



Not all that glitters is green: empirical evidence from the Eurostoxx600 on stakeholders' perception of greenwashing

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Abstract

Greenwashing refers to the deceptive practice where a company exaggerates or misrepresents the sustainability of its actions or projects. Given the ambiguity surrounding the methodologies behind conventional ratings, we enquire their robustness through the implementation of an alternative comprehensive measure entailing both internally disclosed and externally generated data. We address a notorious critique in greenwashing research—that the entire voluntary CSR approach inadvertently facilitates the diffusion of greenwashing. We make a unique contribution to the statistical methodology by breaking down the difference between internal and external perception of sustainability through regression analysis. We claim that only when the presence of CSR Committees is coupled with tangible initiatives boosting sustainability, both external and internal stakeholders are found to positively evaluate the sustainable commitment of a company.

Keywords Sustainability · Social responsibility · CSR · ESG · Sustainable finance

1 Introduction

In investment decisions, integrating Environmental, Social, and Governance (ESG) factors involves channelling capital and savings towards companies and projects that prioritize sustainability. This entails supporting environmentally friendly initiatives (Environment), ensuring the well-being and inclusion of workers (Social) and promoting diversity and gender equality in governance positions (Governance). The moment when investments align with these principles is referred to as sustainable finance [11].

In the aftermath of the Great Recession, sustainable finance gained popularity as a way of combining social responsibility with corporate governance. A growing number of companies have been actively participating in sustainable

initiatives, responding conscientiously to the call for action from their stakeholders [15]. Notably, the Wall Street Journal reports a significant uptick in the percentage of companies disclosing ESG information, rising from 56% in 2022 to 63% in 2023.¹ From investors and consumers to governments and corporate customers, stakeholders are increasing the pressure on companies to disclose information about their environmental and social performance [32]. In line with the Nielsen Media Research which reported that customers are willing to pay more when they perceive firms as socially responsible², Grimmer and Bingham [28] show that customers are more likely to buy at a higher price from socially responsible firms.

Despite the growth in interest in sustainable finance, a comprehensive and systematic research on the evolution of this phenomenon, specifically regarding its impacts on stakeholders, is still needed [42]. Matter of factly, a major caveat persists in the lack of standardization, which may lead to a challenging, if not deceiving, interpretation of ESG ratings. Barely a month goes by without a high-profile firm being accused of misleading communications about its environmental activities or sustainable performance [14].

Specifically, when scholars compare ESG ratings across leading financial providers, they find a divergence in results

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¹ See here the Wall Street Journal.

² See the Nielsen Media Research (2015) here.

[12] or a low correlation between Refinitiv and S&P ESG scores, despite these metrics purportedly assessing the same aspects [3]. As companies lack defined targets and standards for presenting data [21], rating agencies are left free to decide upon their own methodology.³ The lack of transparency stemming from this context heightens the risk for investors to be potentially misinformed or misled, thus channelling their investments towards companies that only claim to support green or social initiatives, without achieving any tangible results. In summary, stakeholders face the risk of greenwashing, a deceptive practice where a company exaggerates or misrepresents the sustainability of its actions or projects [11].

Concerns about greenwashing practices have raised concurrently with the rampant adoption of green practices. One of the most notorious critiques is that the entire voluntary Corporate Social Responsibility (CSR) approach inadvertently facilitates the diffusion of greenwashing [24]. While the enhancement of CSR is supposed to boost the share of green initiatives pursued by a company, the lack of standardized rules or common guidelines is likely to pave the way to misleading forms of green communication.

Drawing from a well-established literature, we enquire the institutional complexity underlying the substantial versus symbolic adoption of environmental practices. First, we assess the incentives and deterrents a company generally faces when greenwashing. Next, we focus on the interplay between external and internal stakeholders, evaluating the differences in the respective evaluations of a company engagement in sustainability practices. Given the ambiguity surrounding the methodologies behind conventional ESG ratings, we test for the robustness of standardized black-box scores offered by financial providers by implementing an alternative measure entailing both internal and external stakeholders' perception of sustainability. Our main contribution addresses the notorious critique that the entire voluntary CSR approach inadvertently facilitates the diffusion of greenwashing. We make a significant contribution by outlining how internal versus external stakeholders' perception of CSR differs.

The paper is organized as follows: in Sect. 2 we discuss the relevant literature, in Sect. 3 we describe the data and

the relevant methodology, in Sect. 4 we report our empirical evidence, and finally, we draw our conclusions.

2 Literature review

Sustainable finance typically entails the integration of Environmental, Social, and Governance (ESG) considerations into corporate management, financial decision-making and investors' portfolio choices [37]. The correct integration of the three ESG pillars into corporate practices involves channelling capital and savings towards companies and projects prioritizing sustainability. This entails supporting initiatives that are not "only" environmentally friendly (E), but also ensure the well-being and inclusion of workers (S) and promote diversity and gender equality in governance positions (G) [11].

In line with this perspective, out of the 17 Sustainable Development Goals (SDGs) defined by the United Nations (UN), three exclusively address environmental concerns, while the remaining address socioeconomic concerns for the promotion of future prosperity [50]. Similarly, Sheehy [44] argues that sustainability should encompass environmental as well as sociopolitical aspects, ultimately aiming at the enhancement of labour conditions.

While there is evidence that the enhancement of sustainable consumption and production not only benefits the society as a whole, but also the economic performance of those firms implementing it [36, 40], companies might be inclined to disseminate misleading information about their ESG performance in the attempt to influence stakeholders' perceptions, a phenomenon commonly known as greenwashing. We adopt the definition coined by [11] and define greenwashing as the deceptive communication practice wherein a company exaggerates or misrepresents the sustainability of its actions or projects.⁴

Numerous researchers have extensively investigated this phenomenon. In their groundbreaking research, [18] develop a comprehensive and well-known analysis of the external, organizational, and individual drivers of greenwashing. Being firms faced with "market external drivers" of greenwashing, they are demanded by both consumers and investors to be environmentally friendly and to engage in sustainable initiatives. As consumers and investors increasingly pressure firms to be environmentally friendly, the likelihood of firms enhancing their sustainable performance through misleading

³ When it comes to the methodology, two main aspects can be considered: (I) the indicators included in each pillar and (II) the weights given to each indicator. By indicators, we refer to the aspects included by providers in the evaluation of ESG final scores. For instance, Refinitiv accounts for around 50 indicators in the evaluation of E such as "Targets Emissions" or "Biodiversity Impact Reduction". These indicators are not easily knowable and must be manually derived by unboxing each pillar from the provider site. By weights, we refer to the importance given to each indicator in the final ESG score. Since "Targets Emissions" is available for many more companies than "Biodiversity Impact Reduction", it is likely to weight more in the final computation of the E score.

