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Environmental policy and stakeholder engagement: Incident-based, cross-country analysis of firm-level greenwashing practices

Judit Lilla Keresztúri[1] | Edina Berlinger[1,2] | Ágnes Lublóy[3]

[1]Institute of Finance, Corvinus University of Budapest, Budapest, Hungary

[2]Department of Finance, University of Luxembourg, Esch-sur-Alzette, Luxembourg

[3]Department of Accounting and Finance, Stockholm School of Economics in Riga, Rīga, Latvia

Correspondence
Judit Lilla Keresztúri, Institute of Finance, Corvinus University of Budapest, Fővám tér 8, Budapest 1093, Hungary.
Email: lilla.kereszturi@uni-corvinus.hu

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Abstract

In this study, we investigate how internal and external monitoring systems can help combat greenwashing. We propose a novel, incident-based measure to investigate the greenwashing behavior of 1218 large and mid-cap companies across different industries between 2008 and 2020. These companies are constituents of the MSCI World Index, covering 23 developed market economies. We consider a company to be engaged in greenwashing if it improves its environmental ESG subscore while simultaneously being responsible for severe environmental damage. According to our greenwashing indicator, about 7% of the companies were involved in greenwashing at least once during the 13-year sample period. The proportion of greenwashing companies is highest in the energy, utilities, and materials industries. We find evidence that both internal and external monitoring mechanisms can be effective in deterring companies from adopting greenwashing strategies. Firms with more independent board members, attracting more attention from the investors, and headquartered in countries where the population is more environmentally aware are significantly less likely to engage in greenwashing. The awareness of the population is a key factor especially in the energy, utility, and material sectors.

KEYWORDS
decoupling, environmental incidents, environmental policy, ESG rating, greenwashing, monitoring, stakeholder engagement, sustainable development

JEL CLASSIFICATION
D22, G34, M14, Q50, Q56

1 | INTRODUCTION

In parallel with the popularity of ESG ratings, a new alarming, investor misleading practice has emerged: greenwashing. Greenwashing can be defined as the act or practice of making a product, policy, or activity appear to be more environmentally friendly or less environmentally damaging than it really is (Meriam Webster, 2023). ClientEarth (2024) published several infamous greenwashing cases, including Chevron, a multinational energy company that is often included in ESG investment portfolios, whereas it has been criticized for misleading communication and its frequent involvement in large environmental controversies. The company has faced a class action lawsuit for

massive pollution in the Ecuadorian Amazon rainforest, contributing to deforestation and negatively impacting local ecosystems (Pellegrini et al., 2020). The whole legal process has been marked by extensive legal maneuvers and allegations of misconduct by both sides. Such incidents raise concerns not only about the capacity of global institutions to hold large multinational companies responsible but also the accuracy of ESG ratings and their ability to reflect the actual environmental performance of corporations.

Firm-level greenwashing can be defined as either selective disclosure or decoupling. Selective disclosure means that firms' sustainability reports are biased in the sense that they emphasize positive but irrelevant aspects of the firm's operation while underweighting highly relevant but negative aspects (L'Abate et al., 2023; Marquis et al., 2016). Another definition of greenwashing, called decoupling, is based on contrasting overly positive green communication with poor environmental performance (Delmas & Burbano, 2011; Jones, 2019). Positive green communication can be performed using written words (reports and press releases), spoken word (press conferences and interviews), and nonspoken communication (photographs and illustrations). In parallel with the popularity of ESG ratings, for several companies, communicating ESG-related information has emerged as a new corporate priority. The importance of creating an effective ESG communication strategy has increased; numerous websites list ESG communication best practices and advisory services help deliver ESG communications strategies (e.g., Anderson, 2022; ESG Communications, 2023; Kidd, 2021). Poor environmental performance can manifest in dangerous interference with the climate system (greenhouse gas emissions, increased aerosol concentrations); affecting human health through the environment (water and air pollution, inappropriate waste and hazardous material management, radiation); and affecting ecosystem vitality (biodiversity and habitat and deforestation) (Wolf et al., 2022).

Greenwashing has been identified as one of the main impediments to the green transition, as it creates distorted incentives and undermines social trust (Delmas & Burbano, 2011; Gatti et al., 2019; Jones, 2019). Consequently, greenwashing has garnered increased attention from policymakers and now lies in the heart of regulatory debates (ESMA, 2023, 2024; Randazzo & Perozzi, 2023). In our research, we address how internal and external monitoring systems can help combat greenwashing. We investigate the role of these monitoring systems in a cross-country and cross-industry analysis. Although recent empirical evidence shows that board characteristics are associated with greenwashing, the evidence is inconclusive (Chen & Dagestani, 2023; Frendy & Koike, 2023; Velte, 2023a; Yu et al., 2020). At the same time, the impact that external monitors (such as investors, analysts, the media, regulators, and the general population) may have on corporate greenwashing is under-researched. In this study, we contribute to the vast and rapidly growing literature on greenwashing (Velte, 2023a) in at least three ways.

Our main contribution to the literature is the development of an incident-based greenwashing indicator that can be used for global comparisons. Our indicator belongs to the category of "empty green claims and policies" (Jones, 2019) as it captures the disconnection between the firm's environmental performance (as reflected in an environmental loss event) and its environmental communication (as reflected in the environmental subcomponent of the ESG score). Our indicator has the advantage of objectively measuring a firm's poor environmental performance. If the firm's responsibility is established, it indicates corporate misconduct—a critical concern for responsible and impact investors.

In the empirical literature, as reported by Velte (2023a), three primary methods were employed to detect greenwashing in large-scale global analyses. The first branch of studies relies on the Trucost database and measures only the selective corporate disclosure aspect of greenwashing while disregarding the actual environmental performance of the firm. The second approach uses the decoupling measure proposed by Yu et al. (2020) and contrasts the firm's environmental communication with its performance. However, this approach treats industry differences inconsistently and contrasts disclosure and performance data from different providers (Bloomberg and Refinitiv) that employ varying methodologies. The third approach employs incident-based decoupling-type indicators. Here, some studies rely on the RepRisk database, (actual incidents are detected by content analysis techniques relying on artificial intelligence), while others use legal databases on environmental penalties (e.g., the Violation Tracker in the US) (Ghitti et al., 2023; Li & Wu, 2020), but existing methods face several drawbacks. The RepRisk's approach is highly complex, less transparent, and gives significantly different results than human experts' assessments (ESMA, 2023); while environmental penalty databases typically cover only one country. Hence, despite the promise of incident-based decoupling-type indicators; this research line remains underrepresented (Ghitti et al., 2023; Raghunandan & Rajgopal, 2022). We fill this research gap by developing an incident-based greenwashing indicator, relying on the comprehensive and standardized SAS Global OpRisk database. We argue that the proposed greenwashing measure is well-founded theoretically, objective, transparent, scalable, and it is able to capture relevant aspects of greenwashing—a complex and multi-faceted phenomenon.

The SAS Global OpRisk database is a particularly rich source of information for several reasons (Berlinger et al., 2021). On the one hand, it provides a global coverage, enabling us to examine multiple countries, unlike previous studies that were restricted to specific data from individual countries (Ghitti et al., 2023). On the other hand, it collects data across all industries using consistent definitions (damage types, industry, business line, etc.). Moreover, it specifies the source of the damage (legal liability, regulatory action, restitution, write-downs, etc.), allowing us to assess the firm's responsibility for environmental harm. Furthermore, it provides information on the timing of the misconduct (the first and last years).

While our novel greenwashing measure facilitates a data-driven approach across various industries and countries, it does so by narrowing our focus to a specific subset of potential greenwashing activities. First, we focus exclusively on firm-level greenwashing, disregarding product-level misleading advertising practices. Second, we aim to detect decoupling, the disconnection between environmental communication and performance, thereby excluding cases of

selective disclosure. Third, we concentrate on environmental communication and performance, even though several authors extend greenwashing definitions to the other two components of the ESG framework (e.g., Lee & Raschke, 2023; Marquis et al., 2016; Ruiz-Blanco et al., 2022; Tashman et al., 2019; Yu et al., 2020). Fourth, green communication is proxied by improvements in the Environmental score of a firm's ESG rating based on Refinitiv data, excluding other communication channels such as advertisements, labels, signatures, public speeches, visual effects, and logos. ESG rating may be an effective channel of positive green communication. Firms can, for example, easily manipulate the information set available to the rating agencies (Yang, 2022). Although manipulation does not guarantee a good rating, it may increase the probability of obtaining one (Yang, 2022). Firms may change their external disclosure and reporting practices to please sustainability rating agencies (Clementino & Perkins, 2021). Note that Refinitiv scores are relative indicators, reflecting a firm's position relative to its peers. Therefore, if all firms in an industry improve their E scores purely for greenwashing purposes, our measure would not detect greenwashing. Our measure is thus designed to capture idiosyncratic rather than systemic firm behavior. Fifth, poor environmental performance is proxied by incidents like environmental degradation, hazardous material release, explosion, fire, machinery and implement damage, product failing, and malfunction caused by the firm. Therefore, when evaluating firms' environmental performance, we disregard the business-as-usual impacts of their operation, for example, CO_2 emissions, the (over)use of nonrenewable inputs, and the (non)recyclability of the outputs. Furthermore, if a firm operates irresponsibly without incidents, or if incidents are concealed, our measure will not signal greenwashing. In particular, we consider only those incidents where the firm's responsibility has been established by a legal court or regulatory body. If a firm avoids legal charges, it will not be detected as greenwashing by our measure. However, if an incident is revealed and published, it will be included in the SAS database in a standardized way; hence the proposed greenwashing measure is transparent and objective.

