.

BIND has a negative and statistically insignificant direct impact on companies' Real_SGR_w (cBIND: λ_5=-0.0225, p=0.108), which means that H3 is not supported. This result implies that rather than serving as an independent growth driver in EAC and SADC, BIND mostly impacts Real_SGR_w through shaping sustainability disclosure strategies. Similar findings from the empirical evidence by Abozeid et al. (2025) and Zhang & Wang (2023) indicate that the institutional settings and quality of governance are critical prerequisites to BIND's effectiveness in emerging and developing markets.

The baseline linear ECON shows both a positive linear impact (ECON: λ_2 = 0.0633, p < 0.001) and negative quadratic impact (cECON_sq: λ_6=-0.0704, p=0.040). This demonstrates that ECON and Real_SGR_w have an inverse U-shaped association. The turning point is

$$-\frac{\lambda_2}{2(\lambda_6)} = -\frac{0.0633354}{2(-0.0703593)} = 0.4501,$$

above the mean-centred ECON, corresponding to an original ECON value of 0.9401 (mean 0.4899+0.4501). Since this value exceeds the observed maximum (0.8853), the optimum disclosure cannot be attained without moderation.

BIND significantly moderates both the linear and non-linear functions. The negative linear interaction (cECON_cBIND: λ_9=-0.1700, p=0.007) indicates that BIND weakens the immediate positive effect of the ECON, rendering the H4a non-supported. However, the negative quadratic interaction (cECON_sq_cBIND: λ_{12}=-0.5785, p<0.001) supports H5a, showing that BIND strengthens the inverted U-shaped relationship by shifting the turning point leftwards. At the maximum observed level of BIND (cBIND=0.402748), the moderated turning point becomes:

$$\text{ECON}^* = -\frac{0.0633354 - 0.1700208(0.402748)}{2[-0.0703593 - 0.5785074(0.402748)]} \approx -0.008472,$$

below the mean-centred ECON, shifting the turning point to 0.4814 (mean 0.4899-0.0084722). Unlike the unmoderated turning point, this value lies within the observed disclosure range, indicating that firms with more independent boards attain the maximum growth benefits from economic sustainability disclosures at lower and attainable disclosure levels. The conditional effects analysis supports these findings. The marginal effect of ECON remains positive but declines from β = 0.1002 (p<0,001) at low BIND (-1 standard deviation) to β = 0.0633 (p<0.001), 95% CI [0.0630, 0.1374], at the mean β = 0.0633 (p < 0.001, 95% CI [0.0445, 0.0822], and β = 0.0265 (p=0.043), (+1

standard deviation, 95% CI [0.0015, 0.0544] at high BIND. Thus, BIND weakens - but does not reverse - the positive disclosure-growth relationship.

Overall, the findings indicate that BIND enhances the efficiency rather than the magnitude of economic sustainability disclosures. The results support agency, stakeholder, and legitimacy theories by suggesting that independent directors encourage more disciplined disclosure strategies that maximise growth while limiting excessive reporting costs (Lahyani & Ayadi, 2025; Zhang & Wang, 2023). These findings are also consistent with previous corporate governance studies showing that effective boards improve the effectiveness of sustainability disclosures (Azman & Rashid, 2020). For firms in the EAC and SADC, where financial resources and reporting capacity are often constrained (Mulamula & Zakaria, 2023), BIND enables firms to achieve the optimal growth benefits from economic sustainability disclosures at lower disclosure levels.

For linear SOC_resid, the baseline model shows a positive linear effect (SOC_resid: λ_3=0.0678, p<0.001) and a positive squared effect (cSOC_resid_sq: λ_7= 0.3738, p<0.001), indicating a convex monotonic increasing relationship with Real_SGR_w. Since both coefficients are positive, no economically meaningful turning point exists because the marginal growth benefits continue to increase as the SOC_resid rises.

