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Greenwashing Practices and Firm Performance: Evidence for European MNEs

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Abstract

In order to contribute to the ongoing research on the role of firms and their impact on the environment, this paper assesses the effect of greenwashing on firm performance. By measuring the discrepancy between a firm's symbolic action and its actual green performance, a proxy for greenwashing is formed. Different literature on drivers and mechanics surrounding greenwashing practices substantiate the reasoning behind the analysis. In addition, the risk of disclosure and pressures from stakeholders both influence firms' green behavior. Thereafter, the empirical analysis considers data for over 2,500 European MNEs regarding ESG-, and firm-specific characteristics. In contrast to the hypotheses, results indicate that engaging in greenwashing lowers firm performance after a time period of one year or more. The opposite is occurring with firms operating in an emission-intensive industry. Here, engaging in greenwashing starts with lower performance, but turns positive over time. At last, this paper offers recommendations for further research on a more complete understanding and measurement of greenwashing.

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1. Introduction

Volkswagen manipulating the measured levels of emission of their cars (Brand, 2016), Shell stating to become climate-neutral, whilst still investing over eighty percent into oil and gas (Seele & Gatti, 2017), and McDonald's campaigning for their so-called animal-friendly production (Lyon & Montgomery, 2013). Over the last decades, such practices appear to be almost rule rather than exception. Even though the vast majority of firms are benevolent towards the urgent need in supporting the climate, some firms have taken advantage of this development by creating a discrepancy between their symbolic actions (green talk) and their actual green performance (green walk). According to Walker and Wan (2012), this phenomenon is known as *greenwashing*. Greenwashing is the act of providing the public or investors with misleading or outright false information about the environmental impact of a company's products and operations. Torelli et al. (2019) distinguish four levels of greenwashing, which are characterized by specific communication procedures and goals: (1) Corporate-level greenwashing concerns misleading environmental communication related to the firm's actual reputation and image. (2) Strategic-level greenwashing is related to the firm's future strategies. (3) Dark-level greenwashing concerns misleading information in order to hide illegal activities. And (4) Product-level greenwashing is related to specific features of a product.

Two main motives are present for firms to engage in any of these categorized levels of greenwashing. First, it has proven to be an efficient tool to obtain legitimacy from different stakeholders, creating more possibilities to receive financial resources. Second, according to institutional and signaling theories, it is a way for firms to communicate their values regarding green issues through a signal to stakeholders by engaging in this green talk (Berrone et al., 2017). These motives are therefore a way to convince stakeholders into investing more in the company. In turn, this may positively affect the firm's economic performance. For example, Bosse et al. (2009) created an approach in which firms attempt to distribute surplus value among a broad range of stakeholders. Hereby, the firm develops a pattern of reciprocity among its stakeholders, creating additional rent. Resource-based theories add that increasing strategic resources benefit the firm financially (Crook et al., 2008).

However, other literature suggests that greenwashing practices have a high risk to backfire. If noticed by the public, it may cause reputational damage and a sharp decline in performance (Siano et al., 2017). These consequences are even stronger if an MNE's headquarters is located in a country where environmental regulations are strict (Sun & Zhang, 2019). Greenwashing is then negatively associated with cumulative abnormal returns (Du, 2015). Additionally, Walker and Wan (2012) find that greenwashing has a negative effect on financial performance. Greenwashing in visibly polluting industries is more likely to be identified and subsequently punished. Stakeholders then may identify the firms as manipulative, opportunistic, and untrustworthy (King & Lenox, 2000). Other parties avoid public labeling with a greenwashing firm, resulting in fewer business interactions. Damage to these relationships will ultimately lead to decreased financial performance. Miras-Rodríguez et al. (2015) even suggest that the relationship between a firm's CSR performance and its financial performance forms an inverted U-shape. Even though CSR performance is not directly linked to greenwashing, weak CSR performance, while pretending to be sustainable, can be associated with greenwashing practices. Based on a social impact hypothesis, in the beginning, the satisfaction of stakeholders' needs creates an increase in its performance. Later, however, the costs of social output may outweigh the initial benefits from stakeholders, leading to a relative decrease in performance. This argument could also be applied to greenwashing practices of firms. Scoring higher on CSR performance is more likely to imply at least partial greenwashing within a firm. This, in turn, may be discovered by stakeholders, and can punish the firm towards bad media attention, lower support in resources, and lower transactions or sales. Ultimately leading to lower firm performance.

