



OVERSIGHT MECHANISMS AND THE REDUCTION OF GREENWASHING

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ABSTRACT

Purpose: This study aimed to identify oversight mechanisms that reduce greenwashing behavior.

Method: Data come from Bloomberg and Refinitiv ESG scores of 88 Brazilian public companies listed on the Brazilian stock exchange B3 from 2010 to 2021. The estimation method was the FGLS (Feasible Generalized Least Squares).

Result and Discussion: The results suggest the action of institutional investors, independent board members, and being an environmentally sensitive industry company can reduce greenwashing. However, a series of divergences in the results might indicate that the practice of greenwashing is due to unequal awareness and a developing regulatory framework.

Research Implications: This study contributes to ESG policymakers, managers, and investors by exploiting oversight mechanisms to reduce greenwashing behavior and encourage companies' sustainable development.

Originality/Value: ESG disclosure intentions and actions help stakeholders' decision-making process, especially investors, through sustainability reports. However, the unaudited content can be misleading by pointing out greenwashing behavior, which means what is said does not correspond to company actions. Such context is still to be intensely exploited, and that value to an extensive range of stakeholders.

Keywords: Greenwashing, ESG Disclosure, Oversight Mechanisms, Public Companies, Brazil.

MECANISMOS DE SUPERVISÃO E A REDUÇÃO DO GREENWASHING

RESUMO

Objetivo: Este estudo teve como objetivo identificar mecanismos de supervisão que reduzam o comportamento de greenwashing.

Método: Os dados provêm das pontuações ESG da Bloomberg e Refinitiv de 88 empresas brasileiras de capital aberto listadas na bolsa de valores brasileira B3 de 2010 a 2021. O método de estimação foi o FGLS (Feasible Generalized Least Squares).

Resultado e Discussão: Os resultados sugerem que a ação de investidores institucionais, conselheiros independentes e ser uma empresa do setor ambientalmente sensível pode reduzir o greenwashing. No entanto, uma

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série de divergências nos resultados pode indicar que a prática do greenwashing se deve a uma sensibilização desigual e a um quadro regulamentar em desenvolvimento.

Implicações da Pesquisa: Este estudo contribui para os formuladores de políticas, gestores e investidores ESG, explorando mecanismos de supervisão para reduzir o comportamento de lavagem verde e incentivar o desenvolvimento sustentável das empresas.

Originalidade/Valor: As intenções e ações de divulgação ESG auxiliam no processo de tomada de decisão das partes interessadas, especialmente investidores, por meio de relatórios de sustentabilidade. No entanto, o conteúdo não auditado pode ser enganoso ao apontar comportamentos de greenwashing, o que significa que o que é dito não corresponde às ações da empresa. Tal contexto ainda precisa ser intensamente explorado e tem valor para uma ampla gama de partes interessadas.

Palavras-chave: Greenwashing, Divulgação ESG, Mecanismos de Supervisão, Empresas Abertas, Brasil.

MECANISMOS DE SUPERVISIÓN Y REDUCCIÓN DEL GREENWASHING

RESUMEN

Propósito: Este estudio tuvo como objetivo identificar mecanismos de supervisión que reduzcan el comportamiento de greenwashing.

Método: Los datos provienen de las puntuaciones ESG de Bloomberg y Refinitiv de 88 empresas públicas brasileñas que cotizan en la bolsa de valores brasileña B3 de 2010 a 2021. El método de estimación fue el FGLS (Feasible Generalized Least Squares).

Resultado y Discusión: Los resultados sugieren que la acción de inversionistas institucionales, miembros de juntas directivas independientes y ser una empresa industrial ambientalmente sensible puede reducir el greenwashing. Sin embargo, una serie de divergencias en los resultados podrían indicar que la práctica del greenwashing se debe a una conciencia desigual y a un marco regulatorio en desarrollo.

Implicaciones de la Investigación: Este estudio contribuye a los formuladores de políticas, gerentes e inversores de ESG al explotar los mecanismos de supervisión para reducir el comportamiento de greenwashing y fomentar el desarrollo sostenible de las empresas.

Originalidad/Valor: Las intenciones y acciones de divulgación de ESG ayudan al proceso de toma de decisiones de las partes interesadas, especialmente los inversores, a través de informes de sostenibilidad. Sin embargo, el contenido no auditado puede ser engañoso al señalar un comportamiento de greenwashing, lo que significa que lo que se dice no corresponde a las acciones de la empresa. Ese contexto aún debe explotarse intensamente y su valor para una amplia gama de partes interesadas.

Palabras clave: Greenwashing, Divulgación ESG, Mecanismos de Supervisión, Empresas Públicas, Brasil.

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1 INTRODUCTION

There is a growing demand for sustainable investments, which incorporate governance, environmental and social aspects, so-called ESG (Environmental, Social, and Governance) (Yu, Luu, & Chen, 2020), simultaneously related to companies' financial return and performance (Wang & Sarkis, 2017). That leads companies to disclose reports that express their position in



ESG, being instruments of voluntary communication by companies and exposing their levels of engagement in sustainability (Ruiz-Blanco et al., 2022). However, the lack of audited reports (Yu et al., 2020) might lead investors to rely on information that does not always convey the reality of companies' actions in the ESG dimensions, which can figure to misleading manipulation (Yu et al., 2020; Marquis et al., 2016).