BIND significantly moderates both the linear and squared terms of the relationship. The negative linear interaction (cSOC_resid_cBIND: λ_{10}=-0.1696, p=0.016) rendering non-supports for H4b, indicating that higher BIND weakens the immediate positive effect of SOC_resid on Real_SGR_w. Conversely, the positive quadratic interaction (cSOC_resid_sq_cBIND: λ_{13}=2.3817, p<0.001) supports H5b, demonstrating that BIND strengthens the positive convex monotonic increasing pattern. Consequently, although independent boards reduce the short-term marginal gains from social sustainability disclosures, they simultaneously amplify the long-term growth benefits associated with progressively higher disclosure levels. No clear turning point appears either before or after moderation since both the baseline and moderated relationships continue to be convex monotonically increasing.

These results are confirmed by the conditional effects analysis. Across all BIND levels, the marginal effect of SOC_resid is still positive and statistically significant, but it decreases from β = 0.0866 (p < 0.001; (-1 standard deviation), 95% CI [0.0591, 0.1141]) at low BIND to β = 0.0678 [p < 0.001, 95% CI [0.0405, 0.0950] at the mean and β = 0.0489 (p=0.005; CI of 95% [0.0144, 0.0835]) at high BIND (+1 standard deviation). Thus, BIND attenuates the immediate positive effect of social sustainability disclosures without reversing it, while strengthening their long-run contribution to Real_SGR_w.

Overall, these results imply that BIND enhances the efficacy of social sustainability disclosures rather than their extent. The findings show that independent directors motivate greater strategic and social disclosure reporting credibility that prioritises material stakeholder issues over disclosure volume. Therefore, these results support stakeholder theory, legitimacy theory, and agency theory (Lahyani & Ayadi, 2025; Ngu & Amran, 2019).

This narrative is consistent with earlier studies that demonstrate how good corporate governance improves the value of CSR by enhancing the credibility and quality of social reporting (Ngu & Amran, 2019). Independent boards appear to improve companies'

capacity to convert sustained social sustainability disclosures into Real_SGR_w in the EAC and SADC context, where firms face diverse stakeholder expectations and growing demands for social accountability (Githaiga, 2026; Eliakim, 2025).

The relationship between ENV and Real_SGR_w is significantly non-linear. A U-shaped function is confirmed by the negative linear coefficient (ENV: λ_4=-0.003158, p=0.042) and the positive squared coefficient (cENV_sq: λ_8=0.4482, p=0.028). The turning point of this function is

$$-\frac{\lambda_4}{2(\lambda_8)} = -\frac{-0.0031578}{2(0.44818181)} = 0.003523,$$

above the mean-centred ENV, corresponding to an original ENV value of 0.4942 (mean 0.4907+0.003523). The turning point is within the feasible sample range because it falls within the observed range (0.00699 to 0.89952). According to these results, the ENV initially lowers Real_SGR_w because the costs of implementation and compliance outweigh the immediate disclosure benefits. Beyond the threshold, however, the marginal benefits outweigh these costs (Agarwala et al., 2024; Zhang & Wanga, 2023), resulting in improvements in Real_SGR_w.

BIND significantly moderates the linear and squared (non-linear) terms of this relationship. The positive linear interaction (cENV_cBIND: λ_{11}=0.0474, p=0.018) supports H4c, indicating that BIND weakens and eventually reverses the initial adverse effect of environmental sustainability disclosures on the Real_SGR_w. Likewise, the positive quadratic interaction (cENV_sq_cBIND: λ_{14}=0.2529, p=0.052) provides marginal support for H5c, indicating that BIND strengthens the positive curvature of the U-shaped relationship by shifting the turning point leftwards. Consequently, firms with relatively independent boards enter the positive-growth region at lower levels of environmental sustainability disclosures than firms with less independent boards.

