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GRI adoption and corporate brownwashing: Board governance evidence from ASEAN-5

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ABSTRACT

To fully grasp the corporate information disclosure cycle, one needs to study both greenwashing and brownwashing (the shrouding of negative information). While greenwashing research has grown substantially, strategic underreporting (brownwashing) has received less attention. This study investigates the combined effect of voluntary sustainability-standard adoption and internal governance on brownwashing by publicly listed firms in the five largest ASEAN economies (ASEAN-5) from 2014 to 2024. Using panel models with firm- and year-fixed effects on 1,506 firm-year observations from 385 listed companies, we examine brownwashing across both the extensive margin (decision to report) and intensive margin (degree of underreporting). The adoption of the Global Reporting Initiative (GRI) framework decreases the likelihood of brownwashing. However, once brownwashing occurs, estimates indicate a modest, marginally significant reduction in underreporting severity. This extensive-margin effect is more precisely estimated than the intensive-margin effect. Across robustness checks, the directional pattern holds, though statistical significance is weaker in the smallest subsamples. No direct evidence connects board gender diversity or board sustainability committees to brownwashing, notably in an environment where female directors occupy an average of only 18.97% of seats. Sustainability committees also show no association with GRI adoption, indicating that external reporting guidelines and internal governance structures act as independent channels. These findings broaden the scope of ESG decoupling research and suggest that regulators in developing economies should pair voluntary reporting standards with independent assurance rather than relying solely on board governance.

Contribution/Originality: This study contributes to the existing literature by isolating brownwashing from greenwashing and testing it across extensive and intensive margins. Using 1,506 ASEAN-5 firm-years, we show that GRI adoption reduces brownwashing, while board gender diversity and sustainability committees show no effect, indicating that external reporting and internal governance operate independently.

1. INTRODUCTION

As societal and regulatory pressures increase, firms rely more on non-financial disclosures to acquire legitimacy (Eliwa, Aboud, & Saleh, 2023). Effective sustainability practices can yield direct market benefits, including reduced costs of capital and increased firm value. However, the challenge is that sustainability reporting is voluntary and not directly verifiable. This creates information asymmetry between corporate insiders and external parties (Roszkowska-Menkes, Aluchna, & Kamiński, 2024), leaving room for strategic disclosure when there is a gap between firms' words

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and their actual practices. We call this misalignment between sustainability reporting and real firm behavior ESG (environmental, social, and governance) information decoupling. It can take two forms: firms exaggerating their environmental ethics (greenwashing) or firms minimizing their sustainability achievements (brownwashing). Initial perspectives treated decoupling as unidirectional, mainly focusing on low-sustainability firms overstating their ethical commitment. However, Kim and Lyon (2015) challenged this narrow view: decoupling is bidirectional, with firms brownwashing by understating genuine sustainability gains they have achieved. Firms employ these strategies to shape stakeholder expectations and avoid the operational and reputational costs of setting performance goals they may fail to meet.

The literature on decoupling has three distinct gaps. First, the thematic gap: current research focuses heavily on greenwashing while paying less attention to brownwashing. Second, the structural gap: research on external drivers, such as the adoption of Global Reporting Initiative (GRI) standards, and internal drivers, such as having diverse boards or sustainability committees, too often occurs in silos, with each driver viewed as one of many in a system of independent effects. Third, the geographic gap: empirical evidence on decoupling remains concentrated in Western and developed markets, leaving limited insight into the fast-growing ASEAN-5 (the five largest economies of the Association of Southeast Asian Nations), which are attracting ESG investments in massive quantities. The heterogeneity of their disclosure frameworks is stark: Singapore (Singapore Exchange, SGX) has mandated ESG disclosure earlier than its regional peers, while others still have voluntary or transitional regimes.

This paper examines the roles of reporting standards and internal governance mechanisms in ASEAN-5 economies (Malaysia, Singapore, Thailand, Indonesia, and the Philippines) in corporate brownwashing from 2014 to 2024. ASEAN-5 is an interesting context for studying the drivers of bidirectional decoupling, given the diversity in regulatory governance and the scale of the economies. Drawing on four theories, namely neoinstitutional, stakeholder-agency, gender socialization, and resource dependence theories, we formulate and test four hypotheses. First, GRI adoption reduces corporate brownwashing (H1). Second, greater board gender diversity lowers the extent of corporate underreporting (H2). Third, the existence of a sustainability committee (H3) directly lowers brownwashing. Fourth, the existence of a sustainability committee increases the likelihood of GRI adoption (H4). Results from the fixed-effects panel analyses reveal a narrower pattern of relationships than hypothesized. Adoption of the GRI reduces brownwashing on both the extensive and intensive margins, with a more precisely estimated effect at the extensive margin. However, corporate board gender diversity and the existence of sustainability committees show no significant relationship with brownwashing.

The paper makes three related contributions to the literature on disclosure. First, from a conceptual point of view, it contributes to the literature by refining the notion of greenwashing by decomposing information decoupling into positive and negative exclusive parts and studying the latter in isolation. Second, it studies the interaction between external disclosure standardization and internal governance mechanisms. The evidence suggests the absence of a reinforcing effect: the presence of sustainability committees does not facilitate the adoption of GRI either as a substitute or a catalyst. Third, it distinguishes the extensive from the intensive margin of underreporting, showing that standardized frameworks reduce both the likelihood that brownwashing starts and its severity once underway, with effects similar in magnitude but more precisely estimated for prevention than for cure.

The paper proceeds as follows: Section 2: Literature Review; Section 3: Theoretical Background and Hypotheses; Section 4: Data and Methodology; Section 5: Results and Discussion; and Section 6: Conclusions.

2. LITERATURE REVIEW

2.1. ESG Information Decoupling

Strong ESG disclosure leads to increased legitimacy and better access to capital, reflected in lower costs of debt and higher valuations (Eliwa et al., 2023; Saeed, Khurram, Manita, & Thanakijsombat, 2026). This presents a tangible incentive for companies to disclose strong sustainability performance. However, sustainability reporting is mostly

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voluntary and hard to verify (Roszkowska-Menkes et al., 2024). This leads to a situation where stated practices may diverge from actual conduct. Some companies portray an inflated image of ethical conduct that does not match their practices (Cepêda, Monteiro, & Aibar-Guzmán, 2026; MacLean & Behnam, 2010). In the short term, this may boost a company's reputation, but once uncovered, it results in market penalties (Di & Li, 2023; Eliwa et al., 2023). The concept of decoupling stems from neo-institutional theory, in which organizations adopt formal policies to symbolically comply without changing their actual practices (Meyer & Rowan, 1977; Roszkowska-Menkes et al., 2024). Kim and Lyon (2015) expanded this into a bidirectional framework in which organizations seeking to avoid scrutiny may either overstate their positive actions (Greenwashing) or understate their genuine achievements (Brownwashing).