The literature has different terminologies associated with deceptive communication. There are, for example, the terms bluewashing, for social issues (Ruiz-Blanco et al., 2022; Chen & Chang, 2013), blackwashing, to name the differences between communication and behavior in economic matters, and greenwashing, both for environmental issues (Ruiz-Blanco et al., 2022; Lyon & Montgomery, 2015; Chen & Chang, 2013) and for unsatisfactory performance in the ESG pillars (Yu et al., 2020). This research focuses on greenwashing, assumed as the misleading manipulation of ESG dimensions (Yu et al., 2020; Siano, Vollero, Conte, & Amabile, 2017).

Understanding greenwashing has become increasingly important, given the growing demand for companies to perform better on ESG dimensions and provide more transparent and accurate information to complement their financial reports (Yu et al., 2020). Ruiz-Blanco et al. (2022) argue that companies under more significant pressure and supervision have greater reputational risk and fewer incentives to provide distorted sustainability information. Kim and Lyon (2015) conclude that growing companies tend to greenwash; however, external stakeholder oversight smooths this tendency. According to Yu et al. (2020), companies exposed to greater oversight are less likely to engage in ESG greenwashing.

Previous studies have explored mechanisms for oversight and prevention of greenwashing, such as the engagement of institutional investors (Yu et al., 2020), board size (Yu et al., 2020; Adams & Mehran, 2012), and involvement of independent directors (Yu et al., 2020; Liu et al., 2015). Companies with shares listed on foreign capital markets are under a supervisory mechanism due to international exposure (Yu et al., 2020; Del Bosco & Misani, 2016). Additionally, Ruiz-Blanco et al. (2022) explored the association between the reduction of greenwashing behavior and activity sectors under more significant external pressure, such as environmentally sensitive industries and companies operating closer to customers or with high visibility.

The greenwashing literature discusses the presence of symbolic and substantive strategies adopted by companies (Donia et al., 2019; Marquis et al., 2016), consumer confidence in environmental performance or green products (De Jong et al., 2020; Delmas & Burbano,



2011), harmful threats to corporate reputation (Caldas et al., 2021) and the circumstances in which companies are involved in greenwashing (Yu et al., 2020; Marquis et al., 2016).

However, studies are yet to explore the existence of greenwashing behavior in Brazilian companies in the three ESG pillars, separately and jointly. They must, furthermore, explore supervisory mechanisms capable of reducing the effects of greenwashing behavior in companies. This research aims to fill this gap by quantitatively studying ESG disclosure and performance across Brazilian companies and exploring mechanisms to inhibit companies from engaging in ESG greenwashing practices. Thus, this study aims to identify oversight mechanisms that reduce ESG greenwashing behavior, resulting in more transparent and accurate ESG information disclosures for investor decision-making.

Although research by Yu et al. (2020) examined aggregated ESG greenwashing behavior internationally, this research contributes to the literature, as it assesses greenwashing in the three ESG dimensions in a grouped manner and the individual pillars – environmental, social, and governance – exclusively in Brazil. Following studies by Yu et al. (2020) and Ruiz-Blanco et al. (2022), we aim to identify companies that exhibit greenwashing behavior, that is, the practice of disclosing large amounts of ESG data but unsatisfactory ESG performance. The ESG scores from Bloomberg and Refinitiv encompass the aggregate ESG and its pillars. After pairing those greenwashing scores, we developed the hypotheses to test oversight mechanisms for potentially reducing greenwashing behavior.

This research suggests a reduction in greenwashing when stakeholders exercise ESG monitoring through oversight mechanisms through the engagement of institutional investors, an independent board, and belonging to environmentally sensitive industries – subject to minimum environmental rules. The results could affect policymakers and ESG reporting regulations, managers, and investors, showing which characteristics reduce greenwashing behavior.

2 THEORETICAL FRAMEWORK

2.1 ESG AND PUBLICLY TRADED COMPANIES IN BRAZIL

Yu et al. (2020) argued that, in response to the growing pressure for ESG transparency and corporate responsibility, companies report ESG data voluntarily. However, the reliability of reports varies due to a lack of auditing and standardized regulatory guidelines on their content. In this scenario, investors depend on unregulated and unaudited voluntary information,



which does not always accurately convey their performance in the ESG dimensions, and may lead to misleading manipulation (Yu et al., 2020; Marquis et al., 2016).

ESG practices are central to corporate decisions (Martins, 2022). Although the theme is not recent, the Covid-19 crisis grew environmental concern and the demand for inclusion and diversity (CVM, 2022). ESG performance is increasingly relevant in financial markets (Del Bosco & Misani, 2016). For example, generating value implies reducing risk exposure and lowering the cost of capital (El Ghoul et al., 2018).

In Brazil, corporate governance gained with the foundation, in 1995, of the Brazilian Institute of Corporate Governance (IBGC) and the publication of the first version of the Brazilian Code of Best Practices of Corporate Governance (CMPGC) in 1999 (IBGC, 2015). The fifth and current version of the CMPGC is from 2015. The Securities and Exchange Commission (CVM) introduced several mechanisms to boost governance. The Brazilian stock exchange, B3, also introduced differentiated listing segments that express levels of governance with additional obligations to the legislation and various indexes related to sustainability, aiming to induce companies to adopt the best ESG practices. That is due to the natural maturation of investors, so much so that the primary approach used in choosing ESG investments is environmental (84.8%), followed by governance (76.6%) and social (75.9%) (CVM, 2022).