The conditional effects (nlcom) analysis corroborates these findings. The linear effect of environmental sustainability disclosures is negative at low BIND (-SD), (β = -0.0139, p =0.038; CI of 95% [-0.0271, -0.0007]), becomes less negative at the mean level (β = -0.0032, p = 0.042; CI of 95% [-0.0062, -0.0001]), then turns positive at high BIND (+SD), (β = 0.0076, p = 0.048; CI of 95% [0.0001, 0.0151]). Similarly, the positive quadratic effect remains significant across all levels of BIND, increasing from 0.4482 at the mean level to 0.4929 at high BIND, indicating that the upward curvature of the U-shaped relationship becomes stronger as BIND increases. These findings demonstrate that BIND not only mitigates the initial costs of environmental sustainability disclosures but also accelerates the realisation of their long-term growth benefits. These findings imply that BIND improves the oversight, credibility, and strategic implementation of environmental sustainability initiatives, which is consistent with agency, institutional, and legitimacy theories (Ramoeletsi, 2025; Zhang & Wang, 2023). These results are also consistent with the empirical evidence currently available, which shows that sound governance mechanisms strengthen the benefits of investments in environmental sustainability by enhancing implementation efficiency and decreasing resource misallocation (Song et al., 2025; El Ghoul et al., 2018). Independent boards seem to strengthen companies' capacity to transform environmental compliance into strategic opportunities that support long-term Real_SGR_w within the EAC and SADC, where environmental regulations and sustainability reporting continue to develop (Githaiga, 2026; Eliakim, 2025).

Put together, the interaction-term and conditional-effects analyses show that BIND is more of a corporate governance mechanism than a direct firm growth driver. BIND systematically enhances how sustainability disclosures translate into Real_SGR_w among listed firms in the EAC and SADC by moving the turning point of the ENV-growth relationship to the left, strengthening the inverted U-shaped function for ECON, and reinforcing the convex relationship for SOC_resid.

After integrating the moderating variable, BIND, the control variables indicate mixed results. The relationship between COVID and Real_SGR_w is positive and marginally significant, the relationship between LEV and Real_SGR_w is negative and insignificant. The relationship between DPO and Real_SGR_w is negative and highly significant. On the other hand, the relationship between the CUR_w and Real_SGR_w is positive and significant. This result indicates that greater liquidity is related with higher Real_SGR_w.

5. Robustness Checks

The analysis uses the dividend dummy variable (DIVDM) as an alternative control variable in place of the DPO as a robustness check.

5.1. Robustness Check for Empirical Model 1

The DIVDM yields very consistent results when used in place of DPO. The lag dependent variable's coefficient is still significantly positive ($\beta_1 = 0.1420$, $p < 0.001$). For empirical model 1, the Wald χ^2 statistic is 2340.64 ($p < 0.001$). This outcome demonstrates the joint significance of the model. The instrument validity is still supported by the Sargan ($\chi^2 = 137.86$, $p = 0.060$), Hansen ($\chi^2 = 108.12$, $p = 0.094$), and Difference-in-Hansen tests (GMM: $p = 0.69$; IV: $p = 0.535$), while the AR(2) is still insignificant ($p = 0.345$).

Across all specifications, the non-linear results are robust. An inverted U-shaped relationship between the ECON and Real_SGR_w is confirmed by the fact that ECON maintains a significant positive linear influence (ECON: $\beta_2 = 0.0732$, $p < 0.001$) and a negative and significant quadratic impact (cECON_sq: $\beta_5 = -0.2183$, $p<0.001$).

SOC_resid maintains a significant positive linear impact on Real_SGR_w (SOC_resid: $\beta_3=0.0630$, $p<0.001$) and a significantly positive quadratic impact (cSOC_resid_sq: $\beta_6=0.2956$, $p<0.001$), suggesting a convex monotonic increasing relationship. The positive impact of SOC_resid on the Real_SGR_w is maintained as disclosure intensity rises. This also maintains a non-linear association of ENV and Real_SGR_w without a meaningful turning point within the observed sample. ENV retains a negative linear effect (ENV: $\beta_4 = -0.0388$, $p = 0.061$) and a positive quadratic impact (cENV_sq: $\beta_7 = 0.1750$, $p = 0.030$), resulting in a U-shaped association between the ENV and the Real_SGR_w.