Second, we contribute to the literature by providing a lower bound estimate for the frequency of this type of greenwashing on a global sample. Previous research has focused on either particular industries or specific countries (Kim & Lyon, 2015; Lee & Raschke, 2023; Mahoney et al., 2013; Uyar et al., 2020; Walker & Wang, 2012). A large part of greenwashing activities eludes detection, posing considerable challenges in combating them. Although our greenwashing measure signals only the tip of the iceberg, we find that about 7% of the large and mid-cap companies, constituents of the MSCI World Index were involved at least once in greenwashing between 2008 and 2022. This ratio is extremely high (>40%) in the energy sector. The MSCI World Index has 1218 constituents and covers approximately 85% of the free float-adjusted market capitalization in each of the 23 developed market economies (MSCI, 2023). Hence, our sample is representative of publicly traded firms in developed countries. In addition, the sample period covers a full business cycle, from the great financial crisis to the burst of the Covid-19 pandemic.

Third, we contribute to the literature on the determinants of greenwashing by examining the role of internal and external monitoring, using our incident-based greenwashing indicator. Several authors studied the relationship between monitoring and greenwashing, including international samples (Velte, 2023a). Generally, it has been found that better monitoring reduces the risk of greenwashing, but different studies highlighted different aspects of the monitoring systems (board diversity, reporting, institutional investors, quality of country-level governance, etc.). To date, an incident-based indicator that captures a firm's legal responsibility has not been used for global analysis for this purpose. Our study is comprehensive also in the sense that we examine a wide array of explanatory variables found relevant in the literature. We assess the role of five corporate governance variables in greenwashing: the board size, the proportion of independent board members, the gender diversity of the board, the attendance rate at the board meetings, the CEO not being a board member, and sustainability reporting practices. In addition, we also investigate the role of several external monitors on shaping corporate greenwashing strategies. For example, we look at company-specific, mostly stock market related constructs such as the proportion of equity capital freely available to ordinary investors (free float), market liquidity, or the number of analysts following the company. At the same time, we also investigate the association between several country-specific measures and greenwashing: the level of press freedom, regulatory quality, the environmental awareness of the population, the level of globalization, and the legal system.

We find that, in addition to independent board members and stock market investors, the general public (including consumers and investors) also plays an important role in monitoring. Where public environmental awareness is higher, the likelihood of greenwashing is significantly reduced, particularly in strictly regulated and capital-intensive sectors such as energy, utilities, and materials. Our empirical results are consistent with previous literature and align with the legitimacy, agency, adverse selection, and fraud triangle theories, suggesting that the proposed incident-based greenwashing indicator can capture the essential aspects of greenwashing. Therefore, our findings may serve as a basis for data-driven policy design and implementation.

2 | LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1 | Theoretical background

Jones (2019) provided a detailed typology of greenwashing varieties such as selective disclosure, empty green claims and policies, dubious certifications and labels, coopted NGO endorsements and partnerships, ineffective public volunteer programs, misleading narratives or discourse, and misleading visual imagery. Except for selective disclosure, all these practices are characterized by decoupling, that is, the divergence of environmental communications and practices. Decoupling, where companies' communication appears more favorable than

their actual performance, is a significant issue because it deceives consumers, distorts market dynamics, and undermines genuine sustainability efforts. This practice attracts regulatory scrutiny and can lead to severe reputational and financial consequences.

The European Union is a worldwide leader in sustainability regulation. Given that greenwashing is a critical concern in sustainable finance, the European Securities and Market Authority (ESMA) investigated this topic from the investors' perspective (ESMA, 2023 2024; Randazzo & Perozzi, 2023). The final report (ESMA, 2024) identified greenwashing as "a conduct issue as market players are incentivized to gain commercial advantage by misleading consumers/investors" and listed the main drivers in relation to the supervisors (regulatory gaps, inconsistencies, resource constraints, and limited expertise), the firms (lag in transformation and limited incentives), and the investors (data availability problems, lags in literacy, and fragmented labeling landscape). Therefore, greenwashing emerges as a multifaceted phenomenon within a multi-player context.

In the academic literature, greenwashing is explained mostly by the legitimacy and the agency theories. The legitimacy theory suggests that organizations seek to operate within the bounds of societal norms to ensure their actions are perceived as legitimate (Berrêdo et al., 2024; Suchman, 1995; Lee & Raschke, 2023; Mio et al., 2020; Seele & Gatti, 2017). Companies engage in greenwashing as a strategic response to increase societal demand for environmentally responsible behavior. By exaggerating or fabricating their environmental practices, firms enhance their image and gain stakeholder approval, even if their actual performance does not match their claims. Suchman (1995) provided a comprehensive understanding of how organizations gain, maintain, and lose legitimacy by aligning with the interests, norms, and cognitive frameworks of their stakeholders. Pragmatic legitimacy focuses on direct benefits and influence, moral legitimacy on ethical evaluations, and cognitive legitimacy on societal acceptance and integration (Suchman, 1995). Nevertheless, the legitimacy theory alone cannot explain why, in numerous cases, firms aiming at gaining legitimacy do not genuinely adopt green practices but merely pretend to do so (Mio et al., 2020).

Agency theory offers a framework to examine motivations more thoroughly (Jensen & Meckling, 1976; Mio et al., 2020; Tirole, 2010; Velte, 2023a). There are two players in a transaction, a principal and an agent having different interests. The principal has less information about the execution of a transaction, specifically the agent's effort, than the agent (Tirole, 2010). A survey paper on greenwashing depicts the principal-agent problem as a conflict of interests between stockholders (principal) and managers (agents) (Velte, 2023a). However, in reality, there can be many other types of conflicts of interests as well, for example, between creditors and owners (e.g., green bondholders expect an environmentally friendly operation but it is considered as too costly by stockholders), society and owners (e.g., nongovernmental organizations, NGOs aim to advocate for broader stakeholder values, while stockholders prioritize financial profits), or regulators and owners (e.g., the regulator requires transparent environmental reporting whereas the stockholders prefer selective disclosure). Consequently, we posit that extending agency theory to various other instances of principal-agent conflicts is crucial for comprehending the origins of greenwashing.

Information asymmetry, which is the primary cause of the agency problem can lead to another problem, called adverse selection. Firms exhibit distinct characteristics not only in the financial realm but also in the environmental dimension. Insiders (owners and managers) often possess more information about these characteristics than outsiders (potential new investors or sponsors, regulators, or other stakeholders). In the context of greenwashing, this implies that a responsible investor may not know the key characteristics shaping the firm's environmental strategy. For instance, they may be uncertain about the level of commitment from the company's owners and managers toward environmental goals, the firm-level trade-offs between financial and environmental performances, and the availability of relevant technologies (Kaupke & zu Knyphausen-Aufseß, 2023). Therefore, it is possible that financing contracts offered by responsible investors will attract both greenwashers and genuinely green firms, leading to a pooling equilibrium.

We can also examine greenwashing through the lens of the fraud triangle theory (Homer, 2020; Keresztúri et al., 2023). According to this theory, developed in criminology, a fraud is committed only if pressure, opportunity, and rationalization are all present at the same time. In line with the legitimacy theory, companies experience substantial pressure from consumers, investors, and regulators to present themselves as environmentally responsible. When stakeholders have divergent interests, the pressure to engage in greenwashing can be high. Opportunities for greenwashing emerge from asymmetric information, especially when data is scarce, environmental standards lack clarity, enforcement mechanisms are weak or regulatory gaps and inconsistencies exist. Companies may exploit ambiguous terminology and labeling, capitalizing on consumers' or investors' limited understanding of environmental impacts. Companies and individuals engaging in greenwashing may rationalize their actions by downplaying the significance of their deceit, believing that their actions are not truly harmful, or viewing deceptive practices as necessary for business success or competitive advantage.

2.2 | Industry specificities

Based on the theories presented above, we can hypothesize that firms across different industries exhibit varying tendencies toward greenwashing (Ruiz-Blanco et al., 2022). Industries facing intense scrutiny due to their environmental impact, where maintaining a positive public image is crucial, and meeting societal expectations is challenging, are more prone to greenwashing (in line with legitimacy and agency theories) (Berrêdo et al., 2024). Additionally, high information asymmetry, short-term performance pressures, high monitoring costs, and diverse stakeholder demands tempt managers to pursue their own interests (in line with agency theory). Complex operations, less informed stakeholders, and intense competition contribute to increased greenwashing risks (as suggested by adverse selection theory), as do high pressure, ample opportunities for undetected

misconduct, and weak corporate culture (in line with the fraud triangle theory).

Energy suppliers and energy-intensive firms are particularly susceptible to greenwashing due to their critical role in the global energy ecosystem and their substantial environmental footprints (Berrêdo et al., 2024; Heatable, 2023). These companies are under constant public and regulatory scrutiny as they strive to demonstrate their commitment to sustainability (Al-Ubaydli & McLaughlin, 2017). Their high operational complexity and significant carbon emissions associated with their activities create information asymmetry, making it challenging for stakeholders to verify environmental claims. Short-term performance pressures and diverse stakeholder demands further incentivize managers to present a greener image than may be warranted. Moreover, the intense competition and increasing regulatory requirements drive these firms to exploit any opportunity to enhance their environmental credibility, often through misleading or exaggerated claims. The combination of these factors creates a fertile ground for greenwashing practices within the energy sector (Ruiz-Blanco et al., 2022).