2.2 GREENWASHING

The literature shows different terminologies associated with misleading communication, such as bluewashing regarding social issues (Ruiz-Blanco et al., 2022; Chen & Chang, 2013) and blackwashing regarding economic issues (Ruiz-Blanco et al., 2022). In that same path, greenwashing deals with the ESG pillars (Ruiz-Blanco et al., 2022; Lyon & Montgomery, 2015; Chen & Chang, 2013; Yu et al., 2020). The present study considers the definition of greenwashing the misleading manipulation (Siano et al., 2017) at a company level when there is a large amount of ESG disclosure information but unsatisfactory ESG performance (Yu et al., 2020).

Greenwashing practices have grown (Quoquab et al., 2021). Although companies seek to disclose positive aspects of ESG to impact their evaluation, there is evidence of manipulative and false communication (Laufer, 2003) or superficial (Porter & Kramer, 2006). Siano et al. (2017) highlight the case of Volkswagen with misleading information about the emission of pollutants in its vehicles. However, the company's reports communicated commitment to



environmental sustainability, showing a divergence between information and concrete action. Thus, greenwashing threatens the accuracy of ESG information (Yu et al., 2020).

In Brazil, studies of corporate social responsibility (CSR) and ESG are predominantly about large companies, as these are subject to controls by more regulated markets in several international cases. Furthermore, ESG disclosure does not necessarily correspond to actual sustainability practices, as there is evidence of use merely as institutional promotion (Brito et al., 2022). Lopes and Demajorovic (2020), when checking the sustainability reports from 2005 to 2014 by Samarco, the company that was the protagonist of a severe environmental accident in Brazil in 2015, concluded that there are weaknesses between the discourse and practice of ESG initiatives.

2.3 OVERSIGHT MECHANISMS

There are arguments in the literature that oversight by external stakeholders can mitigate greenwashing behavior (Ruiz-Blanco et al., 2022; Yu et al., 2020; Del Bosco & Misani, 2016). According to Kim and Lyon (2015), greenwashing is attractive when it can influence the opinions of consumers and investors concerning a company or its products' reputation. Still, external stakeholders, such as environmental activists, could detect and punish greenwashing with the help of oversight mechanisms.

Based on previous studies, there are several oversight mechanisms capable of mitigating the effects of greenwashing, such as the engagement of institutional investors (Yu et al., 2020), board size (Yu et al., 2020; Adams & Mehran, 2012), the presence of independent board members (Yu et al., 2020; Liu et al., 2015), cross-listing (Yu et al., 2020; Del Bosco & Misani, 2016), environmentally sensitive industries, and industries that operate closer to customers or with high visibility (Ruiz-Blanco et al., 2022).

2.3.1 Engagement of Institutional Investors

Institutional investors favor companies focused on sustainability policies (Ambrapa, 2021). That is why the guidelines from the Organization for Economic Cooperation and Development (OECD) in 2011 boosted the concern of institutional investors to protect human rights. Besides, the opinion of the Office of the High Commissioner of the United Nations in 2013 states that formalized guidelines and responsibilities are pivotal for institutional investors to identify, prevent and mitigate human rights abuses committed by companies directly



associated with their investments (Ambrapa, 2021). Additionally, institutional investors are commonly considered critical components of governance, monitoring and disciplining the actions of managers (Bushee et al., 2014).

Yu et al. (2020) showed that the supervision of institutional investors reduced companies' ESG greenwashing behavior. Thus, companies will be discouraged from greenwashing when there is oversight and pressure from institutional investors. Then, there are the following hypotheses:

H1: The engagement of institutional investors reduce (a) ESG greenwashing behavior, (b) greenwashing environmental behavior, (c) greenwashing social behavior, and (d) governance greenwashing behavior.

2.3.2 Presence of Independent Board Members

Ben-Amar and McIlkenny (2015) show that the effectiveness of a company's board is positively related to its carbon emissions disclosure quality. Cuadrado-Ballesteros et al. (2015) document that many independent directors positively influence the disclosure of Corporate Social Responsibility (CSR) information. Liu et al. (2015) indicate that the degree of independence of the board is positively associated with the company's ESG performance. Similarly, Yu et al. (2020) show that oversight by independent directors can reduce companies' ESG greenwashing behavior. Given the evidence in the literature, the research hypotheses are:

H2: The presence of independent board members reduces (a) ESG greenwashing behavior, (b) greenwashing environmental behavior, (c) greenwashing social behavior, and (d) governance greenwashing behavior.

2.3.3 Board Size

Pucheta-Martínez and Gallego-Álvarez (2019) conclude that company size influences sustainability reports. Adams and Mehran (2012) claim that the size of the board is positively related to the company's ESG performance since the size of the board can increase monitoring capacity. However, a different conclusion is observed in the study by Yu et al. (2020), observing that the board size did not significantly impact ESG greenwashing behavior. Thus, there are the following hypotheses:



H3: Board size reduces (a) ESG greenwashing behavior, (b) greenwashing environmental behavior, (c) greenwashing social behavior, and (d) governance greenwashing behavior.