Recent literature begins to operationalize the conceptualization of a reporting-performance gap in ESG practices. Hawn and Ioannou (2016) pioneered empirical research by contrasting nominal ESG scores with controversy-adjusted scores. Building on that work, an emerging stream of research conceptualizes decoupling as bidirectional rather than as a unidirectional construct (Moreno-Ureba, Reguera-Alvarado, & Bravo-Urquiza, 2026; Yue, Wang, & Zhao, 2026). Prior studies identify external and internal forces that limit decoupling. Externally, standardized reporting frameworks and assurance serve as limits to symbolic ESG practices (García-Sánchez, Hussain, Aibar-Guzmán, & Aibar-Guzmán, 2022).

Yue et al. (2026) identify an internal limit: the positive feedback of ESG performance can increase stakeholders' expectations of CSR such that brownwashing is a means to alleviate scrutiny. Eliwa et al. (2023) show that female board representation correlates with a lower degree of ESG decoupling, and the presence of sustainability committees (Qiu, Xuan, Ahmad, Sun, & Jinghan, 2026) and specialized board expertise (Moreno-Ureba et al., 2026) shape ESG reporting. Conceptualizations of bidirectional decoupling remain vague in our field, with most concentrating on greenwashing by itself (Moreno-Ureba et al., 2026). Likewise, there are only a few explorations of the joint effect of external forces such as GRI adoption and internal governance mechanisms. Moreno-Ureba et al. (2026) call for research that disaggregates decoupling and tests the moderating role of internal governance; this study takes up that call by analyzing GRI adoption and internal governance together.

2.2. Standardized Reporting and Disclosure Behavior

Global standardization of sustainability reporting provides a key external guardrail to opportunistic disclosure. Standardized non-financial metrics built around structured and uniform reporting frameworks enable cross-corporate comparability (Friske, Nikolov, & Morgan, 2024; Sannino, Lucchese, Zampone, & Lombardi, 2020). Over the last two decades, standards have gradually incorporated more multi-dimensional indicators into their templates, resulting in an increase in disclosure quality and a decrease in corporate opaqueness (García-Sánchez et al., 2022; Roszkowska-Menkes et al., 2024).

There are two competing views on how uniform reporting influences strategic disclosure: as a genuine information-discipline mechanism or as an opportunity for narrative camouflage, as formally developed in Section 3.2. Our evidence indicates that, in the ASEAN-5 countries, the key voluntary reporting framework is the Global Reporting Initiative (GRI), which has been adopted by 85.16% of firms. The aggregate figure masks cross-country heterogeneity in the pace of adoption and the quality of compliance with standards. Institutional paths diverged, with Singapore pushing for mandatory general ESG disclosure early on, although the choice to report specifically under GRI remains voluntary even there, while firms in Malaysia, Thailand, Indonesia, and the Philippines have progressed through multiple phases of voluntary guidance and new frameworks. This heterogeneity manifests itself in an uneven spread of standardized reporting during 2014-2024, with adoption driven by institutional pressure in home countries (García-Sánchez et al., 2022; Sannino et al., 2020). The GRI was founded to harmonize the reporting of non-financial information, but in the context of ASEAN-5, with uneven enforcement and institutional differences, firms still

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diverge. Narrative camouflage will persist in regions with weak oversight through selective disclosure that highlights positive aspects and obscures negative ones.

3. THEORETICAL BACKGROUND AND HYPOTHESES

3.1. Stakeholder-Agency and Gender Socialization Theories

Stakeholder theory is the underpinning theory since stakeholders are "any group or individual who can affect or is affected by the achievement of the organization's objectives" (Freeman, 1984), and stakeholder groups provide the resources a firm needs to survive and grow and demand accountability (Roszkowska-Menkes et al., 2024). Note that stakeholders hold misaligned interests. For example, community groups may seek more environmental disclosure, whereas shareholders may worry that such disclosure jeopardizes short-term profits. Executives, as agents of the firm, must manage these competing demands (Qiu et al., 2026). Stakeholder-agency theory helps explain this behavior by arguing that differences in sources of power and information asymmetry influence which demands managers respond to and that internal governance structures constrain opportunistic disclosure to align managerial behavior with stakeholder expectations (Moreno-Ureba et al., 2026).

3.2. GRI Adoption and Corporate Brownwashing (H_1)

Information discipline, the pressure that standardized, comparable metrics place on managers to align disclosed and actual practice, should improve transparency when firms adopt frameworks such as the GRI, which equips firms with a vocabulary for rigorous and comparable disclosure (Friske et al., 2024; Wang, Zhang, & Liu, 2026).

Information discipline is the mechanism through which GRI adoption should reduce brownwashing. Standardized data collection and reporting across multiple ESG indicators make firm performance easier to evaluate by rating agencies and analysts and so increase the visibility cost of what Kim and Lyon (2015) term “green hushing,” the informal label for the same brownwashing behavior this study measures. This, in turn, should create pressure on managers to narrow the negative decoupling gap by aligning actual conduct with disclosed commitments. However, as mentioned before, a less optimistic view is narrative camouflage. Since voluntary guidelines such as GRI allow flexible application, symbolic compliance remains possible (Roszkowska-Menkes et al., 2024). Because sustainability reporting is voluntary and unverifiable, insiders know more about actual practices than outside stakeholders can observe, and managers might use standardized metrics as a “ceremonial shield” to draw attention to favorable data points and obscure unfavorable ones in lengthy qualitative disclosures (Boiral, Heras-Saizarbitoria, & Brotherton, 2019; Wijen, 2014). From this perspective, voluntary standards may not function as a binding constraint on communication and could even enable misrepresentation rather than transparency (Roszkowska-Menkes et al., 2024). Section 5 tests which of these two effects, information discipline or narrative camouflage, dominates empirically.

Hypothesis 1 (H_1). GRI reporting-standard adoption correlates negatively with corporate brownwashing.

3.3. Board Gender Diversity and Underreporting (H_2)

The literature widely accepts the link between board gender diversity and firm transparency (Eliwa et al., 2023; Moreno-Ureba et al., 2026). Gender socialization and stakeholder-agency theories provide the major foundation for this link. These theories suggest that male and female directors have distinct cognitive and ethical frameworks and that they vary in their tolerance of risk because of their different socialization (Boulouta, 2013; Manita, Bruna, Dang, & Houanti, 2018). This division has ramifications for a board's oversight capacity in practice. Research indicates that female directors have a greater orientation toward stakeholders and a greater sensitivity to social and environmental concerns (Eagly, Johannesen-Schmidt, & van Engen, 2003; Eliwa et al., 2023). Gender-diverse boards, then, should be more vigilant monitors, less likely to accept unethical or deceptive firm disclosure (Manita et al., 2018) and less likely to excuse managers for misreporting.