At the same time, the desire to obtain cheap financing is high due to the capital intensity of companies supplying energy. Empirical evidence shows that better corporate environmental performance leads to better access to capital and mitigates firms' financing constraints (Agyei-Boapeah et al., 2023; Liu et al., 2021; Wang et al., 2018). Shareholders might put emphasis on the environmental performance of the companies either due to sustainability reasons or because they believe that it is associated with management capabilities and operational performance (Xia et al., 2023). Investors anticipate polluting companies to face significant pollution-related fines and expenses (Sun et al., 2019). All in all, the financial constraints faced by energy supplying companies might put pressure on the firms to appear to be environmentally friendly; and hence to communicate positively about their environmental performance (Delmas & Burbano, 2011; Roulet & Touboul, 2015). In a recent study, Xia et al. (2023) showed that the higher the financing need, the higher the probability of greenwashing. Based on the arguments above, we form the following hypothesis:

> **H1.** Greenwashing is more prominent in energy supplying (oil and gas, and utilities) and energy-intensive (materials, including chemicals, nonferrous metals, cement, and other construction materials) industries.

2.3 | Internal monitors

Regardless of the theoretical perspective, we adopt to analyze greenwashing, the information asymmetry between internal and external stakeholders remains crucial. Consequently, robust internal and external monitoring systems that mitigate information asymmetry can significantly reduce the greenwashing risk.

Boards of directors play a crucial role in shaping corporate strategy and internal monitoring. Boards may engage in greenwashing with profit seeking motives (Cherry & Sneirson, 2010), while moral considerations might deter boards from adopting greenwashing strategies (Blome et al., 2017).

Good corporate governance practices and efficient internal monitoring procedures have been shown to decrease the likelihood of corporate misconduct. Vast empirical evidence shows that there is an association between the quality of corporate governance and the probability of corporate misconduct (Velte, 2023a, 2023b). In a recent systematic review, the author concluded that gender diversity on the board, audit committees, and female CFOs lead to reduced restatements, enforcement actions, and fraud (Velte, 2023b). Some recent empirical evidence suggests that several board characteristics might be associated with greenwashing. For example, Yu et al. (2020) found evidence that a higher share of independent directors reduces greenwashing behavior. Chen and Dagestani (2023) reported that female directors, age diversity, and educational background inhibit, while local directors and political connections promote greenwashing behavior. At the same time, Frendy and Koike (2023) found that firm-level corporate governance characteristics, the ratio of board's independent directors and the ratio of directors' variable compensation, are ineffective in mitigating greenwashing.

Drawing upon the theory and the empirical evidence documenting the link between the quality of corporate governance and the probability of greenwashing, our second hypothesis is formulated as follows:

> **H2.** Companies with stronger internal monitoring systems (a larger, more diverse, and independent board experienced in sustainability reporting) are less prone to greenwashing.

2.4 | External monitors

Corporate external monitors are individuals, organizations, or other entities outside the company who observe, assess, and sometimes influence the company's actions, practices, and performance. They can include stakeholders such as investors, the media, regulatory agencies, consumers, and NGOs. These monitors provide oversight, accountability, and feedback to the company, often helping to ensure transparency, ethical conduct, and adherence to regulations and best practices.

In the case of listed firms, potential investors, short sellers, and analysts can monitor a firm's financial and environmental performance by analyzing financial statements, sustainability reports, and environmental impact assessments (Karpoff & Lou, 2010; Kim et al., 2020). They may also track key performance indicators related to financial metrics (e.g., revenue and profit margins) and environmental factors (e.g., carbon emissions and water usage). Market liquidity is crucial in this monitoring process because it affects the availability and accuracy of information. In liquid markets, there is greater transparency, timely dissemination of financial and environmental information, and efficient price discovery, allowing market players to make more informed decisions.

Journalists and social media play a crucial role in combating corporate greenwashing, as they reveal misleading environmental claims and promote transparency in corporate environmental practices. The

media's scrutiny can hold corporations accountable for their environmental impact, thereby reducing the prevalence of greenwashing (Berlinger et al., 2022; Miller, 2006; Wang et al., 2023).

A range of studies have explored the role of regulation in detecting and preventing corporate greenwashing. For example, Sun et al. (2019) emphasized the need for government regulation, highlighting the effectiveness of a punishment mechanism and calling for binding and enforceable regulation. Gatti et al. (2019) suggested that insufficient regulation can lead to greenwashing and proposed voluntary and mandatory aspects in corporate social responsibility. Several authors highlighted the need for a global framework for ESG reporting to prevent greenwashing (Lokuwaduge & De Silva, 2022).

We also investigate the disciplining role of the environmental awareness of the population in deterring management from greenwashing. It is reasonable to assume that the more environmentally aware the population in a country is, the larger the punishment in case of greenwashing. In the past decade, external pressure to behave responsibly toward the environment has increased dramatically, and the punishment for eco-harmful behavior also increased over time (Flammer, 2013). In case of misconduct, consumers and employees might boycott the firm; investors might put a downward pressure on the stock prices; and regulators can impose fines or other sanctions. Empirical evidence also shows that with the improvement of environmental awareness, companies that are environmentally irresponsible face underinvestment (Zeng et al., 2019). Therefore, the environmental awareness of the stakeholders might indirectly function as a deterrent improving managers' behavior.

Marquis et al. (2016) documented that a greater exposure to foreign investors and consumers, hence strong connections to the global economy lowers the probability of greenwashing. In general, heightened scrutiny from diverse stakeholders across different countries makes it harder for multinational corporations to engage in greenwashing without serious consequences. Furthermore, access to resources enables larger, globally embedded firms to implement robust environmental management systems, reducing the incentives to engage in greenwashing practices.

Based on the arguments above, we form the following hypothesis:

> **H3.** Companies operating in markets with stronger external monitoring institutions (developed financial markets, freer media, stronger regulation, more environmentally aware population, and more openness to global competition) are less prone to greenwashing.

3 | DATA AND METHODS

3.1 | Measurement of greenwashing

We rely on the widely accepted greenwashing definition of Delmas and Burbano (2011), positive communication about the environmental performance and poor environmental performance, when defining our greenwashing measure, a behavior labeled as decoupling in organizational theory (Kim & Lyon, 2015). Companies signaling improvement in their environmental performance through higher E subscore while harming the environment are identified as greenwashers.

In particular, we proxy poor environmental performance by the presence of public operational loss events, as reported in the SAS OpRisk Global database (SAS, 2021), corresponding to the subcategory of damage to physical assets (environmental degradation and hazardous material release, explosion, fire, machinery and implement damage, product failing, and malfunction). SAS OpRisk Global database is the world's most comprehensive and accurate repository of external loss events (SAS, 2015; Wei et al., 2018). The database includes all publicly reported operational losses higher than US $100,000 across all industries worldwide, see some characteristic cases and country-level statistics in Tables S1 and S2, respectively. The sample period ranges from 2008 to 2020, covering a full business cycle between the great financial crisis and the Covid pandemic. In line with Seele and Gatti (2017), we only consider those events where a legal court or a regulator assessed the responsibility of the firm, or the firm acknowledged its responsibility for the environmental damage. In the SAS (2021), when looking at damages to physical assets, 37.19% of the events fall into this category. In the remaining cases, the operational loss event can be considered as purely exogeneous, a sudden and destructive change in the environment without cause from human activity and hence beyond corporate responsibility.

Raghunandan and Rajgopal (2022) and Ghitti et al. (2023) also used incident-based measures; they contrasted the ex-ante ESG communication with the environmental misconduct a firm commits. In their studies, corporate misconduct covered incidents recorded in the Violation Tracker database containing all penalties in the USA over $5000. In our study, however, corporate misconduct is proxied by incidents recorded in the SAS Oprisk Global database, which focuses only on large losses over $100,000 but covers all countries worldwide. Another advantage of the SAS OpRisk Global database is that it provides data not only on the year of penalty (like Violation Tracker), but also the first and the last year of the corporate misconduct. Therefore, we can contrast ESG communication to the actual environmental misconduct more precisely, accounting for the timing. Finally, and most importantly, our comprehensible database provides information on the exact costs of the penalties resulting from irresponsible environmental behavior (regulatory action, legal liability, or restitution), hence, the responsibility of the firms can be assessed objectively.

3.2 | Variables

3.2.1 | Dependent variable

The dependent variable is a dummy variable GW showing whether firm i is involved in greenwashing in year t.

$$GW_{i,t} = \left\{ \begin{array}{l} 1 \text{ if } ((\Delta E_{i,t} > 0) \text{ and } (L_{i,t} > 0)) \\ 0 \text{ otherwise} \end{array} \right\}, \quad (1)$$

where $\Delta E_{i,t}$ is the change in the Environmental subscore of firm i in year calculated from Refinitiv (2022) t and $L_{i,t}$ is the total

environmental loss incurred by firm *i* in year *t* for which the firm was held responsible derived from SAS (2021). If the subsidiary had its own ESG rating, we took that into account; if it did not, then we used the parent company's rating. Corporate misconduct causing environmental damage can persist for one or several years. We assumed that the damages accumulated uniformly between the first year and the last year of the misconduct; hence, we distributed the final losses evenly over the whole period accounting for the changes in the purchasing power parity as well. If a firm was involved in several misconducts in a year, we summed up all those losses. In the main model, we focus on the frequency of greenwashing; hence *GW* is a binary variable.

3.2.2 | Independent and control variables

To test the hypotheses, the independent variables of interest include the industry classification of the companies (H1); and the characteristics of the internal (H2) and external (H3) monitors.