2.3.4 Cross-Listing

Cross-listing means that a company has its shares listed on foreign capital markets in addition to its place of origin (Yu et al., 2020). These companies are subject to compliance with the home country and international securities regulations. Consequently, international exposure tends to increase pressure and scrutiny on possible greenwashing, as Marquis et al. (2016) indicated.

Cross-listing allows companies to overcome investment barriers between capital markets and gain access to investors outside their home country, thus raising capital on better terms due to greater visibility. Therefore, cross-listing companies seek to improve their ESG performance to legitimize themselves in foreign capital markets and meet external stakeholders' objectives (Del Bosco & Misani, 2016). Thus, cross-listing can dissuade companies from engaging in greenwashing, as indicated by Yu et al. (2020). Then, there are the following hypotheses:

H4: Companies that have cross-listings reduce (a) ESG greenwashing behavior, (b) greenwashing environmental behavior, (c) greenwashing social behavior, and (d) governance greenwashing behavior.

2.3.5 Environmentally Sensitive Industry

Marquis et al. (2016) and Ruiz-Blanco et al. (2022) show that more environmentally harmful companies are less likely to engage in greenwashing. Cho and Roberts (2010) justify that companies that cause environmental damage are subject to more significant external pressure and are more likely to voluntarily comply with institutional pressures to disclose ecological information. Based on the literature, we argue that companies in environmentally sensitive industries have a lower greenwashing behavior. Therefore, there is a fifth hypothesis:

H5: Firms in environmentally sensitive industries reduce (a) ESG greenwashing behavior, (b) greenwashing environmental behavior, (c) greenwashing social behavior, and (d) governance greenwashing behavior.



2.3.6 Industry Closer to Customers or With High Visibility

Proximity to the consumer (Chen & Chang, 2013) or high visibility (Delmas & Montes-Sancho, 2010) are also factors that deter greenwashing, given the greater scrutiny and pressure from its customers (Schons & Steinmeier, 2016). However, Ruiz-Blanco et al. (2022) present the opposite conclusion. They show that companies in nearby and high-visibility industries have a more unusual greenwashing behavior than their counterparts in other industries. Despite this divergence, companies in industries that operate closer to customers or with high visibility have minimized greenwashing behavior. Therefore, the research hypotheses are:

H6: Companies in industries that operate closer to customers or with high visibility reduce (a) ESG greenwashing behavior, (b) greenwashing environmental behavior, (c) greenwashing social behavior, and (d) governance greenwashing behavior.

3 METHODOLOGY

Survey data on ESG scores and related pillars come from Bloomberg and Refinitiv systems. The accounting data of the companies come from the Economatica® database. The sample consisted of Brazilian non-financial companies listed on B3 from 2010 to 2021, with scores available on Refinitiv and Bloomberg. The initial period of 2010 allowed the comparability of data resulting from the adoption of international accounting standards in Brazil from that year onwards were adopted. The cut in 2021 was due to data availability. The initial sample of 1,064 observations comprised 130 companies; the final contained 770 observations from 88 companies. Table 1 presents such adjustments. The data were winsorized at 1% to mitigate possible effects of outliers.

Table 1

Sample composition

Description remarks	Observations
Initial Observations	1.064
(-) Loss of observations of companies without Refinitiv or Bloomberg scores	-174
(-) Loss of observations of companies without data from independent directors	-4
(-) Financial sector companies	-116
Final used observations	770

Source: Prepared by the authors



3.1 DEPENDENT VARIABLES

The dependent variable identifies greenwashing behavior when companies disclose a transparent image with large amounts of disclosed ESG data but present unsatisfactory ESG performance (Ruiz-Blanco et al., 2022; Yu et al., 2020). Thus, higher Bloomberg ESG disclosure scores indicate more company transparency, and higher Refinitiv ESG performance scores demonstrate better performance.

Following previous studies, Bloomberg scores measured a company's ESG disclosure (Yu et al., 2020; Yu, Guo & Luu, 2018). Disclosure scores on Bloomberg's ESG Pillars reflect the data the company discloses to the public without assessing its actual ESG performance. The scores range from 0 to 100, meaning a range of companies with no disclosure to those that declare the complete information on all pillars collected.

Refinitiv scores measured the ESG performance of the companies (Yu et al., 2020; Del Bosco & Misani, 2016). Performance scores on Refinitiv's ESG pillars also range from 0 to 100, with higher values representing better ESG performance.

Based on the method proposed by Yu et al. (2020) to quantify the magnitude of a company's ESG greenwashing behavior, equation 1 shows the greenwashing score for each company and year.

$$GW_{it} = PB_{it} - PR_{it} \quad (1)$$

Where:

GW_{it} : ESG greenwashing score relative to peers

PB_{it} : Bloomberg ESG standardized score relative to peers

PR_{it} : Refinitiv ESG standardized score relative to peers

According to Yu et al. (2020), when a company has a Bloomberg disclosure score higher than its Refinitiv performance score, the company is disclosing more ESG information than carrying out concrete ESG actions. Therefore, they have greenwashing behavior. On the other hand, when a company has a Bloomberg Disclosure Score that is less than or equal to its Refinitiv Performance Score, it indicates that the companies disclose as much ESG information as they do, which does not constitute greenwashing behavior. (Yu et al., 2020). To identify in which pillars greenwashing behavior is most affected by supervisory mechanisms, Equation (1)



evaluates greenwashing in the aggregate ESG pillar (GW A_it) and each of the individual pillars – environmental (GW E_it), social (GW S_it) and governance (GW G_it).