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The opposing perspective, though, is a more guarded one. Adding women to the board may not produce effective governance, since the dynamics of inequality and tokenism can diminish their influence (Kanter, 1977; Konrad, Kramer, & Erkut, 2008; Manita et al., 2018). Board composition alone is not sufficient; the level of influence women hold within the board matters just as much.

A healthy male majority on the board may dilute the board's ethical voice because prevailing norms absorb or suppress that voice (Torchia, Calabrò, & Huse, 2011). Again, female directors may not have enough tenure or authority to influence decisions (Moreno-Ureba et al., 2026). Practically, extending disclosure requires less organizational will than changing core practices. Thus, female directors might affect reporting practices more than core practices, decreasing brownwashing when performance is strong but increasing greenwashing when performance is weak. Even so, female directors' monitoring role should still deter non-disclosure overall, supporting a negative sign for H2.

Hypothesis 2 (H_2) follows: board gender diversity correlates negatively with corporate brownwashing.

3.4. Sustainability Committees and Disclosure Alignment (H_3-H_4)

It is important to study external voluntary standards and internal corporate governance jointly when explaining strategic disclosure (Qiu et al., 2026). Resource dependence theory and stakeholder-agency theory suggest internal governance, especially sustainability committees, works with GRI adoption as a complementary control.

Board-level sustainability committees should improve the oversight of ESG risks and reporting. This is relevant for brownwashing and reporting as well. First, a board-level sustainability committee is a subgroup of the board of directors dedicated to handling ESG risks and reporting (Qiu et al., 2026). Structurally, sustainability committees provide the board of directors with additional capacity and expertise, which general boards lack (Qiu et al., 2026; Velte, 2017). In theory and practice, sustainability committees serve as more rigorous internal monitors (Velte, 2017).

Stakeholder-agency theory provides another perspective. An active sustainability committee can help firms achieve substantive ESG-related goals instead of symbolic gestures (Ştefănescu & Suciu, 2026). This reduces the likelihood of brownwashing through consistent communication with stakeholders and the setting of concrete ESG targets.

Based on this, we propose the third hypothesis.

Hypothesis 3 (H_3). A board-level sustainability committee correlates negatively with corporate brownwashing.

Second, the board-level sustainability committee's role in ESG reporting extends beyond direct oversight. The committee can act as a catalyst for more formalized ESG reporting. Resource dependence theory suggests that the presence of a board-level sustainability committee predicts a firm's willingness to adopt GRI reporting guidelines. Covering as many indicator categories as GRI does requires specialized expertise to collect and disclose multidimensional data.

A sustainability committee helps meet that requirement by bringing directors with relevant experience onto the board (Qiu et al., 2026) and by keeping non-financial accountability on the agenda. It pushes the board toward formal, indicator-based reporting. We therefore expect listed firms with such a committee to be more likely to adopt GRI standards.

Hypothesis 4 (H_4). The presence of a board-level sustainability committee correlates positively with the likelihood of GRI adoption.

Figure 1 depicts the framework of our research.

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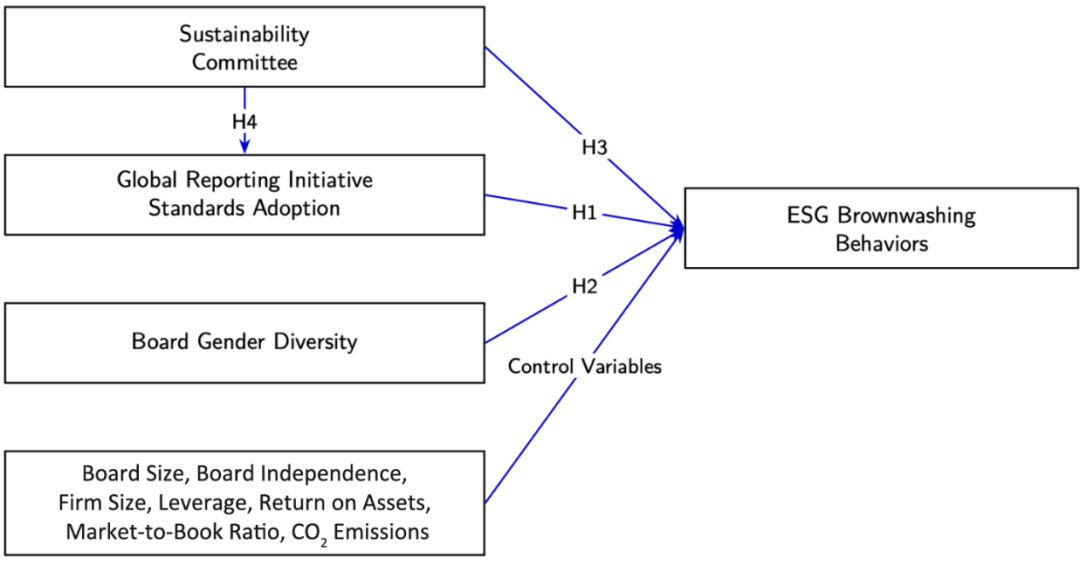


Figure 1. Proposed conceptual framework.

4. DATA AND METHODOLOGY

We collect data from multiple databases using ISIN (International Securities Identification Number) and fiscal year as the matching key (Eliwa et al., 2023). We drop observations whose firm-years do not match across databases or have incomplete data, then apply the further filters described below. We obtain the 2014–2024 ASEAN-5 sample from three databases: we derive ESG data from LSEG (London Stock Exchange Group) Workspace, obtain governance data from BoardEx and official corporate disclosures, and extract financial data from Compustat Global.

The estimation sample consists of 40,799 firm-years observed over 3,709 firms. We exclude observations with missing values, financial firms, and firms not reporting CO_2 emissions, which leaves 1,995 firm-years that satisfy the data-availability filters. We handle remaining missing values through listwise deletion and chained-equations imputation. We lag all independent, control, and moderating variables (FemD, BSize, InD, SustCom, Size, Lev, ROA, MTB, GRI, log_co2) by one year (t-1) relative to the brownwashing outcome (t); CM, Blau, and Shannon, described below, serve as descriptive-only alternatives to FemD, and we do not enter them as regressors. We use this lag structure to reduce concerns about reverse causality and to mirror the realistic time lag in the effect of governance and reporting practices on corporate disclosures. The lag structure removes each firm's first sample year from estimation, which leaves an estimation panel of 1,506 firm-years over 385 firms (see Table 1). Table 2 defines the variables as listed above.

Table 1. Sample distribution by country.