We retrieve the industry classification of the sample companies from Refinitiv. Refinitiv uses a market-based classification system; organizations are assigned an industry on the basis of the market they serve rather than the products or services they offer.

We employ several variables to describe the internal monitoring system. We assess the potential impact of five corporate governance variables on greenwashing, see Table 1. We consider that a larger board size, higher proportion of independent board members, higher attendance rate at the board meetings, and the CEO not being a board member are signs of good corporate governance and internal monitoring practices. In addition, we also assess whether putting emphasis on sustainability reporting is associated with a lower likelihood of greenwashing behavior.

In addition, we assess the associations between the characteristics of external monitors and the company's greenwashing behavior. To capture investors' attention, we include the turnover, free float, bid ask spread, and the number of analysts following the firm's activity; assuming that higher market liquidity and more analysts are the signs of increased investor attention resulting in more disciplined firm behavior. The effect of the media, how efficient journalist are in revealing and/or preventing corporate misconducts, is strongly dependent on the level of press freedom in the country. We measure the level of press freedom (PRESS) by the Word Press Freedom index characterizing the freedom of speech in a country. The World Press Freedom index aggregates the most relevant qualitative and quantitative dimensions: pluralism, media independence, environment and self-censorship, legislative framework, transparency, and infrastructure (RSF, 2022). Regulatory quality (REQ) is measured by one of the six dimensions of the Worldwide Governance Indicator. This indicator characterizes the ability of the government to formulate and implement sound policies and regulations (Kaufmann et al., 2011). The environmental awareness of the population might also deter management from greenwashing. We proxy the environmental awareness of the population by the recycling rate in the country (REC), as suggested by prior research (Guerin et al., 2001; Miranda & Blano, 2010). Global embeddedness is proxied by the KOF Globalization Index (KOFGI) measuring the economic, social, and political dimensions of globalization (Dreher, 2006; Gygli et al., 2019), the most widely used globalization index in the academic literature (Potrafke, 2015).

In addition to the key variables of interest, we include a number of control variables in the regressions. The control variables and their definitions are shown in Table 2.

TABLE 1 Independent variables.

Variable name	Brief definition
Internal monitors	
Board size	The total number of board members at the end of the fiscal year.
Independent board members	Percentage of independent board members as reported by the company.
Board meeting attendance average	The average overall attendance percentage of the board meetings as reported by the company.
CEO board member	Binary variable showing whether the CEO is a board member.
CSR sustainability reporting	Binary variable showing whether the company publishes a separate Corporate Social Responsibility, Heath & Sustainability, or Sustainability report, or a separate section on sustainability in its annual report. CSR section in the annual report must consist of substantial data.
External monitors: company-specific variables	
Turnover value	Natural logarithm of the value of all trades for a stock in a particular year.
Free float	The total amount of share capital freely available to ordinary investors; expressed as percentage of total number of shares.
Bid ask	Bid-ask spread represents the annual average of the daily bid-ask spreads calculated as (Ask − Bid)/((Ask + Bid)/2, similar to Bofinger et al. (2022).
Number of recommendations	The median number of recommendations by investment analysts in a year.
External monitors: country-specific variables	
PRESS	Word Press Freedom index measuring the freedom of speech.
REQ	Regulatory quality, one of the six dimensions of the Worldwide Governance Indicator, retrieved from the database of the World Bank (World Bank, 2022).
REC	Recycling rate, the proportion of post-consumer recyclable materials (glass, plastic, paper, and metal) that is recycled. The indicator is part of the Environmental Performance Index (EPI) describing the state of sustainability around the world (Wolf et al., 2022).
KOFGI	KOF Globalization Index

Abbreviations: KOFGI, KOF Globalization Index; REQ, regulatory quality.

TABLE 2 Control variables.

Variable name	Brief definition
ROA	Return on Assets expressed in percentages, a key measure of profitability. Calculated as (Net income + (Interest expense on debt-interest capitalized)* (1-Tax rate)/(average of last year's and current year's total assets))
Liquidity quick	Quick ratio, a key measure of funding liquidity. Calculated as follows: (Cash & cash equivalents + Net receivables)/Current Liabilities
Cash flow to sales	Funds from operations/Net sales or revenues, expressed in percentages
CAPEX	Capital Expenditures (CAPEX) represent the funds used to acquire fixed assets other than those associated with acquisitions in the current fiscal year. This variable is expressed in percentages of total assets.
Revenue	Natural logarithm of net sales or revenues. It represents gross sales and other operating revenue less discounts, returns, and allowances.
Growth–3 years	Growth rate expressed in percentages; (Current year's net sales or revenues/Net sales or revenues 4 years ago, reduced to a compound annual rate)–1)
Leverage	Total debt less cash and short-term investments to total assets ratio.
Beta	Historical beta; it measures how sensitive stock returns are to the variation in the market returns.
Market-to-book	Valuation metric, the market value of the ordinary (common) equity is divided by the balance sheet value of the ordinary (common) equity.
EV/EBITDA	Valuation metric, the 12-month forward enterprise value is divided by EBITDA (Earnings Before Interest Depreciation and Amortization).

Because of data constraints, we have an unbalanced panel dataset containing the variables outlined in Tables 1 and 2. To explore the available information, we utilize a multivariate imputation technique relying on an iterative Markov chain Monte Carlo method (Little & Rubin, 2020; Stata, 2023).

3.3 | Multivariate analyses

We specify a linear probability panel regression model with firm-level fixed effects as follows:

$$GW_{i,t} = \alpha_i + \sum_k \beta_k Internal_{k,i,t-1} + \sum_l \gamma_l External_{l,i,t-1} + \sum_m \delta_m Controls_{m,i,t-1} + \varepsilon_{i,t}, \quad (2)$$

where $GW_{i,t}$ is the (binary) greenwashing variable for firm *i* in year *t*; α_i is the firm fixed effect that absorbs all firm characteristics that do not change over time, for example, industry and country. $Internal_{i,t-1}$ is the vector of internal monitoring variables of firm *i* in year *t-1*. Similar to this, $External_{i,t-1}$ is the vector of external monitoring variables. Country-level variables (PRESS, REQ, REC, and KOFGI) relate to the country where the headquarter of the firm is registered. $Controls_{i,t-1}$ is the vector of control variables, and $\varepsilon_{i,t}$ is the error term. Standard errors are clustered at a firm level. As we investigate 1218 firms in the MSCI World Index between 2008 and 2022, the total number of firm-year observations is 15,834.

Firms improving their E subscore can be divided into three disjunct categories in each year: greenwasher, eminent, and victim depending on the environmental loss they suffer. If the company is responsible for the loss, it is considered greenwasher (GW); if it suffered no loss, it is called "eminent" (EM); and if it suffered exogeneous losses beyond its responsibility, it is called "victim" (VIC). Similar to the binary GW variable defined in Equation (1), we define binary variables for EM and VIC as well, and similar to the main regression model (2), we perform regression analyses for EM or VIC as a dependent variable. Comparing the results of GW, EM, and VIC regressions, we can better understand the distinctive characteristics of greenwashers.

We also run a number of robustness checks to examine the validity of the results. First, we run a regression model without any imputed data (the number of firm-year observations drops to 4587). Second, we run the same specification as in the main model, but we apply no winsorization. Third, the dependent variable is the severity of the environmental damage in case of greenwashing. Fourth, we lag the improvement of the E subscore by 1 year when defining our binary greenwashing variable. Fifth, we include year fixed effects as well. Finally, we include new (gender) variables to characterize board diversity from a different aspect.

To better understand the phenomenon of greenwashing, we also perform heterogeneity analyses by cutting the sample into two subsets according to some firm characteristics previously absorbed by the fixed effect. Specifically, we estimate Equation (2) separately for firms headquartered in the USA or outside the USA, in the top 50% versus the bottom 50% (measured by market capitalization), and in common law or civil law countries.

4 | RESULTS AND DISCUSSION

4.1 | Descriptive statistics

In this subsection, we provide a lower bound estimate for the frequency of greenwashing across all MSCI World Index constituents, per industry and per country. As firms have strong interests to hide the environmental degradation they cause, we can assume that a large part of the damage remains hidden (Berlinger et al., 2022; Wang et al., 2023). Consequently, we can observe only those greenwashing activities where the environmental damage became public, so all estimates can be considered as lower bounds to actual greenwashing.

As shown in Table 3, around 7% of the companies were involved in greenwashing at least once during the sample period of 13 years. In three industries, the proportion of companies involved in

TABLE 3 Frequency of greenwashing across industries.

Industry	Number of nongreenwasher firms	Number of greenwasher firms	Total number of firms	Proportion of greenwashers within the industry
Energy	28	19	47	40.43%
Utilities	50	19	69	27.54%
Materials	86	10	96	10.42%
Consumer discretionary	117	10	127	7.87%
Consumer staples	86	5	91	5.49%
Health care	118	6	124	4.84%
Industrials	202	10	212	4.72%
Communication services	63	3	66	4.55%
Financials	180	3	183	1.64%
Information technology	128	0	128	0.00%
Real estate	75	0	75	0.00%
TOTAL	1133	85	1218	6.98%

TABLE 4 Frequency of greenwashing per country.