In the field of economics, strategic management, and organization theory, there is a broad consensus on the fact that greenwashing delays and disrupts the efforts of climate action (Johnsson et al., 2020, Kalesnik et al., 2020, Rohleder et al., 2022). However, following the priorly mentioned studies, there has been a debate whether the economic benefits of greenwashing outweigh the possible risks involved. Therefore, this paper firstly elaborates on why firms greenwashing in the first place and then makes an attempt to steer this debate towards an unambiguous answer on its effect on firm performance in the following research question:

What is the effect of greenwashing on the economic performance of firms?

This study uses data from the Eikon Refinitiv and Boardex Database to conduct several cross-sectional and panel data analyses among 2,576 European firms. For managers, regulators, and NGOs that seek to implement policies to reduce the amount of greenwashing, it is critical to understand the drivers behind, and the consequences of greenwashing. Therefore, this paper tries to assess these aspects and thereby giving a broader understanding of greenwashing.

2. Theoretical background and hypotheses

2.1. Theoretical background

2.1.1. Drivers of greenwashing

As of 2022, more than 90% of the S&P 500 companies have a section on their website dedicated to information on the environmental and social policies and performances. So-called green advertising has thereby increased by more than tenfold in the last two decades. These numbers are also visible in Europe. 96% of the G250 companies report on sustainability or ESG related matters (KPMG, 2022). At the same time, a great share of these firms are engaging in greenwashing. Since greenwashing is hard to identify and thereby to quantify, some exact numbers have not yet been identified. But given the profit-oriented nature of MNEs, this may indicate that greenwashing creates multiple financial benefits. However, this is still to be supported by literature and empirical evidence. Some other drivers have already been identified in the literature. Delmas and Burbano (2011) have identified several levels of drivers for greenwashing. These levels have been divided into external, organizational, and individual drivers. These external drivers are further separated by market-, and non-market drivers. They have grounded their reasoning on institutional theories. These theories emphasize the importance of all these different factors. External factors consist of market actors (competitive pressure, consumer demand and investors) and non-market actors (regulations, NGOs, auditors, and the media). On an organizational level, the key firm characteristics may determine in what way the firm is engaging in greenwashing.

A greenwashing firm engages in two behaviors simultaneously (Delmas & Burbano ,2011): positive communication about its environmental performance, but a poor actual environmental performance. For simplicity, poor environmental performers are called *brown firms*, and good environmental performers are called *green firms* (*figure 1*). Considering it would be counterproductive for a brown firm to actively communicate negatively about its bad performance,

and will therefore choose to either remain silent about its performance or represent it in a positive light, these firms are considered on a spectrum from no communication (*silent brown firm*) up to a large amount of seemingly positive communication (*vocal brown firms*), the green talk. This would imply that non-greenwashing firms will only become a greenwashing firm in two ways. First, a vocal green firm can alter its performance to a worse environmental state, giving up parts of its green mission. Second, a silent brown firm can go public with false or untruth information about its environmental performance. The latter, at last, is more common and is a key characteristic of a greenwashing firm (Parguel et al., 2011).

These two ways of engaging in greenwashing are determined by both internal and external drivers (*figure 2*). On a larger scale, market external drivers, consisting of competitive pressure, investor and consumer demands, are the main drivers to outperform competitors financially in a free market economy. A green image or more sustainable products attract a new target group that highly values sustainability, leading to new ways of buying or investing. These market pressures also hold for CSR practices. Not only sustainability based on producing environmentally friendly, but also in combination with social responsibility regarding working conditions and ethical procedures in the entire MNEs' global value chains. Surroca et al. (2013) state that rising pressure from home country stakeholders to actively participate in CSR may actually result in irresponsible practices from an MNEs HQ to its subsidiaries. Then, this effect is stronger if there is a high home country degree of regulatory or civil society control. However, this effect is weaker if the host country's degree of regulatory or civil society control is high. Moving away, and thereby avoiding further pressure from both market and non-market pressures, creates further incentives for firms to communicate positively about their environmental performance. Thus, ceteris paribus, the greater the perceived consumer and investor pressure for operating environmentally friendly, the more likely a brown firm is to engage in greenwashing (Delmas & Blass, 2010).

While these external drives create an environment that incentivizes brown firms to greenwash, internal drivers ultimately determine on which scale a firm may greenwash. In other words, on a lower level, there are several organizational-level drivers for greenwashing. Firm-level characteristics, such as size (Ibhagui & Olokoyo, 2018), industry, and profitability (Bosse et al., 2009), but also the possession of particular competencies and resources within a firm's board are all associated with the overall strategy of a firm. Vafaei et al. (2015), for example, suggest that board diversity is positively associated with financial performance after controlling for other firm-specific characteristics. Boards with both men and women, both young and older, and with

different nationalities tend to better adapt to the changing competitive and regulatory environment, making their financial and CSR-related strategies more efficient, and thereby a more profitable business overall.