Country	Firms	Firm-years	%
Malaysia (Bursa)	132	459	30.5%
Thailand (SET)	113	435	28.9%
Singapore (SGX)	64	299	19.9%
Indonesia (IDX)	47	179	11.9%
Philippines (PSE)	29	134	8.9%
Total	385	1,506	100%

Note: Bursa = Bursa Malaysia; SET = Stock Exchange of Thailand; SGX = Singapore Exchange; IDX = Indonesia Stock Exchange; PSE = Philippine Stock Exchange.

We winsorize ROA, Lev, MTB, and log_co2 at the 1st and 99th percentiles to reduce the influence of outliers and retain their unwinsorized versions for unreported robustness checks.

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Table 2. Variable definitions and measurement.

Variables	Detailed Definition and Measurement	References
Panel A: ESG information decoupling indices		
GWI	Normalized greenwashing gap (z-score (ESG_Score) − z-score(ESGC_Score)). Original variable; we decompose GREENWASH and BROWNWASH directly from it.	Hawn and Ioannou (2016); Moreno-Ureba et al. (2026); García-Sánchez et al. (2022); MacLean and Behnam (2010); and Di and Li (2023)
GREENWASH	Positive part of GWI: = GWI if GWI > 0, otherwise = 0.	Kim and Lyon (2015); Moreno-Ureba et al. (2026); Boiral et al. (2019) and Crilly, Hansen, and Zollo (2016)
BROWNWASH	Negative part (Absolute value) of GWI: = −GWI if GWI < 0, otherwise = 0.	Kim and Lyon (2015); Moreno-Ureba et al. (2026); Yue et al. (2026); MacLean and Behnam (2010) and Wijen (2014)
	Algebraic constraint: GWI = GREENWASH − BROWNWASH; the two variables are mutually exclusive. Frequencies sum to 100%, confirming exclusivity.	
ESG_Score	Nominal ESG score (Voluntary information).	Eliwa et al. (2023); Moreno-Ureba et al. (2026) and Roszkowska-Menkes et al. (2024)
ESGC_Score	Practical ESG score (Controversy-adjusted).	Eliwa et al. (2023); Moreno-Ureba et al. (2026); Roszkowska-Menkes et al. (2024) and Di and Li (2023)
Panel B: Independent, control, and moderating variables		
FemD	% of female board members.	Eliwa et al. (2023); Moreno-Ureba et al. (2026); Manita et al. (2018); Boulouta (2013) and Konrad et al. (2008)
CM	Critical mass (1 if female ≥ 30%).	Kanter (1977) and Torchia et al. (2011)
Blau	Blau diversity index (From FemD).	Eliwa et al. (2023) and Moreno-Ureba et al. (2026)
Shannon	Shannon entropy index (From FemD).	Eliwa et al. (2023) and Moreno-Ureba et al. (2026)
BSize	Board size (Total members).	Eliwa et al. (2023) and Moreno-Ureba et al. (2026)
InD	Board independence (%).	Eliwa et al. (2023) and Moreno-Ureba et al. (2026) and Manita et al. (2018)
SustCom	Sustainability committee (1 if present).	Qiu et al. (2026); Ştefănescu and Suciu (2026) and Velte (2017)
Size	Natural logarithm of total assets.	Eliwa et al. (2023); Moreno-Ureba et al. (2026) and Saeed et al. (2026)
Lev	Financial leverage (%).	Eliwa et al. (2023); Moreno-Ureba et al. (2026) and Saeed et al. (2026)
ROA	Return on total assets (%).	Eliwa et al. (2023); Moreno-Ureba et al. (2026) and Saeed et al. (2026)
MTB	Growth opportunities (Market / Book value).	Eliwa et al. (2023); Moreno-Ureba et al. (2026) and Saeed et al. (2026)
GRI	GRI reporting standard adoption (1 if adopted).	Friske et al. (2024); Wang et al. (2026); Roszkowska-Menkes et al. (2024); García-Sánchez et al. (2022) and Sannino et al. (2020)
log_co2	Log of actual CO_2 emissions.	Moreno-Ureba et al. (2026) and Yue et al. (2026)

Note: This table defines the study's key variables, their measurement, and the sources that motivate their inclusion. Panel A lists the ESG information-decoupling indices; Panel B lists the independent, control, and moderating variables. Section 4 explains why we report CM, Blau, and Shannon here as descriptive alternatives to FemD but exclude them from the regression tables.

Table 2 also reports three alternative measures of gender diversity: critical mass (CM), the Blau index, and the Shannon entropy index. We include these for completeness and for comparability with prior studies. Because Blau = $1 - (p^2 + q^2)$ and Shannon = $-(p \ln p + q \ln q)$, where p is the share of female directors (FemD/100) and $q = 1 - p$,

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both indices are deterministic, monotonic transformations of FemD, and CM is a binary recoding of the same underlying variable at the 30% threshold (Kanter, 1977).

Entering FemD alongside any of these transformations would introduce near-perfect collinearity rather than new information, so we retain FemD as the continuous gender-diversity measure in Tables 4 and 5, since it uses the full information in board composition rather than a threshold or a rescaled aggregate. CM, Blau, and Shannon appear in Tables 2 and 3 for descriptive completeness only.

Table 3. Descriptive statistics.

Variables	Mean	Std. Dev.	Min.	Median	Max.	Frequency (%)
Panel A: ESG information decoupling indices						
GWI	0.00	1.47	-3.43	-0.14	8.40	-
GREENWASH	0.51	1.08	0.00	0.00	8.40	45.56%
BROWNWASH	0.51	0.68	0.00	0.14	3.43	54.44%
ESG_Score	55.30	15.66	5.34	55.95	92.07	-
ESGC_Score	97.13	11.89	4.55	100.00	100.00	-
Panel B: Independent, control, and moderating variables						
FemD	18.97	13.20	0.00	16.67	75.00	-
CM	-	-	-	-	-	19.95%
Blau	0.27	0.15	0.00	0.28	0.50	-
Shannon	0.42	0.21	0.00	0.45	0.69	-
BSize	9.54	3.15	1.00	9.00	21.00	-
InD	49.37	14.36	0.00	50.00	100.00	-
SustCom	-	-	-	-	-	22.71%
Size	21.62	1.55	16.31	21.79	25.34	-
Lev	28.77	17.14	0.15	29.64	66.37	-
ROA	5.84	6.40	-9.12	4.40	36.84	-
MTB	3.00	5.48	0.24	1.42	42.01	-
GRI	-	-	-	-	-	85.16%
log_co2	11.77	2.66	2.38	11.64	19.10	-

Note: This table reports descriptive statistics for the study's key variables: mean, standard deviation, minimum, median, and maximum for continuous variables, and frequency for binary variables.