Regarding the control variables, COVID remains insignificant ($\phi_1=0.0029177$, $p=0.148$), whereas LEV ($\phi_2=-0.0255$, $p=0.046$) and the DVDM ($\phi_3=-0.0063$, $p=0.036$) negatively affect the Real_SGR_w, while the CUR ($\phi_4=0.0055$, $p=0.035$) remains positive.

Overall, replacing DPO with DIVDM does not change the direction, statistical significance, turning points, or non-linear relationships of the sustainability disclosure variables, confirming the robustness of the primary results of empirical model 1.

5.2. Robustness Check for Empirical Model 2: Moderation Model

In empirical model 2, replacing DPO with the DIVDM also produces highly consistent results. The coefficient of lagged dependent variable remains significantly positive (λ_1 = 0.1225651, p<0.001). The Wald χ^2 statistic of 5160.43 (p<0.001) indicates that the empirical model 2 is jointly significant. The AR(1) also remains significant (p < 0.001), whereas the AR(2) remains insignificant (p = 0.449), and the Sargan (χ^2=174.03, p=0.053), Hansen (χ^2 = 136.01, p = 0.166), and Difference-in-Hansen tests (GMM: p = 0.403; IV: p = 0.781) continue to support instrument validity.

The coefficients of ECON, SOC_resid, and ENV retain their signs and statistical significance in both main and robustness check specifications. These results indicate that the estimated effects of sustainability disclosures are insensitive to the alternative measure of dividend policy.

The impact of BIND as a moderating variable also stays stable. The interaction terms cECON_cBIND and cSOC_resid_cBIND remain negative and significant, whereas cENV_cBIND remains positive and significant in both models. Similarly, the non-linear moderation effects represented by cECON_sq_cBIND, cSOC_resid_sq_cBIND, and cENV_sq_cBIND maintain their signs and statistical significance. These findings indicate that the moderating influence of BIND is robust across the two specifications.

The non-linear relationships are equally stable. ECON continues to exhibit a positive linear effect and a negative squared effect, indicating a concave relationship. SOC_resid retains positive and significant linear and squared coefficients, confirming a convex relationship, while ENV consistently exhibits a negative linear effect and a positive squared effect, supporting a U-shaped relationship. These findings indicate that the non-linear effects are unaffected by the alternative proxy for dividend policy.

The control variables also display considerable consistency. LEV remains statistically insignificant, CUR_w remains positive and significant in both models. Although the COVID-19 dummy loses statistical significance in the robustness model and DIVDM is only marginally significant compared with DPO, both dividend policy proxies retain negative coefficients.

Overall, replacing DPO with DIVDM does not materially alter the empirical findings. The stability of the coefficient signs, significance levels, non-linear relationships, and moderation effects demonstrates that the results are robust to the alternative operationalisation of dividend policy, thereby strengthening confidence that estimates produced by Sys GMM are valid.

5.3. Contributions, Practical and Policy Implications

To advance the body of knowledge, this paper contributes to the literature in several ways. First, methodologically, it integrates longitudinal panel-data, non-linear modelling, and moderation analysis using comprehensive GRI-based disclosure indices. The findings further extend stakeholder, legitimacy, agency, and institutional theories by showing that disclosure effects vary across disclosure levels and that the influence of BIND may depend on the institutional context.

For listed firms in EAC and SADC and their boards, the findings indicate that ECON, SOC_resid, and ENV have non-linear association with Real_SGR_w. BIND changes their magnitude and, in some instances, moves their turning points and the strengths with which the disclosure-growth impact increases or decreases. Boards, should therefore, integrate the sustainability disclosure into business strategy and decision-making, and monitor disclosures extent and efficacy instead of treating it as a compliance issue.