Figure 1: Typology of firms on environmental performance

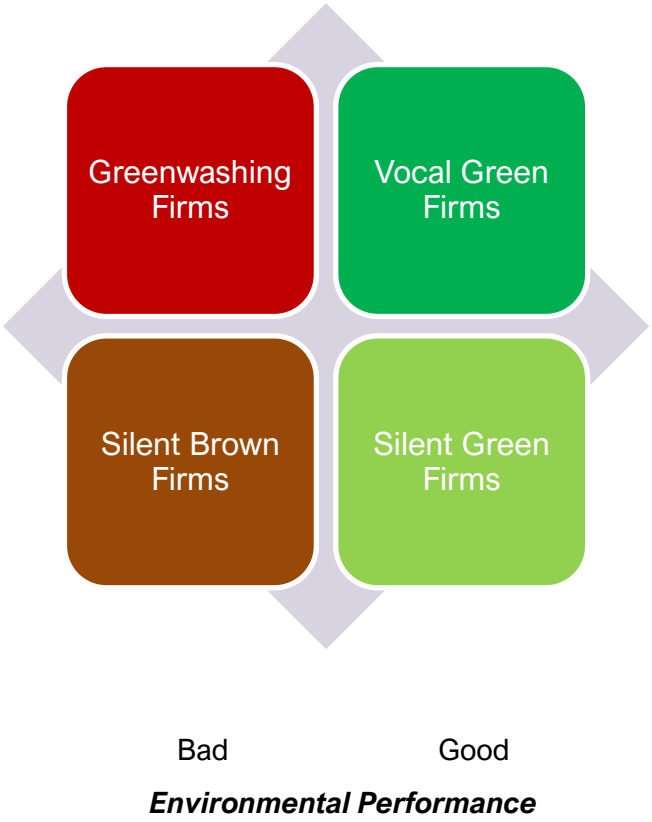

Figure 2: Underlying drivers of greenwashing on three levels

2.1.2. Levels of greenwashing

Previous studies have examined greenwashing at the product and the company level. At the product level, it is associated with specific and explicit strategies to advertise environmental characteristics of a product or service. At the corporate level, it incorporates environmental issues that affect larger parts of the firm. With such attitude, firms seek to create a misleading positive impression of its environmental performance.

Nowadays, greenwashing at the firm level is particularly effective in coping with the growing demand from stakeholders for higher levels of transparency and responsibility (Lyon & Maxwell, 2011). Therefore, it has become a widespread strategy to outperform competitors. To further substantiate this outperformance in both environmental as well as financial matters, product- and company-level greenwashing can be classified into four categories (Torelli et al., 2019). These are characterized by specific communication procedures and goals. Each kind of greenwashing also comes with different perceptions from stakeholders and thereby with different responses from stakeholders. Most approaches are rather unharmful to the firm. However, others can produce scandals, boycotts, or other reputational damage. The four levels of greenwashing formed by Torelli et al. (2019) are as follows: (1) Corporate-level greenwashing concerns misleading environmental communication related to the firm's actual reputation and image. It embodies a static dimension, such as the firm's vision, adherence, or basic things as its name and logo. Another form of corporate-level greenwashing is decoupling. Decoupling takes place when a firm claims to fulfill stakeholders' expectations, without making any real change in its practices. Generally, this occurs when a firm promotes ambitious, sustainable projects without the support of an adequate sustainability department (Siano et al., 2017) (2) Strategic-level greenwashing is related to the firm's future strategies (i.e. strategic plans for improvement or implementation of new sustainable processes, strategic public communication, and corporate medium- to long-term goals). (3) Dark-level greenwashing concerns misleading information in order to hide illegal activities. The most common activities are corruption, illegal working conditions, and polluting practices, mostly offshore. It reflects symbolic actions intended to deflect stakeholders' attention. Thus, hiding irresponsible or unethical practices (Siano et al., 2017) At last, (4) Product-level greenwashing is related to specific features of a product. This can be done through e.g. packaging, green labels, and targeted advertising, while the product or service itself is not produced or executed environmentally friendly.