There was variation between the distributions of Bloomberg ESG disclosure scores and Refinitiv ESG performance scores. Consequently, to reduce the impact on distributions between scores and reduce the possibility of unfairness in the comparison between sectors sensitive to ESG pillars, led to a standardization of Bloomberg and Refinitiv scores based on year and sector of activity according to the Global Industry Classification Standard (GICS). Bloomberg and Refinitiv scores were divided by 100, so the maximum value for both indicators is 1. Then, the scores were standardized, by sector and year, for the same scales subtracting the mean and dividing by the standard deviation (Yu et al., 2020), as shown in equations 2 and 3.

$$PB = \frac{(D_{it} - \bar{D})}{\sigma_D} \quad (2)$$

$$PR = \frac{(P_{it} - \bar{P})}{\sigma_P} \quad (3)$$

Where:

PB: standardized score relative to Bloomberg disclosure peers

PR: standardized score relative to Refinitiv performance peers

σ_D : standard deviations of the Bloomberg disclosure score

σ_P : standard deviations of Refinitiv performance score

D_{it} : Bloomberg disclosure score of the company i in year t

P_{it} : Refinitiv performance score of the company i in year t

$\bar{D}$: average value of Bloomberg disclosure score

$\bar{P}$: average value of Refinitiv performance score

3.2 INDEPENDENT VARIABLES

To test the hypotheses, following previous research, the mechanisms of governance supervision, cross-listing, and sector of activity were used as explanatory variables to assess common characteristics of companies that could potentially reduce greenwashing behavior.

According to Yu et al. (2020), the supervision of institutional investors directly reduces companies' greenwashing behavior. Thus, the variable engagement of institutional investors



(EII) refers to the percentage of shares held by strategic entities - individuals, corporations, holding companies, government agencies, and investment funds - concerning total capital. Still, according to Yu et al. (2020), the supervision of independent directors can mitigate companies' greenwashing behavior. Thus, the variable presence of independent board members (IBM) represents, in percentage terms, their percentage in the total number of board members.

Pucheta-Martínez and Gallego-Álvarez (2019) concluded that the size of the board of directors influences sustainability reports. Therefore, the board of directors members (BOD) is a natural logarithm ($\ln$) of the total number of board members at the end of the fiscal year. A *dummy* variable indicated cross-listing (CLI) companies in a foreign stock exchange in a given year, according to Yu et al. (2020) and Marquis et al. (2016).

Ruiz-Blanco et al. (2022) identified the following environmentally sensitive industries: pharmaceutical, chemical, mining, metals, paper, transport, oil, and utilities. The standardized GICS classification assigns the variable environmentally sensitive industry (ESI). This variable had a value of 1 for companies in an environmentally sensitive industry and 0 otherwise (Ruiz-Blanco et al., 2022; Marquis et al., 2016).

Ruiz-Blanco et al. (2022) also indicated industries that operate closer to customers or with high visibility: energy utilities, food and beverages, health, household and personal products, retailers, telecommunications, finance, textiles and clothing, waste management and utilities, water, commercial services, consumer durables, and tobacco. Also, the standard GICS classification allowed the assignment of the high visibility and proximity industry variable (VPI). This variable with a value of 1 means a company belonging to an industry with great immediacy and consumer visibility and 0 otherwise (Ruiz-Blanco et al., 2022; Fernandez-Feijoo et al., 2014).

Control variables intended to avoid secondary interferences and ensure greater control of results: return on assets ROA_{it} (Yu et al., 2020; Marquis et al., 2016; Delmas & Burbano, 2011); firm size SIZ_{it} (Harymawan et al., 2021; Yu et al., 2020; Wang & Sarkis, 2017); current liquidity ratio CL_{it} (Yu et al., 2020; and Wang & Sarkis, 2017); leverage LEV_{it} (Harymawan et al., 2021; Yu et al., 2020; Wang & Sarkis, 2017); and the COVID-19 pandemic $COVID_t$ (Cicchello et al., 2022).

The dependent variable quantifies a company's greenwashing behavior by estimating the greenwashing score relative to a company's peers (i) in a year (t). The independent variables evaluate the hypotheses, containing the supervisory mechanisms for analyzing the reduction of greenwashing behavior. Control variables are measures used in previous sustainability research,



greenwashing, or ESG report analysis. Therefore, equation 4 shows the model proposed in the study.

$$GW_{it} = \beta_0 + \beta_1 EII_{it} + \beta_2 IBM_{it} + \beta_3 TCA_{it} + \beta_4 CLI_{it} + \beta_5 ESI_{it} + \beta_6 VPI_{it} + \beta_7 ROA_{it} + \beta_8 SIZ_{it} + \beta_9 CR_{it} + \beta_{10} LEV_{it} + \beta_{11} COVID_t + \varepsilon_{it} \quad (4)$$

The model is the same to estimate effects on the four pillars of ESG dimensions: aggregated ESG (GW_ESG_A_{it}), greenwashing environmental (GW_E_{it}), greenwashing social (GW_S_{it}), and greenwashing governance GW_G_{it}).