⁴ This definition is provided by the European Supervisory Authorities (ESAs). The European Supervisory Authorities (ESAs) are represented by three entities—i.e., European Banking Authority (EBA), European Security and Market Authorities (ESMA), and European Insurance and Occupational Pension Authorities (EIOPA)—responsible for overseeing the financial sector of the European Union. The relative reports are available here: [EBA](#), [ESMA](#), [EIOPA](#).

communication also rises. Moreover, the regulatory environment defines the availability and reliability of information disseminated by companies about their environmental practices. At the same time, they argue that internal drivers, such as firms' characteristics, the effectiveness of intra-firm communication, and incentive structure, can influence the way that firms face external pressure. For instance, large and well-known corporations, especially those operating in industries with poor environmental performance, frequently find themselves under increased scrutiny from both activists and the media. In line with this branch of research, our analysis investigates differences in external and internal stakeholders' perception by considering both self-disclosed and external sources of data for the evaluation of the sustainability conduct of firms.

There is evidence that the ultimate impact of greenwashing on a company performance is broad and even expands to those companies authentically committed to their environmental mission [23]. In a well-known article, Du [19] finds evidence of a negative correlation between greenwashing and corporate revenues, thus suggesting that companies are more likely to resort to greenwashing behaviours during periods of financial distress. Notably, other scholars assert that only symbolic actions negatively impact a company's financial performance, while substantive actions neither harm nor benefit firms [53]. Under the concept of green highlighting, they differentiate between a firm's environmental responsibility in terms of past actions (substantive) and plans (symbolic), stating that only the difference between symbolic and substantive actions gives rise to greenwashing. Ultimately, greenwashing adversely affects financial outcomes.

Corporate governance plays a major role in deciding upon the level of sustainability engagement of a company and the actions undertaken. Accordingly, scholars have widened the concept of corporate governance beyond the traditional focus on economic and financial aspects. Hambrick and Mason [29] state that organizational outcomes such as strategic choices and performance levels can be partially predicted by managerial background characteristics. Aguilera et al. [5] support for a broader interpretation of governance encompassing the intricate network of interdependencies between organizations and the diverse incentives that shape the effectiveness of governance practices. Similarly, Aoki [7] argues that corporate governance should consider the value systems of all stakeholders involved in a firm, thus paving the way to the inclusion of social, equality, and inclusive instances.

More recently, an innovative area of research has emerged, shedding light on the distinct role of female stakeholders within corporate governance. Specifically, scholars focus on the influence exerted by the presence of women on boards and its implications for a company's performance across ESG dimensions. Findings claim that higher levels of gender or ethnic diversity make boards more responsive to sustainabil-

ity instances: a female CEO as well as a higher share of female directors on the board Committees significantly increase corporate environmental investments [10]. Moreover, gender matters when it comes to the perception of ethical climate, as women show a significantly more favourable attitude towards ethical behaviours than men [38]. In comparison to male, the environmental investment made by female executives significantly reduces pollutant emissions, thus implying that increasing representation of female executives in enterprises can contribute to a significant improvement in environmental quality [31]. An enhancement of female presence at corporate level is bound to bring significant economic advancements also at the global level, with an increase in global GDP by 26% [17].

Stemming from the literature on corporate governance, a significant amount of research has concentrated on an iconic element of a company sustainable engagement—Corporate Social Responsibility (CSR). Despite its growing relevance, CSR lacks of a universally accepted definition. Sarkar and Searcy [43] delve into the evolution of CSR by analysing 110 definitions spanning from 1953 to 2014. The study identifies six recurring and enduring dimensions that underpin the CSR concept: economic, social, ethical, stakeholders, sustainability, and voluntary dimension. Despite high levels of heterogeneity across definitions, these features have persisted, providing key insights for the correct definition of CSR. In line with [44], CSR can be defined as a self-regulatory system that fosters a company's social accountability to itself, its stakeholders and the wider public. To effectively implement CSR, companies establish CSR Committees with the goal of conducting business in such a way that actively contributes to societal and environmental well-being, transcending mere profit-making objectives.

In reality, the mitigating role of CSR appears controversial. CSR practices can sometimes act as a smokescreen, concealing a company superficial engagement in sustainability actions with the aim of winning or retaining investors' trust [16]. Sometimes companies resort to CSR Committees in times when management becomes more intricate and CSR Committees can function as a tool to reduce a company exposure to responsibility failures [25]. Initiatives by social stakeholders are found to potentially increase the likelihood of future financial distress [20]. Similarly, there is a positive correlation between a company's probability of default and the presence of CSR Committees [13]. Diverse perspectives surround the impact of voluntary CSR disclosure. Supporters argue that such disclosure mitigates problems of asymmetric information among market agents [35] and is generally linked to higher CSR performance scores [39]. However, contenders argue that even companies with high CSR scores may engage in various forms of greenwashing [1]. Furthermore, [46] specifically focuses on the risk of greenwashing that may arise when companies market high levels of commit-

ment to gender equality. Recent studies challenge the notion that establishing CSR Committees alone can eliminate the possibility of greenwashing [24]. In other words, the mere existence of CSR Committees does not guarantee the absence of deceptive environmental practices. Additionally, the prevailing consumer and investor pressure for environmental responsibility heighten the likelihood of firms resorting to greenwashing [52], emphasizing the importance of scrutinizing relative claims.

To date, sustainable finance faces a notable weakness attributed to the absence of standardized definitions or interpretations [21]. A body of literature has highlighted how the lack of clear policy frameworks paves the way to the proliferation of greenwashing practices [34, 49]. This void creates a significant hurdle in interpreting ESG indicators, thus reducing their credibility as reliable financial metrics. Scholars have addressed this issue by mapping differences in ESG rating methodologies among prominent providers and categorizing them under a common taxonomy. Their research reveals that divergent scores may arise from varying providers, prompting a call for a unified methodology [3, 12]. In response to this challenge, the European Commission, in collaboration with the Technical Expert Group on Sustainable Finance, developed the "EU taxonomy" to provide a comprehensive list of economic activities considered green [47]. However, it has not been made legally binding so far.

To overcome the limitations of conventional ESG ratings, we advocate for a departure from conventional black-box scores offered by financial providers and we propose the implementation of an innovative comprehensive measure entailing both internally and externally disclosed data. This approach allows us to investigate the differences in external and internal stakeholders' perception for the evaluation of the sustainability conduct of firms, in line with [18]. By building on both internal and external perception, we aim to shed new light on the controversial role of CSR.

In sum, we draw from a well-established literature to assess the consequences of misleading green communication on corporate performance. Our dataset and methodology, alongside our results, will be presented in the next section.

3 Methodology and data

3.1 Data

Since the EU seems more sensible to sustainability problems than other institutions, as proved by the number of initiatives and regulations promoted in this regard—e.g., Technical Experts Group (TEG) on Sustainable Finance, we use the Eurostoxx600 companies as a sample of data.

We advocate for a departure from standardized black-box scores provided by financial institutions and propose the implementation of an innovative measure entailing both internal and external stakeholders' perception of sustainability. These data are sourced from FinScience and define internal scores as those derived from self-reported and disclosed corporate data and external scores as those derived from data generated by external stakeholders.⁵ More specifically, internal scores encompass standard ESG metrics from Refinitiv, S&P and Bloomberg, coupled with information on sustainable initiatives derived from Sustainability/CSR reports, corporate websites, sustainability memberships and affiliations and certifications.⁶ External data are sourced from reputable entities, such as specialized websites, NGOs, vertical websites and mainstream news sources, that provide insights into the positive or negative sentiment surrounding news related to sustainability matters concerning the company. The metrics include controversies and reviews, crucial to capture instances where companies face sanctions or fines due to environmental violations or their involvement in highly polluting activities and, finally, information sourced from social media. This way, external scores capture a dynamic information stream about a company's performance, providing a comprehensive overview of its environmental reputation.