Country	Number of greenwasher firms	Total number of firms	Proportion of greenwashers per country
GERMANY	5	43	11.63%
USA	55	480	11.46%
CANADA	8	70	11.43%
NORWAY	1	10	10.00%
ISRAEL	1	11	9.09%
UNITED KINGDOM	5	73	6.85%
FRANCE	4	60	6.67%
SPAIN	1	16	6.25%
ITALY	1	17	5.88%
AUSTRALIA	2	47	4.26%
JAPAN	2	215	0.93%
SWEDEN	0	36	0.00%
SWITZERLAND	0	36	0.00%
HONG KONG	0	21	0.00%
SINGAPORE	0	16	0.00%
NETHERLANDS	0	15	0.00%
DENMARK	0	14	0.00%
BELGIUM	0	12	0.00%
FINLAND	0	11	0.00%
TOTAL	85	1203	6.98%

Note: Austria, Ireland, Portugal, and New Zealand are not shown in this table due to the low number of companies (less than 10) in the MSCI World Index. As a result, the total number of firms in Table 4 is 1203 instead of 1218, as in the full sample.

greenwashing is much higher than the sample average: (i) energy, typically oil and gas, and related equipment and services, (ii) utilities, mostly multiline water and electric utilities; (iii) materials–metals and mining, construction materials and chemicals subindustries. Additional subindustries with greenwashing frequency higher than 10% include consumer goods conglomerates, freight and logistic services, pharmaceuticals, hotels and entertainment services, food and drug retailing, and telecommunication services.

The frequency of greenwashing per country is shown in Table 4. Countries where the proportion of greenwashing companies, by

TABLE 5 Regression results on greenwashing (1218 MSCI constituents from 23 developed economies).

			Panel A										Panel B			
			Model A1		Model A2		Model A3		Model A4		Model A5		Model B1		Model B2	
Dependent variable:			Greenwasher		Greenwasher		Greenwasher		Greenwasher		Greenwasher		Eminent		Victim	
Group name		Variable name	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*
Internal monitors		Board size	0.00082	0.149	0.00081	0.155	0.00081	0.154	0.00069	0.219	0.00070	0.211	0.00097	0.670	0.00013	0.648
		Independent board members	−0.00013	0.042 *	−0.00004	0.420	−0.00013	0.048 *	−0.00014	0.024 *	−0.00009	0.055	0.00089	0.007 **	0.00001	0.645
		Board meeting attendance average	−0.00018	0.203	−0.00017	0.229	−0.00017	0.238	−0.00014	0.326	−0.00014	0.334	0.00004	0.957	0.00002	0.725
		CEO board member	0.00345	0.295	0.00345	0.297	0.00308	0.351	0.00318	0.338	0.00311	0.350	−0.02002	0.413	−0.00203	0.316
		CSR sustainability reporting	0.00312	0.414	0.00319	0.402	0.00193	0.607	0.00266	0.478	0.00240	0.520	−0.05382	0.000 ***	−0.00009	0.956
External monitors	Company-specific variables	Turnover value	−0.00056	0.588	−0.00055	0.596	−0.00065	0.523	−0.00060	0.557	−0.00062	0.545	0.00148	0.720	0.00026	0.524
		Free float	0.00004	0.763	0.00004	0.738	0.00003	0.786	0.00007	0.564	0.00007	0.589	0.00051	0.349	−0.00006	0.229
		Bid ask spread	0.00011	0.029 *	0.00011	0.034 *	−0.00009	0.089	0.00009	0.081	0.00003	0.494	0.00072	0.000 ***	0.00005	0.070
		N. of recommendations	0.00018	0.611	0.00019	0.591	0.00035	0.329	0.00054	0.134	0.00053	0.137	0.00044	0.746	−0.00015	0.349
	Country-specific variables	PRESS	0.00015	0.223	0.00015	0.210	0.00025	0.042 *	0.00021	0.095	0.00023	0.055	−0.00044	0.385	0.00013	0.025 *
		REQ	0.00652	0.398	0.00692	0.369	0.00642	0.405	0.00607	0.429	0.00631	0.411	−0.08443	0.042 *	−0.00417	0.329
		REC	−0.07600	0.000 ***	−0.07628	0.000 ***	−0.07470	0.000 ***	−0.03463	0.001 **	−0.04128	0.000 ***	0.21690	0.000 ***	−0.00204	0.636
		KOFGI	−0.00079	0.441	−0.00078	0.447	−0.00036	0.726	0.00014	0.892	0.00013	0.902	0.03285	0.000 ***	0.00107	0.026 *
Company specific control variables		ROA	0.00079	0.000 ***	0.00079	0.000 ***	0.00064	0.002 **	0.00054	0.006 **	0.00053	0.007 **	0.00106	0.281	−0.00006	0.595
		Liquidity quick	0.00107	0.197	0.00115	0.163	0.00118	0.160	0.00108	0.201	0.00115	0.171	0.00390	0.597	0.00001	0.991
		Cash flow to sales	−0.00010	0.464	−0.00009	0.471	−0.00005	0.705	−0.00002	0.887	−0.00001	0.907	0.00004	0.948	0.00009	0.326
		CAPEX	0.01942	0.758	0.02290	0.714	0.03666	0.555	0.02224	0.724	0.02895	0.644	0.28160	0.161	−0.01506	0.299
		Revenue	0.01645	0.000 ***	0.01608	0.000 ***	0.01510	0.000 ***	0.00997	0.005 **	0.01045	0.004 **	0.11468	0.000 ***	0.00136	0.229
		Growth—3 years	0.00005	0.697	0.00005	0.685	0.00003	0.762	0.00010	0.377	0.00009	0.433	−0.00002	0.954	0.00002	0.597
		Leverage	−0.00002	0.024 *	−0.00002	0.026 *	−0.00001	0.201	−0.00001	0.298	−0.00001	0.379	−0.00005	0.317	0.00000	0.554
		Beta	−0.00230	0.561	−0.00237	0.548	−0.00064	0.869	−0.00288	0.442	−0.00229	0.542	0.01242	0.374	−0.00378	0.022 *
		Market-to-book	0.00072	0.082	0.00070	0.088	0.00036	0.350	0.00022	0.544	0.00018	0.622	−0.00045	0.801	−0.00010	0.680
		EV/EBITDA	−0.00004	0.663	−0.00004	0.631	−0.00003	0.711	0.00003	0.788	0.00002	0.876	0.00340	0 0.000***	0.00002	0.826
		Industry × Independent board members			−0.00062	0.066					−0.00030	0.319				
		Industry × Bid ask spread					0.00095	0.000 ***			0.00030	0.079				
		Industry × REC							−0.23826	0.000 ***	−0.19831	0.000 ***				
Number of observations			15,834		15,834		15,834		15,834		15,834		14,729		14,729	

Note: Models A1-A5. Greenwasher: The dependent variable is a binary variable indicating whether the company is categorized as "greenwasher" (1) or not (0). Greenwasher companies increased their environmental subscore and at the same time they were held responsible for environmental damage. Model B1. Eminent: The dependent variable is a binary variable indicating whether the company is categorized as "eminent" (1) or not (0). Eminent companies increased their environmental subscore and at the same time they were not involved in any environmental damage. Model B2. Victim: The dependent variable is a binary variable indicating whether the company is categorized as "victim" (1) or not (0). Victim companies increased their environmental subscore and at the same time they suffered an exogeneous environmental damage (no corporate responsibility).

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

headquarter, are above 10% include Canada, Germany, Norway, and the USA.

In the Appendix A, we present the descriptive statistics of the independent variables (minimum, maximum, standard deviation, and mean) separately for greenwasher and nongreenwasher companies.

4.2 | Regression results

Table 5, Panel A presents the regression results from the main model (Model A1). We find that the number of independent board members, the bid-ask spread on the stock market, and the recycling rate (REC) are associated with greenwashing. Therefore, we can observe significant associations in each category: internal monitoring, company-level, and country-level external monitoring.

The number of independent board members, a proxy for internal monitoring, is negatively associated with the likelihood of greenwashing. If the ratio of independent board members (in percentage) is larger by 100 (the highest difference within a firm in the sample), then the likelihood of greenwashing is by $100 \times -0.00013 = 0.013$, that is 1.3 percentage point lower.

The bid-ask spread on the stock market, a proxy for the (lack of) investor attention, is positively associated with the likelihood of greenwashing. If the bid ask spread is 99.99 basis point higher (the highest difference within a firm in the sample), that is investors are less active in monitoring the firm, then the likelihood of greenwashing is by $99.99 \times 0.00011 = 0.011$, that is 1.1% point higher.

We also find evidence that the recycling rate (REC), a proxy for the environmental awareness of the population in the country of the firm's headquarter, is negatively associated with the likelihood of greenwashing. If the rate of recycling is by 1.1 percentage point higher (the highest difference within a country in the sample), then the likelihood of greenwashing is by $1.1 \times -0.076 = 0.084$, that is 8.4% point lower.

The signs of the coefficients are in line with H2 and H3: more effective monitoring is associated with a lower level of greenwashing. Relative to the overall greenwashing frequency (6.98%), all coefficients are significant in economic sense as well. Hence, we find strong empirical evidence for the deterrence effect of independent board members, investors, and the population. The awareness of the population seems to be the most impactful factor; however, this characteristic might be the most difficult to change (the within country variance of the REC variable is very low relative to the between country variance in our sample).

In Models A2-A5, we investigate the interactions between the significant monitoring variables (number of independent board members, bid-ask spread, REC) and the industry. The industry dummy variable takes the value of 1 if the firm is in the energy, utilities, or minerals industries, and 0 otherwise. Panel A of Table 5 suggests that the deterrence effect of the environmental awareness of the population (REC) is the strongest in those industries where we can observe the highest number of greenwashing scandals.