We test the hypotheses with panel regressions that include firm fixed effects (μ_i), which absorb time-invariant unobserved heterogeneity, and year fixed effects (λ_t), which absorb macroeconomic shocks and region-wide regulatory trends common to all firms in a given year. We cluster standard errors at the firm level throughout (Wooldridge, 2010).

To test the baseline effects of GRI, FemD, and SustCom on brownwashing (H_1-H_3), we estimate.

$$\text{BROWNWASH}_{it} = \beta_0 + \beta_1 \text{GRI}_{it} + \beta_2 \text{FemD}_{it} + \beta_3 \text{SustCom}_{it} + \sum_{k=1}^{K} \gamma_k \text{Controls}_{it} + \mu_i + \lambda_t + \epsilon_{it} \quad (1)$$

Where i and t denote firms and years, respectively; Controls_it includes BSize, InD, Size, Lev, ROA, MTB, and log_co2; and ε_{it} is the error term.

Because 45.56% of the sample has a BROWNWASH value of zero (Table 3; we define the measure formally below), ordinary least squares (OLS) estimates of Model (1) may not be consistent. Following standard corner-solution treatment (Wooldridge, 2010), we therefore split the analysis into an extensive margin (whether a firm brownwashes at all) and an intensive margin (how much it brownwashes, conditional on brownwashing). We model the extensive margin with a linear probability model (LPM) that includes firm and year fixed effects.

$$P(\text{BROWNWASH}_{it} = 1) = \beta_0 + \beta_1 \text{GRI}_{it} + \beta_2 \text{FemD}_{it} + \beta_3 \text{SustCom}_{it} + \sum_{k=1}^{K} \gamma_k \text{Controls}_{it} + \mu_i + \lambda_t + \epsilon_{it} \quad (2)$$

In this specification, the GRI coefficient is directly interpretable as a percentage-point change in the probability of brownwashing. We estimate the intensive margin, underreporting severity conditional on GWI < 0 (GWI is the continuous decoupling gap defined in Table 2; BROWNWASH equals |GWI| when GWI is negative and 0 otherwise), using Equation 1 on the subsample of firm-years that engage in brownwashing.

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As a supplementary test of H3's logic, we also ask whether internal governance moderates the effect of external reporting pressure on the extensive margin. We add GRI_it×SustCom_it to the linear probability model (reported in Section 5.2).

$$P(\text{BROWNWASH}_{it} = 1) = \beta_0 + \beta_1 \text{GRI}_{it} + \beta_2 \text{SustCom}_{it} + \beta_3 (\text{GRI}_{it} \times \text{SustCom}_{it}) + \sum_{k=1}^{K} \gamma_k \text{Controls}_{it} + \mu_i + \lambda_t + \epsilon_{it} \quad (3)$$

Finally, to test whether sustainability committees are an antecedent of GRI adoption (H_4), we estimate.

$$P(\text{GRI}_{it} = 1) = \beta_0 + \beta_1 \text{SustCom}_{it} + \sum_{k=1}^{K} \gamma_k \text{Controls}_{it} + \mu_i + \lambda_t + \epsilon_{it} \quad (4)$$

As a robustness check, we also estimate a Heckman two-stage model (Heckman, 1979) to address possible sample selection, since only firm-years with a complete set of lagged governance and financial covariates enter the estimation panel (Qiu et al., 2026). The probit model for selection is performed on 1,995 firm-years after the initial data filtering described in Section 4, but prior to the one-year lag that drops each firm's first sample year. The objective of this first step is to predict the probability that a firm-year enters the analytic panel. The exclusion restriction is defined as a firm's leave-one-out GRI adoption rate, i.e., the mean GRI adoption status over its other sample years. Specifically, this variable reflects how consistently a firm is observed in the analytic sample, conditional on reporting propensities, but does not directly affect the brownwashing decision in any particular year.

The identification strategy is validated by several robustness checks. In particular, we re-estimate the extensive-margin specification with two-way clustered (firm and year) standard errors, which account for the cross-sectional dependence of shocks and unobservables (Wooldridge, 2010). Because the firm-fixed-effects model exploits within-firm variation to identify the coefficient of GRI, we re-estimate the baseline specification on narrower samples. One is the "switchers" sample, consisting of firms that switch GRI adoption status at least once during the sample period. The other is the "clean switchers" sample, consisting of firms that switch GRI status only once and do not switch it back. A final check is to compare the baseline model with the pooled model, evaluating whether the omitted variable bias is sizeable.

5. RESULTS AND DISCUSSION

5.1. Baseline Empirical Results

We first estimate the baseline relationships between GRI adoption, internal governance, and brownwashing using firm- and year-fixed-effects panel models. Table 4 reports three specifications: Column (1) is the pooled model for the continuous brownwashing gap (Equation 1); Column (2) is the extensive margin (Equation 2); and Column (3) is the intensive margin, the same continuous specification as Equation 1 but restricted to firm-years with GWI < 0.

Column (1) shows that GRI adoption is significantly and negatively associated with the continuous magnitude of brownwashing (β=−0.2146, $p<0.01$), supporting H1 (Hawn & Ioannou, 2016). Decomposing this relationship reveals an asymmetry. In Column (2), GRI remains a significant negative predictor on the extensive margin (β=−0.1337, $p<0.01$): adopting GRI lowers the probability of brownwashing by 13.37 percentage points.

Among firms that already brownwash (GWI<0), Column (3) shows that the GRI coefficient on the intensive margin remains negative and significant at the 10% level (β=−0.1285, $p<0.10$), close in magnitude to the extensive-margin coefficient. Standardized disclosure therefore works as both a preventive and a corrective mechanism, though we estimate the effect with less precision once brownwashing has already started, consistent with a smaller, more heterogeneous subsample of brownwashing firms. Structured, comparable GRI indicators set a transparency baseline that raises the reputational cost of brownwashing, consistent with the observed reduction in its likelihood (Friske et al., 2024; Wang et al., 2026; Yue et al., 2026). The voluntary, loosely enforced nature of GRI adoption in emerging ASEAN markets may still explain why the intensive-margin effect, though present, carries a larger standard error than the extensive-margin effect (Boiral, 2013; Roszkowska-Menkes et al., 2024).

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Table 4. GRI adoption and corporate brownwashing: Pooled, extensive-margin, and intensive-margin estimates.