By combining internal and external scores, we can produce an indicator of greenwashing risk. More in detail, we consider the difference between the internal and the external scores—hereafter referred to as delta (Δ)—and use it as a proxy for the likelihood of a company to communicate misleading information about its sustainability levels. In absolute terms, a higher (Δ) implies a higher risk, as a company's external perception drifts away from its internal stakeholders' one. To compute (Δ) we keep only companies for which both internal and external scores are available, obtaining a dataset of 467 companies all belonging to the Eurostoxx600 index (see Appendix, Table 6 for the complete list of companies and 5 for the definition of variables).

We enhance the scope of the dataset by incorporating key variables to assess the different incentives faced by stakeholders. To account for conventional models viewing corporations as legal tools for stakeholders to maximize their investment returns [45], we introduce traditional finan-

⁵ FinScience is a tech company of the Datrix Group specialized in applying AI to support investment decisions. See the official webpage [here](#).

⁶ For memberships and affiliations to be considered trustworthy, companies must meet stringent requirements related to environmental performance or commitment. Specifically, it is requested the presence of at least two reputable memberships associated with environmental matters. For certifications to be considered trustworthy, it is requested the presence of at least two certifications linked to environmental issues (e.g., ISO 14001, ISO 50001).

Table 1 Distribution of companies across sectors

GICS Sector	Number of firms
Communication services & Information technology	52 (11,1%)
Consumer Discretionary	55 (11,8%)
Consumer Staples	43 (9,2%)
Energy	16 (3,4%)
Financials & Real Estate	93 (20%)
Healthcare	41 (8,8%)
Industrials	95 (20,3%)
Materials	45 (9,6%)
Utilities	27 (5,8%)
TOTAL	467

Sector classification based on the Global Industry Classification Standard (GICS)

cial performance indicators: Revenue Per Share, Return on Assets (ROA), Return on Equity (ROE), Market Capitalization, and Credit Rating. Simultaneously, we incorporate a more modern perspective that sees corporations as responsible for a broader range of stakeholders' interests than financial ones, thereby emphasizing the importance of fair corporate governance mechanisms [5, 9, 48]. Specifically, we include board size, the percentage of women on the board, the percentage of women employees in a company and the presence of a CSR Committee. The integration of gender diversity metrics is vital for evaluating the commitment of a company to equitable and inclusive practices, foundational to sustainable business models. The presence of women on the board is a critical indicator of gender diversity at the highest decision-making level. Research has shown that diverse boards are more likely to engage in responsible governance practices, thereby aligning more closely with broader stakeholder interests, including sustainability [10, 31]. The proportion of women employees within a company reflects gender diversity at the operational level. This metric is essential for evaluating the inclusiveness of a company's workforce, which is a key component of its overall sustainability. A balanced gender representation can indicate a more equitable working environment, which is linked to better social performance outcomes. In our study, the descriptive statistics show that the average percentage of women employees is 37%, while the percentage of women on boards is 36%. This indicates that men occupy roughly two-thirds of the remaining positions, both at the highest decision-making level and at the operational level.

We source all variables from Refinitiv. We control for the size of a company by dividing total assets into quartiles and assigning a value ranging from 1 (smallest firms) to 4 (largest firms) to each quartile. We control for the operating sector of a company by relying on the Global Industry Classification Standard (GICS) grouping companies into the following sectors: communication services, consumer dis-

cretionary, consumer staples, energy, financial, healthcare, industrial, materials and utilities.⁷ The distribution across sectors of the companies in our sample is reported in Table 1. Finally, Table 2 reports descriptive statistics for continuous variables and Table 3 the correlation matrix.

3.2 Methodology

We use Δ as our dependent variable, which is formally constructed as:

$$\Delta = \text{internal score} - \text{external score}$$

After standardizing the dataset, we perform the following main equation:

$$\Delta = \sum_{i=1}^n \left[\beta_0 + \beta_1 \text{RPS} + \beta_2 \text{ROA} + \beta_3 \text{ROE} + \beta_4 \text{MarCap} + \beta_5 \text{CrRat} + \beta_6 \text{CSR} + \beta_7 \text{BS} + \beta_8 \text{WOB} + \beta_9 \text{WE} \right] + \sum_{k=1}^n \varphi_k + \sum_{j=1}^n \eta_j + \epsilon_i, \quad (1)$$

where all traditional financial indicators enter the equation as regressors from β_1 to β_5 , namely Revenue per Share (RPS), Return on Assets (ROA), Return on Equity (ROE), Market Capitalization (MarCap) and Credit Rating (CrRat). From β_6 to β_9 , we encompass all indicators assessing the level of fairness at governance level, namely CSR Committee (CSR), Board size (BS), Women on Board (WB) and

⁷ The GICS is an industry taxonomy developed in 1999 by MSCI and S&P for the global financial community. The GICS structure consists of 11 sectors, 25 industry groups, 74 industries and 163. See the report [here](#).

Table 2 Descriptive statistics

Variable	Mean	Std.Dev.	Min	Max
Revenue Per Share	93.2	873	0.00	18648.275
Return on Assets	0.05	0.08	-0.193	0.87
Return on Equity	0.16	0.97	-2.14	20.5
Market Capitalization	$2.899e^{+10}$	$4.659e^{+10}$	$2.649e^{+08}$	$3.954e^{+11}$
Total Assets	$1.203e^{+11}$	$3.349e^{+11}$	$2.194e^{+08}$	$3.039e^{+12}$
Board Size	11.27	3.5	4	23
Women Employees	0.37	0.15	0.11	0.76
Female on Board	0.36	0.11	0.00	0.75
Delta	-4.6	13.7	-48	38
Internal	66.44	11.5	29	88
External	71.02	9.5	41	84

Table 3 Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Revenue per Share	1.000							
(2) ROA	-0.010	1.000						
(3) ROE	-0.006	0.164	1.000					
(4) Market Capitalization	0.006	0.076	0.013	1.000				
(5) Total Assets	-0.015	-0.179	-0.033	0.164	1.000			
(6) Board Size	-0.064	-0.281	-0.049	0.206	0.254	1.000		
(7) Female on Board	-0.100	-0.021	0.060	0.048	0.072	0.070	1.000	
(8) Women Employees	0.064	-0.033	-0.027	0.088	0.214	-0.000	0.181	1.000
(9) Delta	-0.065	0.006	0.023	0.082	0.016	0.119	-0.058	-0.232
(10) Internal	-0.052	-0.076	0.043	0.171	0.126	0.290	0.050	-0.096
(11) External	0.031	-0.102	0.019	0.088	0.130	0.181	0.143	0.219

Women Employees (WE). Each specification runs for all companies i from 1 to n included in the dataset. The error term is indicated as ϵ_i . To ensure the robustness and reliability of our results, we first cluster standard errors at the sector level to address potential correlations or heteroscedasticity within sectors. Second, we incorporate fixed effects at size level (φ_k) and sector level (η_j) to account for unobservable factors that may systematically vary within the size of companies or be unique to each economic sector.