This study used the main tests for detecting heteroscedasticity: Breusch-Pagan and White (Murteira & Castro, 2018). According to Yu et al. (2020), the estimation models used Generalized Least Squares – GLS (Generalized Least Squares – GLS) method. Considering that the covariance of the errors is unknown, an estimation version of the GLS - Feasible Generalized Least Squares (FGLS) - was used for heteroscedasticity and independent correlation (Reed & Ye, 2011).

4 RESULTS

Table 2 reports the results of descriptive statistics considering 770 observations, representing 88 companies, for all variables under analysis between 2010 and 2021.

Table 2

Descriptive analysis

Variables	Mean	SD	Min	P25	Median	P75	Max
GW_ESG_A	0.01	0.51	-1.30	-0.28	0.01	0.33	1.38
GW_E	0.02	0.52	-1.12	-0.33	0.00	0.32	1.38
GW_S	0.01	0.62	-1.59	-0.37	0.00	0.39	1.52
GW_G	-0.01	0.66	-1.50	-0.51	0.00	0.45	1.50
EII	0.55	0.18	0.12	0.42	0.55	0.67	0.98
IBM	0.37	0.23	0.00	0.21	0.36	0.52	1.00
BOD	2.24	0.36	1.10	1.95	2.20	2.48	3.14
CLI	0.30	0.46	0.00	0.00	0.00	1.00	1.00
ESI	0.45	0.50	0.00	0.00	0.00	1.00	1.00
IPV	0.58	0.49	0.00	0.00	1.00	1.00	1.00
ROA	0.04	0.09	-0.34	0.01	0.05	0.08	0.36
SIZ	16.64	1.18	13.98	15.87	16.52	17.37	20.44
CL	1.73	0.89	0.40	1.13	1.55	2.08	5.99
LEV	0.66	0.35	0.16	0.48	0.62	0.76	2.60
COVID	0.15	0.36	0.00	0.00	0.00	0.00	1.00

Note: GW_ESG_A - Greenwashing ESG Aggregate; GW_E - Greenwashing Environmental; GW_S – Greenwashing Social; GW_G - Greenwashing Governance; EII – Engagement of Institutional Investors; IBM – Independent Board Members; BOD - Board of Directors Members; CLI - Cross Listing, ESI - Environmentally



Sensitive Industry; IPV - Industry of Great Proximity and Visibility by Customers; ROA - Return on Assets; SIZ - Company Size; CL - Current Liquidity; LEV - Leverage; and COVID - COVID-19 Pandemic.

Source: Prepared by the authors

When the greenwashing ESG, environmental (E), social (S), and governance (G) scores have a positive average, it means that the company is greenwashing in these pillars, as its ESG disclosure score relative to peers is higher than in your ESG performance score. The presented results show that, on average, the aggregate, environmental and social ESG pillars scores were positive. That is, they explained greenwashing behavior in these pillars. On the other hand, the score on the governance pillar showed a negative sign, inferring that, on average, there was no greenwashing for this pillar, as governance performance was better than disclosed.

Table 3 aims to identify the activity sectors that showed, on average, greenwashing behavior. A higher, positive value in the mean score per sector indicates higher greenwashing behavior.

Table 3

Greenwashing mean by sector

GICS Sector	Observ.	%	GW_ESG_A	GW_E	GW_S	GW_G
Communication services	33	4.3%	0.01	0.01	0.00	0.03
Consumer discretionary	118	15.3%	0.04	0.00	0.01	-0.07
Consumer staples	101	13.1%	0.00	0.11	0.09	-0.01
Energy	49	6.4%	-0.06	-0.06	-0.04	0.01
Health care	53	6.9%	0.01	0.02	0.05	0.03
Industrials	99	12.9%	0.00	0.01	0.01	-0.03
Information technology	20	2.6%	-0.02	-0.01	0.00	-0.02
Materials	111	14.4%	0.11	0.09	-0.05	0.07
Real estate	25	3.2%	0.01	-0.01	0.00	0.00
Utilities	161	20.9%	-0.05	-0.01	0.02	-0.03
Total of observations	770	100.0%				

Note: GW_ESG_A - Greenwashing ESG Aggregate; GW_E - Greenwashing Environmental; GW_S - Greenwashing Social; GW_G - Greenwashing Governance.

Source: Prepared by the authors

Thus, results show that, on average, materials companies have the highest ESG greenwashing score compared to other sectors (0.11), as identified by Yu et al. (2020). Furthermore, the aggregated ESG greenwashing behavior in the materials sector was reflected, mainly by the greenwashing identified in the environmental (0.09) and governance (0.07) dimensions.

Pearson's correlation confirmed no degree of a linear relationship. That means no identified variable could predict or explain another variable under analysis. Moreover, the Variance Inflation Factor (VIF) tested negatively for multicollinearity.



The presence of heteroscedasticity was confirmed using Breusch-Pagan and White tests (Murteira & Castro, 2018). Therefore, the results were analyzed using the GLS method and the FGLS estimator, considering heteroscedasticity and independent correlation (Yu et al., 2020; Reed & Ye, 2011). Table 4 contains the results of the estimates made for the aggregate and individual ESG pillars (environmental, social, and governance) to identify which supervisory mechanisms common in companies reduce greenwashing behavior.