Variables	(1) BROWNWASH (Pooled)	(2) P(BROWNWASH=1) (Extensive margin)	(3) BROWNWASH | GWI<0 (Intensive margin)
FemD	-0.0011	-0.0023	-0.0018
	(0.0015)	(0.0022)	(0.0029)
GRI	-0.2146***	-0.1337***	-0.1285*
	(0.0566)	(0.0476)	(0.0732)
BSize	0.0075	0.0109	0.0043
	(0.0091)	(0.0132)	(0.0199)
InD	-0.0001	-0.0021	0.0036*
	(0.0011)	(0.0016)	(0.0022)
SustCom	0.0202	0.0075	-0.0376
	(0.0297)	(0.0372)	(0.0656)
Size	0.0022	-0.0299	-0.2413*
	(0.0766)	(0.0798)	(0.1401)
ROA	-0.0031	-0.0062**	-0.0032
	(0.0023)	(0.0027)	(0.0050)
Lev	-0.0018	-0.0024	0.0018
	(0.0023)	(0.0022)	(0.0038)
MTB	-0.0044*	-0.0020	-0.0127**
	(0.0024)	(0.0029)	(0.0054)
log_co2	-0.0098	-0.0343*	0.0213
	(0.0139)	(0.0185)	(0.0248)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	1,506	1,506	704
Firms	385	385	296
R-squared	0.820	0.662	0.858

Note: This table reports fixed-effects panel regressions of GRI reporting-standard adoption on brownwashing. Column (1) is the pooled model on the continuous gap, column (2) is the extensive-margin model (whether a firm brownwashes), and column (3) is the intensive-margin model (Severity, conditional on brownwashing occurring). We omit the greenwashing-side results, the algebraic mirror image of columns (1)-(2), for brevity. We report cluster-robust standard errors in parentheses. ***/**/* denote statistical significance at 1%/5%/10%.

Board gender diversity (FemD) is negative but not significant in any specification (β=−0.0011, p>0.10 pooled; β=−0.0023, p>0.10 extensive margin), so the data do not support H2. Stakeholder-agency and gender socialization theory predict that female directors act as vigilant monitors (Boulouta, 2013; Eagly et al., 2003; Eliwa et al., 2023) but our results fit a tokenism explanation better (Kanter, 1977; Manita et al., 2018). Female board representation in the ASEAN-5 sample averages only 18.97% (Table 3), often below the critical mass needed for substantive influence (Konrad et al., 2008) and female directors face structural barriers to shaping capital-intensive reporting strategies (Moreno-Ureba et al., 2026).

Sustainability committee presence (SustCom) also shows no significant baseline relationship with brownwashing (β=0.0202, p>0.10 pooled; β=0.0075, p>0.10 extensive margin), which does not support a direct effect. Committees in ASEAN firms may play a symbolic, legitimacy-seeking role rather than exercise substantive oversight (Boiral, 2013; Qiu et al., 2026; Ştefănescu & Suciu, 2026); on their own, they do not appear to change disclosure incentives unless tied to an external standard such as the GRI.

Among the controls, profitability (ROA) is negative and significant on the extensive margin (β=−0.0062, p<0.05): profitable firms are less likely to brownwash, which fits the behavioral theory of the firm (Kim & Lyon, 2015; Yue et al., 2026). Profitable firms face less survival anxiety, while distressed firms underreport to manage investor expectations and avoid setting a performance benchmark they cannot sustain (Yue et al., 2026). Growth opportunities (MTB) are negative and significant on the intensive margin (β=−0.0127, p<0.05), suggesting that high-growth firms brownwash less severely once decoupled, likely because they prioritize capital-market legitimacy for external financing (Cepêda et al., 2026). Board independence (InD) is positive and significant on the intensive margin (β=0.0036, p<0.10): among firms that already brownwash, those with more independent boards underreport more

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severely, a result for which we do not have a strong theoretical prior and flag for future work. Carbon intensity (log_co2) is negative and significant on the extensive margin (β=−0.0343, p<0.10), consistent with higher-emission firms facing more scrutiny and so being less likely to brownwash at all.

5.2. Advanced Mechanisms, Structural Sensitivity, and Endogeneity Checks

We run a series of econometric robustness tests to check the validity and causal identification of the baseline results. Table 5 reports these diagnostics, which focus on the extensive margin of brownwashing.

Table 5. Advanced mechanisms, structural sensitivity, and endogeneity checks.

Model / Specification / Subsample	Coefficient (GRI)	Standard Error	p-value	N / Firms
Panel A: Theoretical Mechanisms and Interactions				
(1) Interaction with SustCom (GRI × SustCom)	0.1169	(0.1760)	0.507	1,506 / 385
Panel B: Sensitivity of Statistical Inference				
(2) Full sample, two-way clustering (Firm + Year)	-0.1337**	(0.0501)	0.026	1,506 / 385
Panel C: Sensitivity of Identification (Switcher Subsample)				
(3) 71 switchers only, cluster Firm	-0.0974*	(0.0512)	0.062	382 / 71
(4) 71 switchers only, cluster Firm + Year	-0.0974	(0.0562)	0.117	382 / 71
(5) 62 clean switchers only, cluster Firm	-0.0821	(0.0571)	0.156	302 / 62
Panel D: Specification and Endogeneity Diagnostics				
(6) Industry + Country + Year FE (No Firm FE)	-0.2810***	(0.0409)	<0.001	1,506 / 385
Panel E: Sample-Selection Correction				
(7) Heckman two-step (Selection-corrected)	-0.2799***	(0.0532)	<0.001	1,506 / 385

Note: This table shows mechanism interactions, sensitivity diagnostics, and tests for endogeneity of the GRI effect on the extensive margin of brownwashing. Panel A provides a supplementary test of the logic of H_3 by using the interaction between GRI and sustainability committee (SustCom). Panels B-C offer sensitivity diagnostics by comparing statistical power across alternative clustering and switcher subsamples. Panel D illustrates the importance of firm fixed effects (FE) in purging unobserved time-invariant heterogeneity, and Panel E performs a Heckman two-step correction for sample selection into the analytical panel (reported coefficients are GRI estimates from second-stage regression). We report cluster-robust standard errors in parentheses. ***/**/* denote statistical significance at 1%/5%/10%.

The interaction term (Model (1)) is positive but far from significant (β=0.1169, p=0.507), so sustainability committees do not moderate the extensive margin of brownwashing. Standardized reporting appears to act as a field-level force that operates independently of internal governance: GRI's comparability requirements discipline managerial communication on their own (Friske et al., 2024; Roszkowska-Menkes et al., 2024), leaving no additional role for committee presence.

Panel B checks whether the statistical inference holds up against cross-sectional dependence and regional macroeconomic shocks. Model (2) re-estimates the extensive-margin model with standard errors clustered in two ways, by firm and by year (Wooldridge, 2010). Under this more demanding specification, the GRI coefficient stays negative and significant at the 5% level (β=−0.1337, p=0.026), so the disciplinary effect of standardized reporting on brownwashing holds up against more complex regional error structures.