The inclusion of CSR Committees in our analysis may prompt questions about potential reverse causality concerns, given that CSR-related variables are already a component of the internal score. To address this concern, we break-down how CSR enters our dependent variable. Specifically, internal scores encompass information on I) the quality of sustainability reports, by investigating whether a third party ensures that the environmental/sustainability report undergoes a verification process to conform to specific reporting frameworks (e.g., GRI Sustainability Reporting Standards) and II) the sustainability CSR section on official websites, by examining whether a company official website dedicates

to environmental issues one or more sections. Furthermore, it considers whether the company actively communicates its sustainability efforts to the public through its online platforms. Conversely, the variable CSR we use as a regressor in our analysis is a dummy simply testing for the presence (1) or absence (0) of CSR Committees. It does not provide information about the writing of CSR reports nor about their quality. While this approach allows us to differentiate between the existence of CSR Committees and the nuanced qualities associated with sustainability reporting, it is not likely to lead to reverse causality.

In addition to Eq. 1, we run two further specifications to test for internal and external stakeholders' perception by using internal and external score as dependent variables, respectively:

$$\text{Internal} = \sum_{i=1}^n \left[\beta_0 + \beta_1 \text{RPS} + \beta_2 \text{ROA} + \beta_3 \text{ROE} + \beta_4 \text{MarCap} + \beta_5 \text{CrRat} \right]$$

$$+ \beta_6 \text{CSR} + \beta_7 \text{BS} + \beta_8 \text{WOB} + \beta_9 \text{WE+} \left. \vphantom{\beta_6} \right] + \sum_{k=1}^n \varphi_k + \sum_{j=1}^n \eta_j + \epsilon_i \quad (2)$$

$$\text{External} = \sum_{i=1}^n \left[\beta_0 + \beta_1 \text{RPS} + \beta_2 \text{ROA} + \beta_3 \text{ROE} + \beta_4 \text{MarCap} + \beta_5 \text{CrRat} + \beta_6 \text{CSR} + \beta_7 \text{BS} + \beta_8 \text{WOB} + \beta_9 \text{WE+} \right] + \sum_{k=1}^n \varphi_k + \sum_{j=1}^n \eta_j + \epsilon_i \quad (3)$$

4 Results

4.1 Delta scores

The first part of our research aims at analysing the different drivers of greenwashing a company faces. We rely on Eq. 1 and show results in Table 4 from column (1) to (3). We first run a standard OLS model without fixed effects (column (1)). Next, we add fixed effects at size level (column (2)), and finally, we include the set of fixed effects at the sector level (column (3)).

The negative correlation between revenues per share and (Δ) shown across all specifications suggests a compelling signal that companies may be more inclined to convey misleading messages on sustainability when faced with declining profits. Our findings align with existing studies on the specific connection between greenwashing, investor behaviour, and market responses [14, 19]. While the ROA shows a negative, albeit non-significant correlation, the ROE shows a positive and statistically significant correlation across all specifications. This result partially challenges our previous finding, yet mixed evidence is found on the impact of the ROE on the sustainable performance of a company [6, 27] and on its robustness as an indicator of financial performance [8].⁸

Neither Market Capitalization nor Credit Rating shows a significant correlation with the dependent variable (Δ), except for a weak correlation between Market Capitalization and greenwashing in column (2). The lack of significance can be explained by little variations in terms of credit ratings across the Eurostox600 companies. Beside, these results align with the existing literature [30, 33], where the weak

correlation between ESG scores and ratings is such that ratings alone may not effectively capture the effect of ESG.

The presence of women seems to mitigate the risk of misleading communication. We find that the share of female employees is negatively and significantly correlated across the three model specifications; thus, the risk of misleading communication falls when the number of women employed at different levels increases, in line with [10, 31]. Similarly, the share of women on the board shows a negative, albeit not significant correlation across the model specifications. The board size shows a positive and significant correlation; hence, the larger the board, the higher the risk of greenwashing. This is in line with those claiming that larger boards entail larger agency costs due to a rise in inefficiencies [41].⁹

Corporate Social Responsibility (CSR) Committees, which are supposed to mitigate greenwashing risks by accounting for a company's socially responsible actions and reputation [51], show a positive and significant correlation across all three specifications. In reality, their mitigating role is controversial; some claim that voluntary disclosure of CSR information is generally associated with higher CSR performance scores [39], others argue that companies are likely to be involved in some forms of greenwashing even when they show high CSR scores [1] or they may be guilty of CSR-washing in an attempt of marketing higher levels of commitment to gender equality initiatives than real ones [46]. Further studies deny the possibility of ruling out greenwashing by simply setting up CSR Committees [24]. Our findings confirm this last branch of literature. Ultimately, the presence of such Committees is not enough to ensure an active corporate engagement in sustainability projects. Companies may resort to CSR Committees in an attempt to green-market their products or behaviours as "green" and to conquer or maintain investors' trust.

4.2 Internal versus external scores

We analyse the differences between internal and external stakeholders' perception of sustainability by relying on Eqs. 2 and 3, respectively. Results are presented in Table 4 from column (4) to (9). As usual, we add sector-level fixed effects (column (5) and (8), respectively) and size-level fixed effects (column (6) and (9), respectively).

From column (4) to (6), we focus on the internal perception of sustainability. Revenues per share exhibit a negative and statistically significant correlation across all three specifications, which aligns with the previous negative correlation found between revenues and (Δ). Since greenwashing risks

⁸ Arditti [8] argues that elevated returns may signify inconsistent profits or an over-reliance on excessive debt.

⁹ We remark that we only focus on companies belonging to the Eurostox600 index, which are likely to share similarly sized boards and hence to show little variation across our sample. Results may vary if companies with larger differences are considered.