The findings highlight how important it is for institutional investors to take sustainability disclosure levels and BIND into account when assessing and monitoring companies. Investors can also work with boards and management to encourage effective and strategically relevant sustainability disclosures.

The results highlight the significance of material and decision-useful sustainability information for sustainability standard-setters and professional bodies. Therefore, professional training and reporting guidelines should encourage adequately informative sustainability disclosures and limit unnecessary reporting burdens.

For government and regulatory institutions, the results emphasise the significance of institutional and regulatory frameworks that provide credible sustainability reporting and strong BIND. While preserving appropriate regulatory burdens (including compliance costs) and coordination among relevant institutions, regulators may strengthen disclosure requirements, governance standards, and enforcement mechanisms.

Improved sustainability disclosure and BIND can enhance access to relevant information and reinforce monitoring and responsibility for other stakeholders, such as employees, customers, suppliers, business partners, analysts, civil society organisations, and communities. Therefore, while assessing companies, sustainability practices and governance structures should be used in addition to traditional financial metrics.

Generally, the findings robustness enhances trust in their implications for business decision-making, financing, investment, sustainability reporting, and regulatory practice.

5.4. Limitations and Areas for Further Research

The listed companies in the SADC and EAC regions are the focus of this paper. Therefore, the findings might not apply to unlisted firms since listed and unlisted firms have different stakeholder structures, sustainability disclosure motivations, governance arrangements, and regulatory obligations. Furthermore, the relatively short research period of 2019-2023 may limit the potential to capture long-term sustainability effects and dynamic adjustments, and the firm-level analysis does not analyse sectoral or country-level disparities.

Future studies should address the limitations in various means. First, studies could extend the analysis to unlisted firms and SMEs within the EAC and SADC. Second, sector- and country-level analyses could determine whether the observed non-linear and moderated relationships are context-specific or generalisable across different settings. Third, primary data approaches, including surveys and interviews, could provide complementary insights into managerial, governance, and strategic perspectives on sustainability disclosure and firm growth. Finally, extending the study period would provide longer panel datasets that could facilitate analysis of dynamic adjustments,

persistence effects, and potential structural changes in sustainability disclosure and firm growth relationships in a more robust manner.

6. Conclusion

This study aims at investigating two main things: (1) the direct linear and non-linear relationships between the ECON, SOC_resid, and ENV and Real_SGR_w, and (2) the moderating influence of BIND in these relationships. The results show that ECON and SOC_resid have significantly positive linear impacts on Real_SGR_w, where ENV has a negative significant linear impact. The non-linear results further reveal an inverted U-shaped association between ECON and Real_SGR_w, a positive monotonic increasing relationship for SOC_resid, and a U-shaped relationship for ENV. These results underscore the need of maintaining disclosures of sustainability information at appropriate levels to avoid potential under- or over-investment across sustainability dimensions.

The findings further demonstrate that BIND weakens the positive linear effects of ECON and SOC_resid and attenuates and eventually reverses the initial negative effect of ENV. For the non-linear relationships, BIND strengthens the inverted U-shaped ECON-Real_SGR_w relationship by shifting its turning point to a lower disclosure level, strengthens the positive monotonic increasing effect of SOC_resid, and shifts the ENV-Real_SGR_w turning point to a lower disclosure level. Thus, BIND plays a critical influence in shaping both the level and strength at which sustainability disclosures influence Real_SGR.

Overall, the results offer broad support for stakeholder, legitimacy, agency, and institutional theories by demonstrating that sustainability disclosure and governance effects depend on disclosure levels and institutional governance conditions. The study therefore fulfils its objectives and extends understanding of how sustainability disclosures and BIND jointly shape firms, real sustainable growth.

Ethical Approval and Consent to Participate

Ethical approval was obtained from Universiti Tunku Abdul Rahman (UTAR). All those who participated to this study were assured of the confidentiality and anonymity of their participation and the data collected were solely used for academic purposes.

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Conflict of Interest

The authors declare that there are no conflicts of interest associated with this study.

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