Panel C tests the sensitivity of the identification strategy. With the firm-fixed-effects specification, within-firm variation alone identifies the GRI coefficient, drawn only from firms that change their GRI status during 2014-2024 (termed "switchers"). In Model (3), we restrict the sample to these 71 switchers (382 observations) and cluster standard errors at the firm level. The estimate of GRI remains negative and significant at 10% (β=−0.0974, p=0.062). In the following models, we narrow the specification further. In Model (4), we use two-way clustered standard errors; the magnitude of GRI's coefficient remains similar (β=−0.0974, p=0.117), but it loses significance because of the small sample size. Model (5) further restricts the sample to 62 "clean switchers" (302 observations)—firms that transition to or from GRI once and do not revert to their previous status—and still yields a negative, similarly sized estimate of GRI's coefficient (β=−0.0821, p=0.156), though it is also not significant at conventional levels. Across all three switcher specifications, the point estimate stays negative and stable in magnitude, consistent with within-firm transitions rather than cross-sectional differences between firms, identifying the baseline result, even though statistical power falls as the switcher subsample shrinks.

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This supports the causal interpretation. Panel D tests the sensitivity of the specification: in Model (6), we remove firm fixed effects and introduce industry, country, and year dummies instead. The GRI coefficient more than doubles in magnitude, from −0.1337 in the firm-fixed-effects specification to −0.2810 ($p<0.001$), consistent with omitted-variable bias: unobserved time-invariant firm-specific factors such as ethical culture or management quality (Eliwa et al., 2023; Moreno-Ureba et al., 2026) may correlate positively with the decision to adopt the GRI framework and negatively with the level of brownwashing. Firm fixed effects are therefore necessary to isolate the effect of the institutional change in sustainability reporting practices.

In Model (7), reported in Panel E, firms may have self-selected into the analytic panel: analytic-panel-entry firms may be a non-random subset of all firms. Applying a Heckman two-step selection correction yields the same main result: the GRI coefficient remains negative and significant at 1% ($\beta=-0.2799$, $p<0.001$), close in magnitude to the omitted-variable-bias estimate in Panel D. Selection correction leaves the coefficient's sign and significance unchanged, and the Inverse Mills ratio is itself insignificant ($\beta=0.2916$, $p=0.155$; full first- and second-stage Heckman output is available from the corresponding author on request), indicating that selection into the panel is not driving the result. Because this test uses the same within-firm variation as the baseline specification, it should be read as a check on the baseline estimate rather than as independent evidence from a different identification source.

We next test the antecedent pathway implied by H4: whether the presence of a sustainability committee predicts a firm's future GRI adoption. Results in Table 6, Model (1), show the antecedent test in which we regress GRI on a one-year-lagged SustCom in a firm- and year-fixed-effects panel model with the same control variables used throughout the paper.

Table 6. Antecedent test: Sustainability committee presence and GRI adoption (H_4).

Model / Specification	Coefficient (SustCom)	Standard Error	p-value	N / Firms
(1) Firm + Year FE, one-year lag (Primary specification)	-0.0141	(0.0191)	0.461	1,506 / 385
(2) Contemporaneous SustCom (No lag)	-0.0192	(0.0177)	0.279	1,506 / 385
(3) Industry + Country + Year FE	0.0034	(0.0219)	0.878	1,506 / 385
(4) Pooled, Year FE only	0.0111	(0.0218)	0.611	1,506 / 385

Models (2)-(4) vary the specification for robustness: model (2) uses contemporaneous SustCom without the one-year lag, model (3) replaces firm fixed effects with industry, country, and year fixed effects, and model (4) uses a pooled specification with year fixed effects only. In all models, we cluster standard errors by firm and report them in parentheses below the coefficient estimates. We include control variables (board size, board independence, firm size, leverage, ROA, market-to-book, and log CO_2 emissions) in all specifications but omit them from the table to save space; full regression coefficients are available from the corresponding author on request.

The SustCom coefficient is tiny and statistically indistinguishable from zero in the main model ($\beta=-0.0141$, $p=0.461$), meaning that the data do not support H4. The finding is consistent across different model specifications. We find the same null effect when we use a non-lagged SustCom variable ($\beta=-0.0192$, $p=0.279$), when replacing firm fixed effects with industry, country, and year fixed effects ($\beta=0.0034$, $p=0.878$), or when using a pooled specification with only year fixed effects ($\beta=0.0111$, $p=0.611$).

5.3. Transition Dynamics and Switcher Diffusion

All these results imply that the presence of sustainability committees does not predict adoption of the GRI standards by firms. The wider implication is that these findings challenge resource dependence theory. External reporting and internal governance appear to work through separate channels: GRI adoption is a direct discipline mechanism (H1), and SustComs neither substitute for nor trigger it. Figure 2 shows GRI adoption trends 2014-2024.

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Adoption rises steadily, and switching events are spread gradually across years rather than clustered around one macro-shock, a pattern that favors fixed-effects identification because it rules out the possibility that the mitigating effect comes from a single crisis or policy reform.

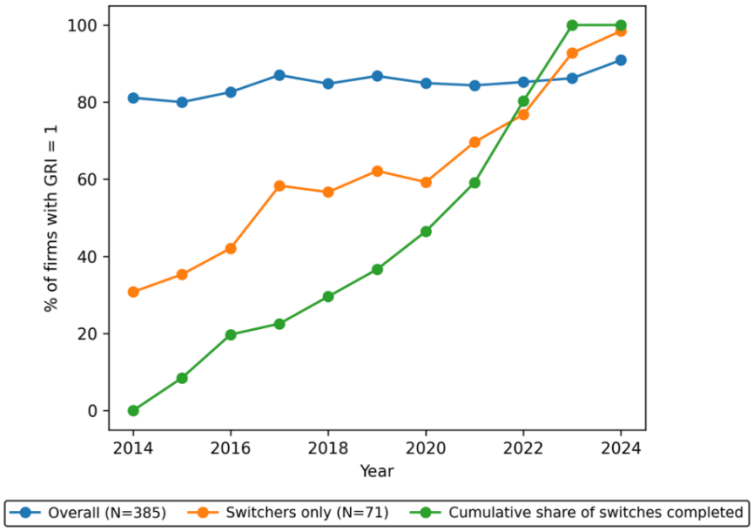


Figure 2. GRI adoption trends and switcher diffusion timing, 2014-2024.

Figure 3 reports the GRI coefficient across the seven specifications in Table 5. The coefficient is negative and stable across every specification except the GRI x SustCom interaction term, which captures a different quantity (the incremental effect of committee presence, not the main GRI effect), indicating that the mitigating effect does not depend on any particular set of controls or clustering choices.