Table 4 Main estimates

	Delta (1)	(2)	(3)	Internal (4)	(5)	(6)	External (7)	(8)	(9)
Revenue per Share	−0.0566*** (0.011)	−0.049** (0.014)	−0.051** (0.02)	−0.0367** (0.01)	−0.047* (0.014)	−0.047** (0.011)	0.037** (0.014)	0.014 (0.012)	0.017 (0.012)
ROA	0.0278 (0.06)	−0.006 (0.056)	0.07 (0.044)	−0.005 (0.084)	0.04 (0.094)	0.033 (0.091)	−0.047 (0.048)	0.057 (0.053)	0.03 (0.06)
ROE	0.0183* (0.009)	0.0233* (0.0086)	0.018* (0.008)	0.0487*** (0.004)	0.045*** (0.005)	0.044*** (0.006)	0.033* (0.0014)	0.021 (0.012)	0.027* (0.009)
Market Capitalization	0.0591 (0.051)	0.081 (0.047)	0.021 (0.042)	0.1. (0.065)	0.06 (0.057)	0.04 (0.051)	0.04 (0.057)	−0.04 (0.025)	0.02 (0.025)
Credit Rating	−0.007 (0.007)	−0.004 (0.007)	0.0003 (0.07)	−0.005 (0.007)	−0.009 (0.006)	−0.007 (0.007)	0.0047 (0.01)	−0.005 (0.008)	−0.009 (0.007)
CSR Committee	0.67*** (0.114)	0.7*** (0.114)	0.576** (0.128)	0.95*** (0.154)	0.92*** (0.15)	0.85*** (0.16)	0.18* (0.075)	0.101 (0.061)	0.192* (0.063)
Board size	0.0874* (0.044)	0.119. (0.053)	0.124. (0.057)	0.223*** (0.038)	0.181*** (0.038)	0.189** (0.04)	0.145** (0.053)	0.048 (0.05)	0.05 (0.05)
Women on board	−0.0537 (0.041)	−0.043 (0.04)	0.024 (0.04)	0.118 (0.055)	−0.0022 (0.051)	0.0133 (0.052)	0.09 (0.056)	0.057 (0.053)	0.049 (0.058)
Women employees	−0.2287** (0.07)	−0.231* (0.075)	−0.209*** (0.035)	−0.109* (0.05)	−0.11. (0.054)	−0.059 (0.032)	0.198*** (0.077)	0.199* (0.065)	0.23** (0.061)
Observations	467	467	467	467	467	467	467	467	467
Adj. R ²	0.1	0.1	0.17	0.17	0.18	0.2	0.08	0.16	0.21
Size effects	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Sector effects	No	No	Yes	No	No	Yes	No	No	Yes
Clustered Std.Err	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Clustered standard errors in parentheses: *** $p < 0.000$; ** $p < 0.001$; * $p < 0.01$; $p < 0.05$

increase when revenues go down, it follows that internal stakeholders are more likely to declare higher level of sustainability performance when profits decrease. While the ROA bears no significance, a positive and highly significant correlation across all model specifications is found between the ROE and the internal perception of sustainability. Significance levels are higher than before, which we explain through the intuition that corporate financial performance is likely to weight more on internal perception [4].¹⁰

The board size shows a positive and significant correlation; hence, larger boards seem to favour an improvement in the internal perception of sustainability performance. Compared to (Δ), the significance level for the board size has remarkably improved, in line with the importance played by the board from an internal stakeholder's perspective.

The share of women on the board does not exhibit any significant impact, while the share of female employees weakly

survives in the first two specifications (column (5) and (6), respectively). The absence of a significant influence of this variable from an internal perspective marks a structural difference from Δ , as it infers that the overall level of women employed is not decisive in shaping a company's internal perception of sustainability. Conversely, the presence of CSR Committees shows a positive and highly significant correlation across all specifications (from column (4) to (6)). It follows that internal stakeholders greatly value the presence of similar Committees when evaluating the sustainability performance of the company. A similar robust correlation implies that the mere presence of CSR Committees signals a tangible commitment on the part of the company to address sustainability concerns, yet the existing literature cautions against over-interpreting the presence of these Committees as a guarantee of active engagement in CSR investments

When we move to the external perception of sustainability, the usual indicators of financial performance—i.e., Revenues per Share and ROE—exhibit a diminished significance compared to earlier results in both (Δ) and internal scores. The significance level of Revenues survive only in the first model specification (column (7) vis-à-vis column (1) and column

¹⁰ We remark that ROE alone is neither an adequate measure of financial performance [8] nor of sustainable performance [6]. Though our results suggest that ROE has a positive and significant impact on a company's self-disclosed scores of sustainability, this intuition is limited to our sample.

(4), respectively), while the ROE retains statistical relevance only in the first and last models (column (9) vis-à-vis column (3) and (6)), with notably lower significance levels than before, especially if compared with internal scores estimates. A strong financial performance is viewed positively by external stakeholders, but it does not seem to play a crucial role in shaping their evaluation of the sustainable performance of a company. Similarly, the significance of board size endures only in the first model specification, indicating that the size of the board may not be a consistent factor influencing external stakeholders' evaluations.

Notably, the level of women employed resurfaces with a positive and strongly significant correlation across all three model specifications, which seems to indicate that a higher representation of women in the workforce corresponds to a more favourable external perception of sustainability. Finally, the loss of importance witnessed by the presence of CSR comes as a validation of our results. Estimates are the weakest out of all models and even lose their significance in column (8), thus suggesting that external stakeholders are not likely to accept the presence of CSR Committees as a sufficient indicator of a firm's commitment to sustainability.

5 Conclusions

We draw from a well-established literature to enquire the institutional complexity underlying the substantial versus symbolic adoption of environmental practices, namely greenwashing. We analyse the drivers of greenwashing through regression analysis and break down the difference between internal and external stakeholders' perception of sustainability.

We find a negative correlation between greenwashing and corporate revenues, which suggests that firms facing financial distress encounter heightened motivations for greenwashing as a strategic move to secure investors' trust. The absence of stringent regulations in sustainable finance amplifies the incentives for companies to present a positive image of their sustainable practices. Conversely, a higher number of female employees seem to mitigate the risk of greenwashing.

We uncover a disparity in external vis-à-vis internal stakeholders' evaluation of sustainability. The positive correlation between the presence of CSR Committees and internal perception is robust to the point that presence of CSR Committees may be enough to signal a tangible commitment on the part of the company to address sustainability concerns, yet results derived from the external perspective caution against over-interpreting the presence of these Committees

as a guarantee of active engagement in CSR investments. In the pursuit of sustainability, external stakeholders appear to place greater emphasis on tangible, real-world achievements, such as the actual level of women employed at the firm level, as opposed to internal stakeholders, who seem to prioritize formal achievements, such as the mere presence of CSR Committees and overall place greater emphasis on traditional indicators of financial performance. Crucially, this contrast highlights a shift in priorities between internal and external perception. After years of uncontrolled greenwashing, consumers tend to become more cynical about green claims, making it hard for companies to deceive them by the mere establishment of CSR Committees.

Nevertheless, the need for a common methodology to mitigate the risk of misleading communication is urgent. A notable effort in this direction has been made by the "Technical Expert Group on Sustainable Finance" (TEG), established in 2018 by the European Commission. The TEG developed the EU taxonomy, a classification system that determines whether an economic activity is environmentally sustainable, and proposed disclosures for ESG factors. This framework is one of the most significant achievements in sustainable finance, though it primarily focuses on the Environmental (E) dimension.

To improve sustainability assessments, ESG rating agencies must integrate all three dimensions—Environmental (E), Social (S), and Governance (G)—equally, considering both current and future needs as well as specific risks over the short and long term. In addition to standardizing methodologies, European authorities should develop a comprehensive disclosure system for ESG indicators, providing clear and consistent information to the monitored firms.

As further lines of research, valuable insights could be gained by expanding the sample of companies analysed. In particular, the inclusion of emerging internet companies, which are rapidly gaining prominence, is likely to represent an innovative and valuable contribution to the literature. Given the present of internal vis-à-vis external stakeholders' perspective and in line with the innovative research developed by [2] [26] and [22], our methodology could be expanded following their Bayesian approach with the aim of merging the two stakeholders' perspectives, eventually assessing the impact on greenwashing.

Appendix

See Tables 5 and 6.