In the next step, we divide the sample of firms improving their Environmental subscores into three disjunct subsets depending on whether they suffered an environmental loss or not, and if they did, whether the loss was endogenous or exogenous. Table 5 summarizes the regression results for greenwashers (endogenous loss, Model A1), eminent companies (no loss, Model B1), and victims (exogeneous shocks, Model B2).

When comparing Model A1 with Model B1, we can see that there are differences among greenwasher and eminent companies, the latter invested in sustainability and hence received a higher Environmental subscore from the rating agencies while not causing any environmental damage. Eminent companies typically have higher valuation metrics (EV/EBITDA), higher proportion of independent board members, and do not publish a separate CSR report or an extensive sustainability section in the annual report. From the country-specific monitoring variables, the level of globalization, measured by the KOFGI index, and the recycling rate REC, are positively and significantly associated with the likelihood of being eminent. It is important to note that in the main model of greenwashers (Model A1), the coefficient of the recycling rate is negative, while in the model of eminent companies (Model B1), the respective coefficient is positive. In the former case the environmental awareness of the population deters management from greenwashing, while in the latter case the environmental awareness of the population stimulates managers to invest in sustainability.

In Model B2, we focus on companies called victims, which invested in sustainability resulting in higher Environmental subscore but suffered an exogenous environmental loss event (e.g., natural catastrophe). The model outcomes show that the characteristics of greenwashers (Model A1) are different from the characteristics of the victims (Model B2). Victims are more prevalent in countries with freer media (PRESS), more embedded in the global economy (KOFGI) and typically have lower beta; all these variables were insignificant in Model A1.

Table 6 shows the regression results from the robustness checks (Models R1–R6). The results mostly confirm the findings from Model A1 (the main regression). In the robustness checks, the number of independent board members is associated negatively and significantly with the likelihood of greenwashing, except for Model R1 (no imputation) and Model R5 (smaller firms). The bid-ask spread is positively and significantly associated with the likelihood of greenwashing in Model R2 (without winsorization) and R5 (with time fixed effects). The environmental awareness of the population proxied by the recycling ratio (REC) is in a significant negative relationship with the probability of greenwashing in all models, albeit in Model R1 (no imputation) only at $p = 7.6\%$. Note that in Model R1, the sign of the coefficients of the key variables of interest are the same as in the main model; the lack of statistical significance can be due to the drastic decrease in the number of observations, as no imputation is applied.

Table 7 displays the results of the heterogeneity analysis. The ratio of independent board members is significant in the subsample of large firms outside the USA. The bid ask spread is significant for large firms both within and outside the USA. The recycling ratio (REC) is

TABLE 6 Robustness checks on greenwashing (1218 MSCI constituents from 23 developed economies).

			R1		R2		R3		R4		R5		R6	
			Without imputation		Without winsorization		Greenwashing severity		Lagged E subscore improvement		With time fixed effects		With additional board diversity variables	
Group name		Variable name	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*
Internal monitors		Board size	−0.0001	0.947	0.0010	0.087	0.0005	0.576	0.0006	0.293	0.0008	0.166	0.0009	0.160
		Independent board members	−0.0001	0.874	−0.0001	0.040 *	−0.0003	0.034 *	−0.0001	0.033 *	−0.0001	0.082	−0.0002	0.022 *
		Board Gender Diversity											−0.0002	0.269
		Executive Members Gender Diversity											−0.0001	0.767
		Board Meeting Attendance Average	−0.0004	0.139	−0.0001	0.205	−0.0004	0.133	−0.0003	0.040 *	−0.0002	0.193	−0.0001	0.740
		CEO Board Member	0.0036	0.319	0.0033	0.317	0.0112	0.319	0.0052	0.126	0.0032	0.338	0.0047	0.297
		CSR Sustainability Reporting	0.0018	0.630	0.0027	0.472	0.0089	0.188	0.0077	0.024 *	0.0031	0.422	0.0075	0.124
External monitors	Company-specific variables	Turnover Value	−0.0007	0.757	−0.0005	0.596	−0.0008	0.716	−0.0003	0.806	−0.0006	0.538	−0.0004	0.717
		Free Float	0.0005	0.118	0.0001	0.647	0.0000	0.973	0.0000	0.695	0.0000	0.772	0.0000	0.904
		Bid Ask	0.0001	0.336	0.0001	0.035 *	0.0001	0.238	0.0001	0.063	0.0003	0.003 **	0.0001	0.083
		N. of recommendations	0.0009	0.367	0.0002	0.601	−0.0002	0.754	−0.0001	0.766	0.0001	0.727	0.0001	0.740
	Country-specific variables	PRESS	0.0007	0.133	0.0001	0.216	0.0001	0.621	0.0001	0.292	0.0005	0.007 **	0.0003	0.048 *
		REQ	0.0120	0.328	0.0089	0.248	0.0301	0.104	0.0109	0.168	0.0157	0.075	0.0099	0.241
		REC	−0.0414	0.076	−0.0727	0.000 ***	−0.1073	0.000 ***	−0.0741	0.000 ***	−0.0678	0.000 ***	−0.0847	0.000 ***
		KOFGI	0.0001	0.958	−0.0005	0.619	−0.0048	0.060	−0.0021	0.044 *	0.0015	0.391	0.0003	0.796
Company specific control variables		ROA	0.0004	0.122	0.0005	0.000 ***	0.0018	0.002 **	0.0007	0.001 **	0.0008	0.000 ***	0.0009	0.001 **
		Liquidity quick	0.0019	0.296	0.0005	0.258	0.0041	0.164	0.0005	0.598	0.0010	0.205	0.0010	0.325
		Cash Flow to sales	−0.0002	0.508	0.0000	0.181	−0.0003	0.228	−0.0001	0.370	−0.0001	0.496	−0.0001	0.428
		CAPEX	0.1832	0.037 *	0.0133	0.766	0.1534	0.151	0.0347	0.559	0.0167	0.790	0.0237	0.759
		Revenue	0.0213	0.007 **	0.0114	0.001 **	0.0303	0.007 **	0.0193	0.000 ***	0.0164	0.000 ***	0.0162	0.001 **
		Growth—3 years	−0.0001	0.554	0.0000	0.295	0.0000	0.992	0.0000	0.949	0.0001	0.650	0.0001	0.565
		Leverage	0.0000	0.455	0.0000	0.535	0.0000	0.029 *	0.0000	0.007 **	0.0000	0.018 *	0.0000	0.035 *
		Beta	0.0131	0.049 *	−0.0027	0.448	−0.0033	0.663	−0.0001	0.980	−0.0026	0.505	−0.0032	0.507
		Market-to-book	0.0001	0.534	0.0000	0.945	0.0011	0.097	0.0008	0.045 *	0.0008	0.062	0.0008	0.087
		EVEBITDA	0.0000	0.864	0.0000	0.948	−0.0003	0.139	0.0001	0.521	0.0000	0.765	−0.0001	0.564
Number of observations			4587		15,834		15,834		15,834		15,834		15,834	

Note: Model R1: Without imputation. We apply no imputation techniques for the estimation of missing data; hence we lose most of the observations. Model R2: No winsorization. We keep all observations in the sample. Model R3: Greenwashing severity. The dependent variable is the loss severity in greenwashing. Model R4: Lagged E subscore improvement. The greenwashing variable is calculated by lagging the E subscore by 1 year. Model R5: With time fixed effects. We also included year fixed effects into the main regression. Model R6: With additional diversity variables. We add two gender diversity variables, the Board Gender Diversity and Executive Gender Diversity.

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

TABLE 7 Heterogeneity analysis.