2.1.3. Pressure of stakeholders

As stated before, firms have witnessed a high increase in stakeholder pressure regarding CSR practices and other environmental issues. Environmental actions can be an effective mean to achieve social acceptance, since they help overcome asymmetric information about the environmental quality of a firm's operations (Berrone et al., 2015). On the other hand, the results of Berrone et al. (2015) suggest that not all environmental actions are effective to this goal. Firms that resort to greenwashing and thus do not *walk the talk*, will receive way less legitimacy from stakeholders, especially in the presence of vigilant NGOs. At the corporate level, stakeholders drive companies' sustainability strategies and the impact it has is determined by the power that a particular stakeholder group has (Wolf, 2014). If the different pressures in a firm's home country are relatively high, most firms feel the urge to incorporate more aspects of CSR in their management strategies. Sun and Zhang (2019) find that this urge creates more incentives to either move irresponsible practices abroad, far away from the monitoring institutions, or to resort to greenwashing. This way, firms found a way to elude stakeholder pressures.

Moreover, Yu et al. (2020) give another reason why firms get away with such pressure; the fact that the presented ESG information on their reports is often vague or unaudited. This institutional gap creates a path in which firms present unreliable data regarding their ESG performances. This creates even more incentives for firms to engage in greenwashing, leaving it unnoticed. If ESG information disclosed by firms is not reliable, a firm's greenwashing behavior acts as a barrier to integrating ESG factors into investment decisions.

2.1.4. Risks of disclosure

Not only are firms overseen more and more by stakeholders regarding their green performance and their reporting on CSR initiatives, the risk of disclosing greenwashing practices comes into question, and should be accounted for by firms. Marquis et al. (2016) indicate that poor environmental performance makes firms more visible to stakeholders with environmental concerns. This characteristic then may expose firms to greater scrutiny, making them more vulnerable to actual disclosure of their greenwashing activities. Information access and activism by civil society had pronounced inhibiting effects. As more damaging firms are exposed to scrutiny and global norms, they opt to disclose more substantive information. As a result, the number of companies worldwide that have voluntarily issued CSR reports has increased drastically. The unresolved question here is whether this increased prevalence disclosure is an actual increase in responsibility, accountability, and transparency or merely a symbolic action, the green talk.

Moreover, Marquis et al. (2016) suggest that higher-performing firms regarding the reduction of their ecological footprint might be less prone to selective disclosure. Because of their superior position to stakeholders, they tend to convey a form of legitimacy more easily. Besides, firms are motivated to disclose only information that fosters their reputation (Dye, 2001). Logically, relatively poorly performing firms would only disclose indicators that enhance their reputations, while hiding the others.

Following this, several studies have shown that firms' higher visibility leads them to comply with institutional demand more frequently, because of their higher likelihood of receiving attention from external stakeholders (King, 2008; Bartley & Child, 2014). It is therefore argued that environmental damage is also a form of visibility, exposing firms to attention from the public (Marquis et al., 2016). This creates a risk where irresponsible CSR or greenwashing practices get the attention of the public eye. If such news gets media attention, a scandal is very likely to be formed.

2.2. Hypotheses development

In recent literature, several drivers and forms of greenwashing have been identified. Drivers of greenwashing have been organized into the levels external, organizational, and individual. The external drivers include pressures from both market actors (competitors, consumers, and investors) and non-market actors (NGOs and regulators) (Delmas & Burbano, 2011). The pressure from these stakeholders to operate more sustainably has led to incentives for firms to seek legitimacy in other ways. By being untruthful about their commitment to reduce their ecological footprint, firms are able to acquire more critical financial and strategic resources. These resources can in turn be used to further invest in improving business operations, which coincides with higher performance (Berrone et al., 2017). If brought credibly, greenwashing creates a more environmentally-friendly image for the firm, especially based on organizational-level greenwashing. Consequently, the firm obtains a competitive advantage compared to firms that do not follow such strategies (Wagner & Schaltegger, 2004). Competitive advantage leads to a higher market share and competitive advantage and thereby higher sales. In conclusion to these findings, this has led to the first hypothesis:

H1: Greenwashing has a positive effect on the economic performance of the firm.

The industry is an important aspect in investigating nonfinancial disclosures and corporate and social responsibility practices (Torelli et al., 2019). Emission-intensive, or environmentally sensitive industries (EIIs) in particular, such as the oil industry and other industrial productions, are experiencing more pressure to reduce their emissions. The benefits that can be gained by greenwashing are higher for firms operating in these sectors. Such sectors can frame their impact on the environment in such a way that obscures the negative impacts of dependency on their fossil fuel-based economy (Scanlan, 2017). This creates a moderating effect in which the positive effect of greenwashing on economic performance is influenced by whether the firm is operating in an EII. Therefore, the second hypothesis is as follows:

H2: The positive effect of greenwashing on the economic performance of the firm is stronger in emission-intensive industries.