Table 5 List of variables and their definition. *Source:* Authors' elaboration

Type of variable	Variable	Description	Source
Dependent variable	Delta	Difference in absolute term between internal and external scores	Authors' calculations
	Internal score	Measures the company's ESG performance based on corporate self-reported and disclosed data	FinScience
Explanatory variables	External score	Measures the company's ESG "perceived" performance based on alternative external stakeholder-generated data	FinScience
	Revenue per Share (RPS)	Total Revenue for the fiscal year divided by Diluted Weighted Average Shares Outstanding	Refinitiv
	ROA	Return on Assets	Refinitiv
	ROE	Return on Equity	Refinitiv
	Market Capitalization (MarCap)	Market value of the requested issue share type	Refinitiv
	Credit rating (CR)	Agency-equivalent credit rating	Refinitiv
	CSR Committee (CSR)	The presence of a CSR Committee or team in the company	Refinitiv
	Board size (BS)	The total number of board members at the end of the fiscal year	Refinitiv
	Women on board (WOB)	Percentage of female on the board	Refinitiv
	Women employees (WE)	Percentage of women employees	Refinitiv

Table 6 List of companies. *Source:* Authors' elaboration

Company Name	Sector	Company Name	Sector
Ashmore Group PLC	Financials & Real Estate	Kesco Oyj	Consumer Staples
Mercedes-Benz Group AG	Consumer Discretionary	Kingfisher PLC	Consumer Discretionary
William Hill Ltd	Consumer Discretionary	Kingspan Group PLC	Industrials
3i Group PLC	Financials & Real Estate	Kinnevik AB	Financials & Real Estate
A2A SpA	Utilities	Kleppierre SA	Financials & Real Estate
AAK AB	Consumer Staples	Knorr Bremse AG	Industrials
AB Skf	Industrials	Kone Oyj	Industrials
Abb Ltd	Industrials	Koninklijke Ahold Delhaize NV	Consumer Staples
ABN Amro Bank NV	Financials & Real Estate	Koninklijke DSM NV	Materials
Acciona SA	Utilities	Koninklijke Philips NV	Health Care
Accor SA	Consumer Discretionary	Koninklijke Vopak NV	Energy
ACS Group	Industrials	LE Lundbergforetagen	Financials & Real Estate
Adecco Group AG	Industrials	Air Liquide	Materials
Adidas AG	Consumer Discretionary	L'Oreal SA	Consumer Staples
Admiral Group PLC	Financials & Real Estate	Land Securities Group PLC	Financials & Real Estate
Adyen NV	Communication Services & IT	Lanxess AG	Materials
Aegon NV	Financials & Real Estate	LEG Immobilien SE	Financials & Real Estate
Aena SME SA	Industrials	Legal & General Group PLC	Financials & Real Estate
Aerports de Paris SA	Industrials	Legrand SA	Industrials
Airbus SE	Industrials	Leonardo SpA	Industrials
Aker BP ASA	Energy	Linde PLC	Materials
Akzo Nobel NV	Materials	Lloyds Banking Group PLC	Financials & Real Estate
Alcon AG	Health Care	Logitech International	Communication Services & IT
Allianz SE	Financials & Real Estate	LSEG PLC	Financials & Real Estate
Alstom SA	Industrials	Lonza Group AG	Health Care
Amadeus IT Group SA	Communication Services & IT	LVMH Moet Hennessy Louis Vuitton SE	Consumer Discretionary
Amplifon SpA	Health Care	M&G PLC	Financials & Real Estate
ams OSRAM AG	Communication Services & IT	Marks and Spencer Group PLC	Consumer Staples
Amundi SA	Financials & Real Estate	Mediobanca Banca di Credito Finanziario SpA	Financials & Real Estate
Andritz AG	Industrials	Meggitt PLC	Industrials
Anglo American PLC	Materials	Melrose Industries PLC	Industrials
Anheuser Busch Inbev SA	Consumer Staples	Merck KGaA	Health Care
AP Moeller - Maersk A/S	Industrials	Metso Outotec Corp	Industrials
ArcelorMittal SA	Materials	Moncler SpA	Consumer Discretionary
Arkema SA	Materials	Mondi PLC	Materials

Table 6 continued

Company Name	Sector	Company Name	Sector
ASM International NV	Communication Services & IT	Mowi ASA	Consumer Staples
ASML Holding NV	Communication Services & IT	MTU Aero Engines AG	Industrials
ASR Nederland NV	Financials & Real Estate	MunichRe	Financials & Real Estate
Asa Abloy AB	Industrials	National Grid PLC	Utilities
Assicurazioni Generali SpA	Financials & Real Estate	Natixis SA	Financials & Real Estate
Associated British Foods PLC	Consumer Staples	Nature Energy Group SA	Utilities
Assura PLC	Financials & Real Estate	Natwest Group PLC	Financials & Real Estate
AstraZeneca PLC	Health Care	Nemetishek SE	Communication Services & IT
Atlas Copco AB	Industrials	Neste Oyj	Energy
Atos SE	Communication Services & IT	Nestle SA	Consumer Staples
Avast PLC	Communication Services & IT	Next PLC	Consumer Discretionary
AVEVA Group PLC	Communication Services & IT	NN Group NV	Financials & Real Estate
Aviva PLC	Financials & Real Estate	Nokia Oyj	Communication Services & IT
AXA SA	Financials & Real Estate	Nokian Tyres plc	Consumer Discretionary
B&M European Value Retail SA	Consumer Discretionary	Nordea Bank Abp	Financials & Real Estate
BAE Systems PLC	Industrials	Norsk Hydro ASA	Materials
Banco Bilbao Vizcaya Argentaria SA	Financials & Real Estate	Novartis AG	Health Care
Banco de Sabadell SA	Financials & Real Estate	Novozymes A/S	Materials
Banco Santander SA	Financials & Real Estate	Ocado Group PLC	Consumer Staples
Bank of Ireland Group PLC	Financials & Real Estate	OMV AG	Energy
Bankinter SA	Financials & Real Estate	Orange SA	Communication Services & IT
Barclays PLC	Financials & Real Estate	Orion Oyj	Health Care
Barratt Developments PLC	Consumer Discretionary	Orkla ASA	Consumer Staples
Barry Callebaut AG	Consumer Staples	Orsted A/S	Utilities
Basf Se	Materials	Partners Group Holding AG	Financials & Real Estate
BAWAG Group AG	Financials & Real Estate	Pearson PLC	Communication Services & IT
Bayer AG	Health Care	Pernod Ricard SA	Consumer Staples
Bayerische Motoren Werke AG	Consumer Discretionary	Persimmon PLC	Consumer Discretionary
Bechtle AG	Communication Services & IT	Phoenix Group Holdings PLC	Financials & Real Estate
Beiersdorf AG	Consumer Staples	Polski Koncern Naftowy Orlen SA	Energy
Bellway PLC	Consumer Discretionary	Poste Italiane SpA	Financials & Real Estate
Berkeley Group Holdings PLC	Consumer Discretionary	Prosiebensat 1 Media SE	Communication Services & IT
BHP Group Ltd	Materials	Prudential PLC	Financials & Real Estate
Biomerieux SA	Health Care	Prysmian SpA	Industrials