			S1		S2		S3		S4		S5		S6	
			Without USA		Only USA		TOP50%		Bottom 50%		Common law countries		Civil law countries	
Group name		Variable name	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*
Internal monitors		Board size	0.0005	0.292	0.0017	0.203	0.0010	0.345	0.0003	0.365	0.0012	0.201	0.0003	0.548
		Independent board members	−0.0001	0.046 *	−0.0002	0.191	−0.0004	0.007 **	0.0000	0.560	−0.0001	0.721	−0.0001	0.084
		Board Meeting Attendance Average	0.0000	0.883	−0.0006	0.064	−0.0002	0.475	0.0000	0.817	−0.0003	0.172	0.0000	0.933
		CEO Board Member	0.0001	0.980	0.0141	0.065	0.0094	0.273	0.0003	0.613	0.0068	0.221	0.0004	0.930
		CSR Sustainability Reporting	0.0038	0.152	−0.0027	0.694	0.0087	0.352	−0.0007	0.770	0.0022	0.682	0.0056	0.019 *
External monitors	Company-specific variables	Turnover Value	0.0002	0.848	−0.0010	0.489	−0.0012	0.585	0.0001	0.891	−0.0009	0.496	0.0006	0.591
		Free Float	0.0003	0.036 *	−0.0006	0.054	0.0002	0.421	−0.0001	0.145	−0.0001	0.574	0.0002	0.117
		Bid Ask	0.0001	0.017 *	0.0008	0.000 ***	0.0002	0.039 *	0.0000	0.722	0.0002	0.055	0.0001	0.315
		N. of recommendations	0.0007	0.143	0.0003	0.619	0.0003	0.641	0.0000	0.829	0.0000	0.988	0.0008	0.145
	Country-specific variables	PRESS	−0.0001	0.557			0.0004	0.074	−0.0001	0.091	0.0001	0.652	0.0001	0.279
		REQ	−0.0019	0.864			0.0116	0.444	−0.0006	0.850	0.0125	0.184	−0.0059	0.718
		REC	−0.0168	0.045 *			−0.1227	0.000 ***	−0.0122	0.045 *	−0.0689	0.000 ***	−0.0561	0.057
		KOFGI	−0.0015	0.142			0.0011	0.590	−0.0010	0.125	−0.0050	0.066	−0.0004	0.720
Company specific control variables		ROA	0.0004	0.023 *	0.0017	0.001 **	0.0014	0.008 **	0.0001	0.241	0.0011	0.001 **	0.0002	0.275
		Liquidity quick	0.0006	0.349	0.0016	0.324	−0.0001	0.975	0.0006	0.248	0.0014	0.236	0.0002	0.790
		Cash Flow to sales	0.0000	0.713	−0.0009	0.024 *	−0.0001	0.560	0.0000	0.583	−0.0003	0.182	0.0001	0.387
		CAPEX	0.0083	0.882	0.1461	0.283	0.0347	0.806	0.0269	0.619	0.0583	0.537	−0.0197	0.506
		Revenue	0.0003	0.889	0.0265	0.003 **	0.0185	0.009 **	0.0023	0.282	0.0243	0.000 ***	−0.0008	0.729
		Growth – 3 years	0.0002	0.119	0.0003	0.275	0.0001	0.683	0.0000	0.742	0.0001	0.583	0.0001	0.288
		Leverage	0.0000	0.090	0.0000	0.191	0.0000	0.090	0.0000	0.397	0.0000	0.079	0.0000	0.089
		Beta	0.0026	0.467	−0.0037	0.582	0.0034	0.668	−0.0034	0.079	−0.0060	0.249	0.0055	0.232
		Market-to-book	0.0003	0.170	0.0010	0.209	0.0012	0.330	0.0002	0.475	0.0008	0.122	0.0005	0.079
		EVEBITDA	0.0000	0.596	−0.0004	0.061	−0.0006	0.001 **	0.0001	0.111	0.00004	0.810	−0.0001	0.186
Number of observations			9594		6240		7917		7917		9438		6396	
Y			86		145		213		18		187		44	

Note: Model S1: Without USA. We include all firms having headquarters outside the USA. Model S2: Only USA. We include all firms having headquarters in the USA. Model S3: Top 50% by market capitalization. We include large firms having higher market capitalization than the median. Model S4: Bottom 50% by market capitalization. We include small firms having lower market capitalization than the median. Model S5: Common Law countries. We include firms having headquarters in common law countries. Model S6: Civil law countries. We include firms having headquarters in civil law countries. Scandinavian systems are classified as civil law.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

significant in each investigated subsample (though only at $p = 5.7\%$ in civil law countries).

4.3 | Discussion

4.3.1 | Industry specificalities

We document that the proportion of companies involved in greenwashing is much higher than the sample average in the energy, utilities, and materials industries (metals and mining, construction materials, and chemicals subindustries). Out of the 427 greenwashing incidents in our sample, 294 (68.85%) are related to these industries. As a result, we accept H1. Our findings are in line with ESMA (2023) reporting that the occurrence of greenwashing controversies tends to be concentrated within a few sectors and firms but their method to detect greenwashing (combination of manual identification and RepRisk data) gave a lower ratio (19%) of the controversies in these sectors. Our greenwashing measure is narrower in the sense that we focus only the environmental aspects, while ESMA (2023) covered E, S, and G incidents. The stronger the environmental focus of the greenwashing definition, the more likely incidents are to concentrate in the energy, utility, and minerals industries. For example, the nine infamous greenwashing cases ClientEarth examined are linked 100% to large multinational firms operating in the energy, utilities, and materials sectors (ClientEarth, 2024). ClientEarth is a radical nonprofit environmental law organization that uses the power of the law to protect the planet, often engaging in litigation and advocacy efforts to hold governments and corporations accountable for their environmental impacts.

Relying on the legitimacy, agency, adverse selection, and fraud triangle theories, there are a number of plausible explanations as to why companies in these industries are more prone to greenwashing. First, energy suppliers are typically subject to stricter regulation and supervision. The 10 most regulated industries include oil and gas extraction, electric power generation, transmission, and distribution, and petroleum and coal products manufacturing (Al-Ubaydli & McLaughlin, 2017; Kaupke & zu Knyphausen-Aufseß, 2023)—industries identified as prone to greenwash in this research. Given the tight regulation and supervision, regulators can reveal an environmental violation with a higher probability. In line with the legitimacy and agency theories, in these industries, due to the pressure to comply with regulations, firms are more prone to falling into the trap of decoupling.

Second, media coverage of an environmental damage caused by energy, utilities, and materials companies is also expected to be extensive both due to the increasing importance of sustainability efforts and the large size of the companies. As a result of the media acting as a watchdog (Miller, 2006; Wang et al., 2023), companies in energy supplying and energy-intensive industries typically cannot keep the environmental damage or degradation in secret; the probability of an environmental loss event being detected, hence included in the SAS (2021) database is higher.

Third, firms in the oil and gas, utilities, and mining industries might make significant efforts to improve their environmental subscore, and hence total ESG score, with the aim of obtaining cheap financing. Cheap financing is crucial for companies in these industries due to their asset intensity. As shown in the literature, better corporate environmental performance is associated with lower financing constraints (Agyei-Boapeah et al., 2023; Liu et al., 2021; Wang et al., 2018). As a result, the higher the financing constraints, the higher the pressure for improved environmental performance. At the same time, the higher the pressure, the higher the probability of greenwashing—communicating better environmental performance than the actual performance to mislead the public and investors (Xia et al., 2023). This misleading communication might take several forms. First, firms might turn to selective disclosure—not communicating the negative environmental events (L'Abate et al., 2023). Firms can rather easily manipulate the information set available to the rating agency (Yang, 2022). Second, firms might undertake some light improvement in their processes and procedures, which again leads rating agencies to grant a higher Environmental subscore. Firms might turn to these light improvements instead of substantial investments in green projects and sustainability due to the high cost of green investments (Kaupke & zu Knyphausen-Aufseß, 2023).

4.3.2 | Internal monitors

We find evidence that companies with more independent board members are less prone to greenwashing. As a result, we accept H2. However, gender-related diversity variables (board gender diversity and executive gender diversity), are insignificant in all settings.

Our findings confirm two recent empirical studies suggesting that some board characteristics might be associated with greenwashing (Chen & Dagestani, 2023; Yu et al., 2020). In a similar vein, Yu et al. (2020) found evidence that a higher share of independent directors reduces greenwashing behavior. In both studies, the authors used a different greenwashing measure—a score showing the difference between the firm's relative position to its peers regarding the amount of information disclosed and the firm's actual ESG performance. The sample of Chen and Dagestani (2023) included companies listed in China only, while the sample of Yu et al. (2020) included the constituents of the MCSI All Country World index from 47 emerging and developed market economies. Although our greenwashing measure (contrasting the improvement of the E subscore and environmental damage the firm is responsible for) and our sample (companies from developed economies only) are different from the ones used in previous research, results are robust, which underpins the external validity of our findings.

The finding that a higher ratio of independent board members is associated with a lower likelihood of greenwashing supports the notion that independent directors can provide more effective oversight. In general, independent directors are less likely to have conflicts of interest and are more focused on protecting shareholders' interests. This aligns with agency theory, which suggests that independent

directors can mitigate agency problems by monitoring management more rigorously, thus ensuring that corporate actions align with shareholder interests.

The effectiveness of internal monitoring systems may differ across the USA and other developed countries, as well among firms of varying sizes, and between countries with common or civil law systems (La Porta et al., 1998). However, the heterogeneity analysis in Table 7 did not reveal large differences in this regard. Our results indicate that CSR reporting can increase the frequency of greenwashing in civil law countries. In line with legitimacy theory, this can be explained by the stricter environmental regulations in the EU where most civil law countries are located (Randazzo & Perozzi, 2023).

In practical terms, our finding implies that enhancing the independence of boards could be a crucial mechanism for reducing deceptive environmental practices. Firms should consider strengthening their governance structures by increasing the proportion of independent directors to enhance transparency and accountability in their environmental reporting.

4.3.3 | External monitors

We also find evidence that the bid-ask spread and the recycling ratio (REC) are associated with greenwashing, and therefore we accept H3.

When the *bid-ask spread* is wider, it indicates that the market for the given stock is less liquid, meaning it receives less attention from investors and analysts. Our results suggest that in less liquid markets, the probability of greenwashing is significantly higher (Model A1). Investors, especially short sellers, thus may serve as important monitors (Karpoff & Lou, 2010; Kim et al., 2020). In the robustness checks, this finding holds mostly for large nonUS companies.

The finding that wider bid-ask spreads, indicative of lower liquidity, are positively associated with greenwashing incidents can be interpreted through the lens of market attention theory (Hirshleifer & Teoh, 2003). According to this theory, less liquid stocks attract fewer investors and analysts' scrutiny, providing a fertile ground for companies to engage in greenwashing with a lower risk of being detected.

The practical implication here is that investors and regulators should pay closer attention to firms in less liquid markets as they might be more prone to misrepresent their environmental performance. Increased surveillance and stringent disclosure requirements for such firms could mitigate the risk of greenwashing in low-liquidity environments.