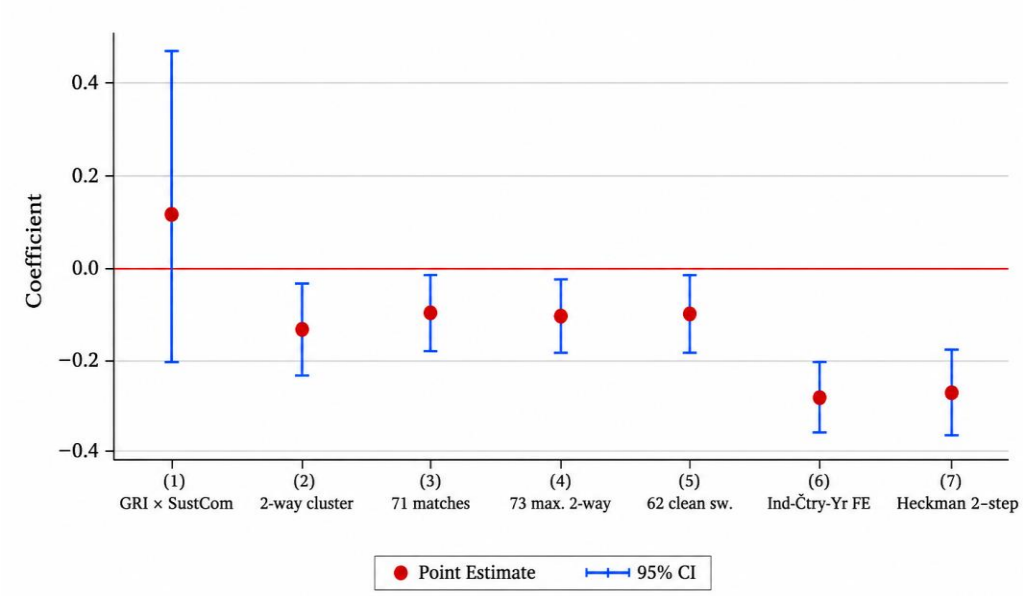


Figure 3. Robustness diagnostics and specification testing for the primary GRI coefficient.

6. CONCLUSIONS

The main results focus on the two-way decoupling of ESG reporting practices in ASEAN-5 markets from 2014 to 2024 by jointly considering the effects of external reporting guidance and internal board monitoring on corporate brownwashing. Our panel fixed-effects findings indicate a consistent pattern. The adoption of GRI sustainability reporting standards is negatively and significantly associated with brownwashing, but this association is non-

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homogeneous. GRI standards restrict both the extensive margin of brownwashing decisions (i.e., whether a firm initiates brownwashing) and the intensive margin (i.e., the severity of ESG score underreporting among brownwashers), with coefficients similar in magnitude, although the extensive-margin effect is estimated with greater statistical precision. This pattern is congruent with the information discipline hypothesis (H1). Uniform, comparable indicators are likely to increase the reputational risks associated with brownwashing (García-Sánchez et al., 2022; Kim & Lyon, 2015) and act as deterrents against the initiation of brownwashing practices and, with less precision, against their continuation once underway. This effect is more muted for voluntary standards practiced in developing ASEAN markets (Boiral, 2013; Roszkowska-Menkes et al., 2024).

Second, neither FemD nor SustCom correlates significantly with brownwashing (H2, H3), which runs against stakeholder-agency and gender socialization theories but fits a tokenism explanation instead (Kanter, 1977; Manita et al., 2018): women still hold only 18.97% of ASEAN boardroom seats on average, short of the critical mass needed to affect disclosure decisions (Moreno-Ureba et al., 2026) and sustainability committees may function as a legitimacy-seeking symbol rather than a substantive monitor (Qiu et al., 2026). Third, the antecedent model results indicate that sustainability committee presence is not a significant predictor of the adoption of GRI guidelines. The coefficient estimates for this variable in all model specifications tested are close to zero and statistically insignificant (see Table 6). Thus, H4 is not supported. These results shift the analytical focus from the well-studied "unidirectional exaggeration" of greenwashing to the more complex "intentional underreporting" of brownwashing, answering the call of (Moreno-Ureba et al., 2026) to disentangle corporate decoupling.

With this, we move the analytical framing away from "unidirectional exaggeration" greenwashing and into more complicated "intentional underreporting" brownwashing phenomena. And just for the record, the findings here answer (Moreno-Ureba et al., 2026) call to disentangle corporate decoupling. This paper, based on neoinstitutional, stakeholder-agency, gender socialization, and resource dependence theories, analyses interaction and antecedent effects, respectively, and finds that the coefficients do not significantly differ from zero. In practical terms, this means that the studied mechanisms act through different paths rather than a single system of reinforcement. We repeat: the external standardization and internal governance mechanisms are different things. The extensive-versus-intensive margin analysis extends neoinstitutional theory further by showing that standard adoption works as a field-level constraint that prevents brownwashing and, with a similarly sized but less precisely estimated coefficient, corrects it once underway (Meyer & Rowan, 1977; Roszkowska-Menkes et al., 2024; Wijen, 2014).

Our findings carry implications for regulators, directors, and capital-market participants (Freeman, 1984). For policymakers, mandating disclosure or encouraging voluntary GRI adoption alone is not enough: because we estimate the intensive-margin effect of voluntary standards with less precision, though not smaller in magnitude, than the extensive-margin effect, regulators need strong external verification and third-party assurance to act as credibility filters (Di & Li, 2023; Friske et al., 2024; Sannino et al., 2020). Because sustainability committees do not appear to catalyze GRI adoption on their own, board reform is not a substitute for direct disclosure regulation. For boards, diversification should not remain a symbolic exercise for shareholders and nominating committees. Female directors and sustainability committees need real executive power and institutional resources to turn stated commitments into practice (Eliwa et al., 2023; Qiu et al., 2026).

Despite our identification strategy's rigor, this study has limitations that point to avenues for future research.

First, our sample covers only listed firms in the ASEAN-5. This gives a clear view of these fast-growing economies, but the findings may not generalize to private firms, which face less public scrutiny (Marquis, Toffel, & Zhou, 2016). Future work should test whether ownership structure, family-owned versus state-owned, moderates the relationship between standardization and brownwashing.

Second, our GRI measure is binary. This matches conventional practice in the literature, but it cannot capture qualitative variation in adherence, such as which indicators a firm chooses to report or how much detail it provides.

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Future research could use natural language processing on the text of sustainability reports to separate symbolic camouflage from real compliance (Crilly et al., 2016).

Third, our analysis relies on secondary databases (LSEG Workspace, BoardEx). Future studies could complement this with qualitative or mixed-method approaches, such as interviews with directors and sustainability managers, to understand the mental models and internal power relations that shape firms' strategic disclosure decisions (MacLean & Behnam, 2010; Wijen, 2014).

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