Table 6 continued

Company Name	Sector	Company Name	Sector
BNP Paribas SA	Financials & Real Estate	Publicis Groupe SA	Communication Services & IT
Boliden AB	Materials	Puma SE	Consumer Discretionary
Bolloré SE	Communication Services & IT	Qiagen NV	Health Care
Bouygues SA	Industrials	Raiffeisen Bank International AG	Financials & Real Estate
BP PLC	Energy	Randstad NV	Industrials
Brenntag SE	Industrials	Rational AG	Industrials
British American Tobacco PLC	Consumer Staples	Reckitt Benckiser Group PLC	Consumer Staples
Britvic PLC	Consumer Staples	Red Eléctrica Corporación SA	Utilities
BT Group PLC	Communication Services & IT	Relx PLC	Industrials
Bunzl plc	Industrials	Remy Cointreau SA	Consumer Staples
Burberry Group PLC	Consumer Discretionary	Renault SA	Consumer Discretionary
Bureau Veritas SA	Industrials	Rentokil Initial PLC	Industrials
Caixabank SA	Financials & Real Estate	Repsol SA	Energy
Capgemini SE	Communication Services & IT	Rexel SA	Industrials
Carl Zeiss Meditec AG	Health Care	Rheinmetall AG	Industrials
Carlsberg A/S	Consumer Staples	Rightmove PLC	Communication Services & IT
Carnival PLC	Consumer Discretionary	Rio Tinto PLC	Materials
Carrefour SA	Consumer Staples	Roche Holding AG	Health Care
CD Projekt SA	Communication Services & IT	Rockwool International A/S	Industrials
Cellnex Telecom SA	Communication Services & IT	Rolls-Royce Holdings PLC	Industrials
Centrica PLC	Utilities	Rotork PLC	Industrials
Chocoladefabriken Lindt & Sprüngli AG	Consumer Staples	Royal Mail PLC	Industrials
Chr Hansen Holding A/S	Materials	RSA Insurance Group Ltd	Financials & Real Estate
Clariant AG	Materials	Rwe AG	Utilities
Close Brothers Group PLC	Financials & Real Estate	Ryanair Holdings PLC	Industrials
CNH Industrial NV	Industrials	Safran SA	Industrials
CNP Assurances SA	Financials & Real Estate	Sage Group PLC	Communication Services & IT
Coca-Cola Co	Consumer Staples	Sandvik AB	Industrials
Coloplast A/S	Health Care	Sanofi SA	Health Care
Commerzbank AG	Financials & Real Estate	SAP SE	Communication Services & IT
Compagnie de Saint Gobain SA	Industrials	SBM Offshore NV	Energy
Compagnie Financière Richemont SA	Consumer Discretionary	Schibsted ASA	Communication Services & IT
Michelin	Consumer Discretionary	Schindler Holding AG	Industrials

Table 6 continued

Company Name	Sector	Company Name	Sector
Compass Group PLC	Consumer Discretionary	Schneider Electric SE	Industrials
Continental AG	Consumer Discretionary	Schroders PLC	Financials & Real Estate
ConvaTec Group PLC	Health Care	Scor SE	Financials & Real Estate
Corbion NV	Materials	Securitas AB	Industrials
Countryside Partnerships PLC	Consumer Discretionary	SEGRO PLC	Financials & Real Estate
Covestro AG	Materials	SES SA	Communication Services & IT
Credit Agricole SA	Financials & Real Estate	Severn Trent PLC	Utilities
Credit Suisse Group AG	Financials & Real Estate	SGS SA	Industrials
CRH PLC	Materials	Shell PLC	Energy
Croda International PLC	Materials	Siemens AG	Industrials
Danone SA	Consumer Staples	Siemens Energy AG	Industrials
Danske Bank A/S	Financials & Real Estate	Siemens Gamesa Renewable Energy SA	Industrials
Dassault Systemes SE	Communication Services & IT	Siemens Healthineers AG	Health Care
Davide Campari Milano NV	Consumer Staples	SIG Combibloc Group AG	Materials
DCC PLC	Industrials	Signature Aviation Ltd	Industrials
Dechra Pharmaceuticals PLC	Health Care	Signify NV	Industrials
Demant A/S	Health Care	Sika AG	Materials
Deutsche Boerse AG	Financials & Real Estate	Skandinaviska Enskilda Banken AB	Financials & Real Estate
Deutsche Lufthansa AG	Industrials	Skanska AB	Industrials
Deutsche Post AG	Industrials	Smith & Nephew PLC	Health Care
Deutsche Telekom AG	Communication Services & IT	Smiths Group PLC	Industrials
Deutsche Wohnen SE	Financials & Real Estate	Smurfit Kappa Group PLC	Materials
Diageo PLC	Consumer Staples	Snam SpA	Utilities
DiaSorin SpA	Health Care	Societe Generale SA	Financials & Real Estate
Direct Line Insurance Group PLC	Financials & Real Estate	Sodexo SA	Consumer Discretionary
Dometic Group AB	Consumer Discretionary	Solvay SA	Materials
DS Smith PLC	Materials	Sonova Holding AG	Health Care
DSV A/S	Industrials	Spie SA	Industrials
Dufry AG	Consumer Discretionary	Spirax-Sarco Engineering PLC	Industrials
E.ON SE	Utilities	SSE PLC	Utilities
Edenred SE	Communication Services & IT	St James's Place PLC	Financials & Real Estate
EDP Energias de Portugal SA	Utilities	Stadler Rail AG	Industrials
EDP Renovaveis SA	Utilities	Standard Chartered PLC	Financials & Real Estate
Eiffage SA	Industrials	Stellantis NV	Consumer Discretionary
Electricite de France SA	Utilities	STMicroelectronics NV	Communication Services & IT