Our findings show that the recycling rate, a proxy for the environmental awareness of the population may have a strong deterrence effect; it retains managers from greenwashing. This finding holds both in the main model (Model A1) and in all but one robustness checks (Models R2–R6); the coefficient of the REC variable is significant and negative. If the environmental awareness of the population is high, it may deter managers from greenwashing either because they fear consumer or investor boycotts or they internalize the values of the society themselves. This is especially relevant in the energy, utilities, and minerals industries, see interactions between the industry dummy and the recycling ratio in Models A4 and A5.

At the same time, we also document that the environmental awareness of the population can stimulate the management to invest in genuine sustainability projects as the coefficient of the REC variable is significant and positive in Model B1 (eminent companies).

The environmental awareness of the population in general and of stakeholders in particular, might indirectly function as a deterrent to greenwashing. High recycling rates indicate a population that values environmental sustainability, exerting social pressure on companies to adhere to genuine environmental practices. Presumably, the more environmentally aware the population, and hence the key stakeholders (consumers, investors, and regulators) in a country are, the larger the punishment is case of corporate misconduct. Flammer (2013) reported that external pressure to behave responsibly toward the environment has increased dramatically over time in parallel with the punishment for eco-harmful behavior. In case of misconduct, investors typically sell their shares and put downward pressure on the stock prices, and the company faces underinvestment (Caiazza et al., 2023; Zeng et al., 2019). The more environmentally aware investors are, the larger the punishment, and hence the stronger the deterrence effect. Hence, in societies where environmental consciousness is high, companies are less likely to engage in greenwashing due to the fear of consumer backlash, investor divestment, and potential regulatory penalties.

From a practical standpoint, this implies that policies aimed at raising public environmental awareness and engagement can indirectly curtail corporate greenwashing. Companies in these contexts might also be more inclined to invest in authentic sustainability initiatives to align with societal values, further reducing the incidence of greenwashing.

4.3.4 | Limitations and future research

This research has some limitations. First, greenwashing might take several forms (Jones, 2019). To measure greenwashing, we proxy the positive communication with an increase in the Environmental subscore. Nevertheless, positive communication might take other forms as well, for example, retaining the negative information and exposing the positive information; a form of communication, which was beyond the scope of this research. Second, we relied on the ESG rating provided by one rating agency only. Nevertheless, Berg et al. (2022) showed that ESG ratings diverge, and this divergence is substantial when looking at the ESG ratings based on data from six prominent ESG rating agencies. Third, firms' environmental performance can also be measured in different ways. We focus on environmental damage where corporate responsibility is manifested in legal liabilities, regulatory actions, or restitutions. As firms have strong interests in hiding misconducts, not all damage become public. Further research may develop techniques to estimate the hidden part of corporate environment damage as well.

Fourth, we investigate companies from developed economies only. Our findings might not be applicable to emerging market economies due to institutional differences, including the level and depth of environmental, recycling, and sustainability efforts. In addition, corporate governance practices also differ greatly between developed and emerging market economies. Future research might assess whether our findings hold for emerging market economies with different institutional environment and corporate governance practices.

Fifth, we examine large and mid-cap companies only. Future research might investigate whether firms with smaller size are more or less inclined to engage in ESG greenwashing.

Finally, various factors may affect companies' greenwashing behavior, factors which were beyond the scope of this research. The panel regression technique with fixed effects, lagged explanatory variables, and firm-level clustered errors mitigate the potential bias from omitted variables, as reflected also in the robustness checks. However, further research may investigate the role of other independent variables such as strong civil liberties and political rights due to higher exposure to scrutiny, and low level of corruption due to the more influential public interests in those countries (Marquis et al., 2016; Yu et al., 2020). Several other informal monitors not addressed in this study (e.g., activist groups and NGOs) might also play a role in holding greenwashers accountable (Delmas & Burbano, 2011; Kim & Lyon, 2015; Marquis et al., 2016). Market external drivers, including consumer demand, investor demand, and competitive pressure, might also put pressure on firms to appear to be environmentally friendly and thus face incentives to communicate positively about their environmental performance (Delmas & Burbano, 2011; Roulet & Touboul, 2015). At the same time, proximity to consumers, high visibility, and high reputation might have a strong deterrent effect as well (Delmas & Burbano, 2011; Marquis et al., 2016).

5 | CONCLUSIONS

Greenwashing undermines trust in society, hampers the transition to the green economy, and consequently causes huge welfare losses.

We investigate greenwashing behavior among 1218 large and mid-cap companies being part of the MSCI World Index covering 23 developed market economies. We introduce a novel measure for greenwashing relying on the definition of Delmas and Burbano (2011): positive communication about environmental performance and poor environmental performance. Companies might emphasize and communicate improvements in their ESG Environmental subscore, while at the same time they are responsible of severe environmental damage.

According to our greenwashing measure, about 7% of the companies were involved in greenwashing at least once during the sample period of 2008–2020. The proportion of companies involved in greenwashing was the highest in the energy, utilities, and materials industries. We find evidence that both internal and external monitoring can be effective in deterring companies from greenwashing. Specifically, a higher number of independent board members, a higher level of investors' attention (reflected in more liquid stock markets), and a higher environmental awareness of the population can mitigate the risk of greenwashing significantly.

Better governance systems have two opposing effects: more effective detection and deterrence simultaneously. As monitoring improves, more greenwashing incidents become public, but it also deters the management from engaging in greenwashing strategies. Our results suggest that this latter deterrence effect is dominant; it is so robust that it can even outweigh the (hidden) detection effect.

The findings of this study carry important implications for several stakeholders. Policymakers should be aware that firms in particular industries are more prone to greenwashing, and hence might need special attention and regulation. Greenwashing cases should be communicated widely to ensure that managers learn from these misconducts, improve corporate governance systems, and hence foster competitiveness, economic growth, and sustainability. Most importantly, policymakers should enhance the environmental awareness of the population. More environmentally aware residents in a country have less negative impact on the environment, and they are effective in deterring management from greenwashing as well. The findings of this study are relevant for the regulators as well; they have interest in preventing and revealing greenwashing incidents—incidents misleading the public and the investors.

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ORCID

Judit Lilla Keresztúri https://orcid.org/0000-0003-1407-242X
Edina Berlinger https://orcid.org/0000-0002-8264-0823
Ágnes Lublóy https://orcid.org/0000-0002-3701-1876

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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APPENDIX A: Descriptive statistics of the independent and control variables

			Number of observations		Min		Max		Std. dev.		Mean		Wilcoxon rank sum test for the equality of median *p*-value
		Variable name	Greenwasher	Nongreenwasher	Greenwasher	Nongreenwasher	Greenwasher	Nongreenwasher	Greenwasher	Nongreenwasher	Greenwasher	Nongreenwasher	
Internal monitors		Board size	190	12,889	5.00	5.00	22.00	22.00	4.10	3.42	12.66	11.38	0.0001
		Independent board members	221	13,831	0.00	0.00	100.00	100.00	21.33	27.43	75.37	64.08	0.0000
		Board Meeting Attendance Average	215	11,273	75.00	75.00	100.00	100.00	10.22	10.54	84.93	87.74	0.0000
		CEO Board Member	222	13,307	0.00	0.00	1.00	1.00	0.27	0.34	0.92	0.87	0.0215
		CSR Sustainability Reporting	231	14,382	0.00	0.00	1.00	1.00	0.36	0.45	0.84	0.72	0.0000
External monitors	Company-specific variables	Turnover Value	72	10,518	10.71	10.65	22.27	22.27	2.93	2.51	15.80	17.04	0.0072
		Free Float	230	15,531	22.00	22.00	100.00	100.00	14.76	19.60	89.64	81.71	0.0000
		Bid Ask	231	15,603	−0.01	−0.01	98.43	98.43	32.90	31.75	43.43	20.13	0.0000
		Number of recommendations	230	15,372	4.00	2.00	39.00	39.00	7.56	8.21	21.36	17.03	0.0000
	Country-specific variables	PRESS	231	15,603	48.22	0.00	100.00	100.00	12.17	17.80	80.11	72.96	0.0000
		REQ	231	15,603	0.78	0.78	1.87	2.13	0.18	0.27	1.48	1.46	0.3091
		REC	231	15,603	11.50	11.47	52.56	52.68	12.30	12.48	21.86	23.00	0.0032
		KOFGI	231	15,603	72.14	66.91	89.19	90.67	3.25	4.96	82.42	81.95	0.3195
Company specific control variables		ROA	231	15,510	−17.74	−17.74	30.41	30.41	5.37	6.86	6.40	6.52	0.7697
		Liquidity quick	228	12,700	0.13	0.13	3.34	7.09	0.53	1.11	0.88	1.29	0.0000
		Cash Flow to sales	231	15,587	−1.70	−19.40	53.53	72.62	9.99	15.07	18.05	19.49	0.7272
		CAPEX	231	15,603	0.00	0.00	0.18	0.19	0.04	0.04	0.07	0.04	0.0000
		Revenue	231	15,596	14.61	11.55	18.90	18.90	1.19	1.51	17.17	15.71	0.0000
		Growth − 3 years	231	15,523	−17.32	−23.55	63.28	63.28	11.88	12.65	7.53	7.17	0.8517
		Leverage	231	15,589	0.00	−407.86	999.86	999.86	116.98	171.19	98.57	104.57	0.2240
		Beta	230	15,569	0.15	0.09	2.66	2.66	0.47	0.49	0.99	1.03	0.1123
		Market-to-book	229	15,364	0.39	−11.36	23.70	23.70	2.30	3.94	2.24	3.06	0.0003
		EV/EBITDA	231	14,441	2.13	−4.19	21.38	51.40	3.29	7.41	7.56	11.15	0.0000