Table 4

Regression estimation for each pillar

Variables	GW_ESG_A	GW_E	GW_S	GW_G
EII	-0.18**	-0.01	-0.16*	-0.15
IBM	-0.03	0.12**	-0.25***	-0.04
BOD	0.08**	0.01	0.09	-0.05
CLI	0.19***	0.14***	0.13***	0.03
ESI	-0.13***	-0.06**	-0.09***	0.10**
IPV	-0.02	0.03	0.03	0.06*
ROA	-0.24*	0.12	-0.20	0.13
SIZ	0.00	0.03***	-0.05	-0.04***
CL	0.06***	0.00	-0.00***	0.05**
LEV	0.08*	-0.01	-0.01	0.14***
COVID	-0.08**	0.00	0.05	-0.08

Note1: GW_ESG_A - Greenwashing ESG Aggregate; GW_E - Greenwashing Environmental; GW_S – Greenwashing Social; GW_G - Greenwashing Governance; EII – Engagement of Institutional Investors; IBM – Independent Board Members; BOD - Board of Directors Members; CLI - Cross Listing, ESI - Environmentally Sensitive Industry; IPV - Industry of Great Proximity and Visibility by Customers; ROA - Return on Assets; SIZ - Company Size; CL - Current Liquidity; LEV – Leverage; and COVID – COVID-19 Pandemic.

Note2: *, ** and *** represent significance at 10%, 5% and 1%, respectively.

Source: Prepared by the authors

The regression results revealed a significant negative coefficient to measure the effect of institutional investor engagement (EII) on aggregated and social greenwashing ESG behavior, confirming the expected reduction in aggregate and social greenwashing ESG behavior of hypotheses H1a and H1c. However, supervision through institutional investors was not statistically significant for reducing greenwashing in the environmental and governance pillars, so hypotheses H1b and H1d failed to be confirmed.

The results differed when analyzing the supervision mechanism in the presence of independent board members (IBM). There was no significant result for the reduction of greenwashing in the aggregate ESG (H2a) and governance (H2d) pillars, and it was positive and significant in the environmental pillar (H2b). However, the coefficient was negative and significant in the social pillar (H2c). That said, on average, the presence of independent board members has reduced greenwashing social behavior, as expected.



The board size (BOD) did not show the expected result, as they had a significant positive coefficient in the aggregate ESG greenwashing reduction aspect (H3a). It did not show a significant effect in the analysis of greenwashing reduction in the environmental (H3b), social (H3c) pillars, and governance (H3d). The results for cross-listing (CLI) did not meet the expectations of this study, as the coefficients identified were significantly positive for the reduction of aggregated (H4a), environmental (H4b), and social (H4c) ESG greenwashing and not significant in the analysis of greenwashing reduction governance (H4d).

The results show that companies in environmentally sensitive industries (ESI) have a lower greenwashing behavior when analyzing the aggregated (H5a), environmental (H5b), and social (H5c) ESG pillars. However, greenwashing governance (H5d) showed a significant positive coefficient, implying that insertion in this environmentally sensitive industry is insufficient to reduce greenwashing governance.

Additionally, the results revealed that companies belonging to an industry with proximity or high customer visibility (IPV) do not necessarily reduce greenwashing. The results showed no statistically significant effect on the pillars ESG (H6a), environmental (H6b), and social (H6c). Still, there was a positive and significant coefficient to the governance pillar (H6d), inferring just an increase in governance greenwashing. Regarding the control variables, there was no constant interference in the four greenwashing dimensions surveyed. Table 5 consolidates the hypotheses tested.

Table 5

Hypotheses tests results for each pillar

Variable	Expected Signal	GW_ESG_A (a)	GW_E (b)	GW_S (c)	GW_G (d)
EII	H1 (-)	(-)**	(-)	(-)*	(-)
IBM	H2 (-)	(-)	(+)**	(-)**	(-)
BOD	H3 (-)	(+)**	(+)	(+)	(-)
CLI	H4 (-)	(+)**	(+)**	(+)**	(+)
ESI	H5 (-)	(-)**	(-)**	(-)**	(+)**
IPV	H6 (-)	(-)	(+)	(+)	(+)*

Note1: GW_ESG_A - Greenwashing ESG Aggregate; GW_E - Greenwashing Environmental; GW_S - Greenwashing Social; GW_G - Greenwashing Governance; EII – Engagement of Institutional Investors; IBM – Independent Board Members; BOD - Size of the Board of Directors; CLI – Cross-Listing, ESI - Environmentally Sensitive Industry; and IPV - Industry of Great Proximity and Visibility by Customers.

Note2: *, ** and *** represent significance at 10%, 5% and 1%, respectively.

Source: Prepared by the authors



5 DISCUSSION

The results supported the reduction of greenwashing through the engagement of institutional investors in the ESG and social pillars, which aligns with Yu et al. (2020) findings. That indicates that companies are less likely to engage in ESG greenwashing when institutional investors exercise greater oversight over a company's ESG performance and transparency. No significant results confirmed the reduction of greenwashing in the environmental and governance pillars through the engagement of institutional investors.