Table 6 continued

Company Name	Sector	Company Name	Sector
Electrolux AB	Consumer Discretionary	Stora Enso Oyj	Materials
Elekta AB	Health Care	Storebrand ASA	Financials & Real Estate
Enagas SA	Utilities	Straumann Holding AG	Health Care
Endesa SA	Utilities	Suez SA	Utilities
Enel SpA	Utilities	Svenska Handelsbanken	Financials & Real Estate
Engie SA	Utilities	Swatch Group AG	Consumer Discretionary
Eni SpA	Energy	Swiss Life Holding AG	Financials & Real Estate
Entain PLC	Consumer Discretionary	Swiss Re AG	Financials & Real Estate
Epiroc AB	Industrials	Swisscom AG	Communication Services & IT
Equinor ASA	Energy	Symrise AG	Materials
Erste Group Bank AG	Financials & Real Estate	Tate & Lyle PLC	Consumer Staples
EssilorLuxottica SA	Consumer Discretionary	Taylor Wimpey PLC	Consumer Discretionary
Essity AB	Consumer Staples	TeamViewer AG	Communication Services & IT
Etablissements Franz Colruyt NV	Consumer Staples	Tecan Group AG	Health Care
Eurazeo SE	Financials & Real Estate	TechnipFMC PLC	Energy
Eurofins Scientific SE	Health Care	Tele2 AB	Communication Services & IT
Euronext NV	Financials & Real Estate	Telecom Italia SpA	Communication Services & IT
Evolution AB	Consumer Discretionary	Telefonaktiebolaget LM Ericsson	Communication Services & IT
Evonik Industries AG	Materials	Telefonica SA	Communication Services & IT
EVRAZ plc	Materials	Telenor ASA	Communication Services & IT
Exor NV	Financials & Real Estate	Teleperformance SE	Industrials
Experian PLC	Industrials	Telia Company AB	Communication Services & IT
Faurecia SE	Consumer Discretionary	Temenos AG	Communication Services & IT
Ferguson PLC	Industrials	Tenaris SA	Energy
Ferrari NV	Consumer Discretionary	Terna Rete Elettrica Nazionale SpA	Utilities
Ferrovial SA	Industrials	Tesco PLC	Consumer Staples
Flutter Entertainment PLC	Consumer Discretionary	Thales SA	Industrials
Fortum Oyj	Utilities	THG PLC	Consumer Discretionary
Fresenius Medical Care AG & Co KGaA	Health Care	thyssenkrupp AG	Materials
Fresenius SE & Co KGaA	Health Care	Tomra Systems ASA	Industrials
Fuchs Petrolub SE	Materials	TotalEnergies SE	Energy
G4S Ltd	Financials & Real Estate	Trainline PLC	Consumer Discretionary
Galp Energia SGPS SA	Energy	Travis Perkins PLC	Industrials
Games Workshop Group PLC	Consumer Discretionary	Trelleborg AB	Industrials

Table 6 continued

Company Name	Sector	Company Name	Sector
GEA Group AG	Industrials	Tryg A/S	Financials & Real Estate
Gecina SA	Financials & Real Estate	TUI AG	Consumer Discretionary
Genmab A/S	Health Care	Ubisoft Entertainment SA	Communication Services & IT
Genus PLC	Health Care	UBS Group AG	Financials & Real Estate
Georg Fischer AG	Industrials	Ucb SA	Health Care
Gerresheimer AG	Health Care	Unicore SA	Materials
Getinge AB	Health Care	UniCredit SpA	Financials & Real Estate
Givaudan SA	Materials	Unilever PLC	Consumer Staples
Glanbia PLC	Consumer Staples	Uniper SE	Utilities
GlaxoSmithKline PLC	Health Care	United Internet AG	Communication Services & IT
Glencore PLC	Materials	United Utilities Group PLC	Utilities
Grainger PLC	Financials & Real Estate	UPM-Kymmene Oyj	Materials
Grifols SA	Health Care	Valmet Oyj	Industrials
H & M Hennes & Mauritz AB	Consumer Discretionary	Veolia Environnement	Utilities
Halma PLC	Communication Services & IT	Verbund AG	Utilities
Hannover Rueck SE	Financials & Real Estate	Victrex PLC	Materials
Hargreaves Lansdown PLC	Financials & Real Estate	Vifor Pharma AG	Health Care
Hays PLC	Industrials	Vinci SA	Industrials
HeidelbergCement AG	Materials	Virgin Money UK PLC	Financials & Real Estate
Heineken Holding NV	Consumer Staples	Viscofan SA	Consumer Staples
Hellofresh SE	Consumer Staples	Vivendi SE	Communication Services & IT
Henkel AG & Co KGaA	Consumer Staples	Vodafone Group PLC	Communication Services & IT
Hermes International SCA	Consumer Discretionary	voestalpine AG	Materials
Hexagon AB	Communication Services & IT	Volkswagen AG	Consumer Discretionary
Hikma Pharma PLC	Health Care	Volvo AB	Industrials
Hiscox Ltd	Financials & Real Estate	Vonovia SE	Financials & Real Estate
HomeServe PLC	Industrials	Wartsila Oyj Abp	Industrials
Howden Joinery Group PLC	Industrials	Wendel SE	Financials & Real Estate
HSBC Holdings PLC	Financials & Real Estate	WH Smith PLC	Consumer Discretionary
Huhtamaki Oyj	Materials	Whitbread PLC	Consumer Discretionary
Husqvarna AB	Industrials	Wienerberger AG	Materials
Iberdrola SA	Utilities	Wizz Air Holdings PLC	Industrials
ICA Gruppen AB	Consumer Staples	WM Morrison Supermarkets Ltd	Consumer Staples
IG Group Holdings PLC	Financials & Real Estate	Wolters Kluwer NV	Industrials

Table 6 continued

Company Name	Sector	Company Name	Sector
Iliad SA	Communication Services & IT	WPP PLC	Communication Services & IT
IMCD NV	Industrials	Yara International ASA	Materials
IMI PLC	Industrials	Zalando SE	Consumer Discretionary
Imperial Brands PLC	Consumer Staples	Zurich Insurance Group AG	Financials & Real Estate
Inchcape PLC	Consumer Discretionary	Novo Nordisk A/S	Health Care
Industria de Diseno Textil SA	Consumer Discretionary	Alten SA	Communication Services & IT
Infinion Technologies AG	Communication Services & IT	Pandora A/S	Consumer Discretionary
Infirma PLC	Communication Services & IT	Sartorius AG	Health Care
ING Groep NV	Financials & Real Estate	Sartorius Stedim Biotech SA	Health Care
Inmobiliaria Colonial SOCIMI SA	Financials & Real Estate	Swedbank AB	Financials & Real Estate
InterContinental Hotels Group PLC	Consumer Discretionary	Swedish Match AB	Consumer Staples
International Consolidated Airlines Group SA	Industrials	Unibail-Rodamco-Westfield SE	Financials & Real Estate
Interpump Group SpA	Industrials	Valeo SE	Consumer Discretionary
Intertek Group PLC	Industrials	VAT Group AG	Industrials
Intesa Sanpaolo SpA	Financials & Real Estate	Vestas Wind Systems A/S	Industrials
Investor AB	Financials & Real Estate	Alfa Laval AB	Industrials
Ipsen SA	Health Care	Belimo Holding AG	Industrials
Iss A/S	Industrials	British Land Company PLC	Financials & Real Estate
ITV PLC	Communication Services & IT	Deutsche Bank AG	Financials & Real Estate
J Sainsbury PLC	Consumer Staples	EQT AB	Financials & Real Estate
JD Sports Fashion PLC	Consumer Discretionary	Geberit AG	Industrials
JDE Peets NV	Consumer Staples	Getlink SE	Industrials
Jeronimo Martins SGPS SA	Consumer Staples	Julius Baer Gruppe AG	Financials & Real Estate
Johnson Matthey PLC	Materials	Koninklijke KPN NV	Communication Services & IT
Just Eat Takeaway.com NV	Consumer Discretionary	Kuehne und Nagel International AG	Industrials
Kaz Minerals Ltd	Materials	Lundin Energy AB	Energy
KBC Groep NV	Financials & Real Estate	Lafarge SA	Materials
Kering SA	Consumer Discretionary	Abrdn PLC	Financials & Real Estate
Kerry Group PLC	Consumer Staples		

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Data availability Data are provided within the manuscript or supplementary information files.

Declarations

Conflict of interest The authors declare no competing interests.

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