The results show that the reduction of greenwashing through the presence of independent directors occurs only in the social pillar, which is in line with the results of Cuadrado-Ballesteros, Rubio, and Ferrero (2015). However, in a survey carried out by the CVM (2022) to choose ESG investments, the following stand out: environmental (84.8%), governance (76.6%), and social (75.9%). That shows less concern for the social dimension, which may lead to a lack of transparency in company disclosures. There was no evidence of greenwashing reductions in the ESG and governance pillars due to the presence of independent directors, which contradicts the results of Yu et al. (2020). Regarding the decrease of greenwashing in the environmental pillar, the significant positive impact observed infers that the presence of independent directors increases or is incapable of reducing environmental greenwashing. The result supports those who claim that shareholders, through their representatives on boards, will probably exert more significant pressure to avoid disclosing broad information and carrying out environmental actions since these can increase a company's costs and, consequently, hurt the price of its shares.

The reduction of environmental, social, and governance greenwashing linked to the size of the board was not confirmed. Additionally, although such effect was significant in ESG greenwashing, the positive coefficient was contrary to expectations, which implies that board size enhances ESG greenwashing behavior instead of reducing it. Moreover, evidence shows that the larger the size of the board, the greater the presence of shareholder representatives. That adheres to the results of Kim and Lyon (2015), indicating the privilege of the economic dimension in the board's decisions.

Cross-listing, contrary to expectations, increased ESG, environmental and social greenwashing behavior. The results differ from Del Bosco and Misani's (2016) and Yu et al.'s (2020) findings. They identified a reduction in greenwashing in companies associated with cross-listing, suggesting that companies are more likely to be transparent regarding the amount of ESG data disclosed to the public in such conditions. That might be due to the company's



intention to reduce its foreignness liability in external capital markets. The results suggest that companies with shares in foreign markets may be overvaluing their ESG actions to attract foreign capital, even in the face of reputational risks and foreign investor oversight. No significant result pointed out the reduction of greenwashing governance due to cross-listing, in this case in line with the results of Del Bosco and Misani (2016).

Companies in environmentally sensitive industries had reduced ESG aggregate, environmental, and social greenwashing behavior, but not for governance. The ESG theme has gained prominence driven by the global awareness of the impact of climate change due to the environmental effects often caused by companies (CVM, 2022). Marquis et al. (2016) have shown that companies potentially more harmful to the environment, particularly those in countries more exposed to scrutiny and global regulations, are less likely to engage in selective disclosure. The results also align with Ruiz-Blanco et al. (2022), who showed that companies in environmentally sensitive industries have less global, environmental, and social greenwashing. As for the governance pillar, the results were contrary to expectations. That may indicate a detachment between value generation, more focused on controls and financial issues, and ESG awareness, due to the market being increasingly oriented to environmental and social dimensions.

The results rejected the hypotheses of reducing ESG, environmental and social greenwashing for companies in industries that operate closer to customers or with high visibility. Regarding the governance pillar, although significant, it showed an unexpected negative signal. This result is consistent with that identified by Ruiz-Blanco et al. (2022), indicating that proximity or visibility may not be strong enough to overcome incentives for greenwashing. Companies in this group can leverage their visibility or proximity to their stakeholders to build their image. These relationship characteristics would make it easier for companies to manage their stakeholders and manipulate their perceptions.

In short, the results showed that no oversight mechanisms studied consistently impact the four dimensions evaluated - aggregate ESG and individually environmental, social, and governance pillars. That may reflect the heterogeneity of the companies in the sample, as each company has potential and strengths and weaknesses in different pillars. Even so, the results indicate that the most effective governance oversight mechanisms to reduce greenwashing are the engagement of institutional investors and independent directors, which can help encourage investor proactivity. The results suggest a reduction in greenwashing in environmentally sensitive industries. A plausible explanation is that these sectors are subject to more significant



legal and regulatory pressure, which can drive ESG policymakers to improve sectoral regulatory instruments.

6 CONCLUSIONS

The results of this study indicated that the 88 publicly traded Brazilian companies studied, in general, are less sensitive to the reduction of greenwashing behavior – aggregated ESG and in each pillar – than expected. Also, environmentally sensitive industries are less prone to greenwashing behavior, and their exposure to customers does not reduce this behavior.

There are convergences and divergences with previous findings in the greenwashing literature. The results showed contradictory outcomes when evaluating the three pillars and their aggregate. That may indicate that ESG practices are still evolving, even in publicly traded companies, or that the content of disclosures, non-regulated in Brazil, leads to the disclosure of unclear or subjective information, intentionally or not. Thus, speech and action are not uniform and do not yet contribute to discarding greenwashing behavior. These conclusions are limited since they derive from the two ESG disclosure and action indicators (Bloomberg's and Refinitiv's).

Considering Brazil's political, economic, and social context, this study contributes to ESG policymakers, managers, and investors' decisions to reduce greenwashing behavior and guide the sustainable development of Brazilian companies. Hence, additional research is needed, as the sample only included publicly traded Brazilian companies listed on B3 with ESG ratings calculated by Bloomberg and Refinitiv. Therefore, extending this study to other publicly traded and privately held companies may bring additional insights. Using said ratings may also have led to some bias in the results. Future research should use data from other ESG assessment companies. For instance, the greenwashing behavior might be investigated among companies with B certification, which stems from a global movement to measure companies' socio-environmental impact actions, assessing whether this status has produced concrete socio-environmental steps.

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