Other literature focuses more on the risks of greenwashing. They do acknowledge that greenwashing creates benefits up to a certain threshold. However, if the practices of greenwashing become public, it can backfire, causing a substantial decrease in economic performance. Greenwashing is then negatively associated with cumulative abnormal returns (Du, 2015). This would imply the form of an inverted U-shape. CSR initiatives positively affect economic performance up to a threshold when it becomes public, whereafter a sudden sharp decline in performance is evolving, creating this inverted U-shape (Miras-Rodríguez et al., 2015). Greenwashing can be seen as a pretense of these CSR initiatives. This would imply that the effect of greenwashing on economic performance is hump-shaped. Thus, greenwashing in earlier years may have an effect on firm performance now. Therefore, the third hypothesis is stated as follows:

H3: The effect of greenwashing on economic performance is hump-shaped.

Even though the benefits from greenwashing might be more present in emission-intensive sectors, it also comes with higher levels of risk. Greenwashing in visibly polluting industries is more likely to be identified and subsequently punished (King & Lenox, 2000). Within these sectors specifically, stakeholders such as environmental NGOs and governments are more severely present. Therefore, the threshold of the disclosure may come earlier than in other sectors. Greenwashing at earlier stages does impact firm performance in these sectors now.

However, in these emission-intensive sectors, this time period will be shortened due to the presence of stricter supervision (Du, 2015). This has led to the fourth hypothesis:

H4: The tipping point of the hump-shaped relationship between greenwashing and economic performance becoming negative is reached earlier by firms in emission-intensive industries.

3. Data and method

3.1. Data

3.1.1. Data source and sample

The Eikon Refinitiv database is used as a source for most ESG variables. It features multi-year business information among 2,576 large European firms, most of them being MNEs. The timeframe reaches from 2002 to 2022. This creates the possibility to both analyze between firms (cross-sectional) as well as over time within a firm (panel analysis). The cross-sectional analyses will determine whether greenwashing firms outperform firms that do not engage in greenwashing. The panel analyses will determine whether a specific firm has benefitted from greenwashing compared to a scenario where they did not engage in greenwashing. The focus point will be data on financial performance and corporate social responsibility (ESG data). ESG stands for *environmental, social and governance performance.* The database assigns scores in percentages between 0 and 100 (Refinitiv Eikon Datastream, 2023). An ESG score between 0 and 25 implies a poor relative ESG performance, while a score between 75 and 100 is considered excellent. Academics and researchers find this database to be of high quality and transparent (Eccles et al., 2014; Shakil, 2021). In addition to this ESG-related data, individual-level board data from BoardEx (2023) has been aggregated and merged into the entire dataset used for this analysis.

3.1.2. Dependent variable

The economic performance of the MNE is the dependent variable in all regressions. This will be measured by return on assets (ROA). This measurement is suggested to be a good measurement for performance, whilst also considering the size of the firm by controlling for the total number of assets (Chemmanur et al., 2013). Company performance is usually measured by either sales growth, profit margin and return on assets. Essentially, sales per employee measures the productivity and efficiency of a firm (Morbey & Reithner, 1990), and thereby the economic performance (Walter et al., 2006). Besides, return on assets contains a higher sample size in the

Refinitiv database, and will therefore be more representative for the analysis than these other measurements of firm performance.

Measuring economic performance by profit margin, the ratio of net income to net sales, return on investment, and sales per employee is considered as well. However, higher profit margins are mostly linked to better cost control, rather than directly to the actual economic performance (Al-Tuwaijri et al., 2004).

3.1.3. Key independent variable

The level of greenwashing is the main independent variable in all regressions. This will be measured by the difference between the *percentage of emissions reduction target set by the company* and the total actual reduction in *CO2 equivalents emission in tonnes*. The higher the value, the higher the level of greenwashing within a firm. The percentage of emissions reduction target set by the company reflects the reduction percentage which they have communicated within their reports. The percentage reduction of the actual emissions reflects how much of this target they have realized. In other words, this difference creates a good indicator for measuring the discrepancy between the symbolic actions (the target of reduction the firm has set) and the actual substantive actions (the reduction they realize) of an MNE (Walker & Wan, 2012). If the percentage of total actual reduction is lower than the target, it can be argued that the specific firm engages in greenwashing. Other literature defines greenwashing as the intersection of two firm behaviors: poor environmental performance and positive communication about that performance (Delmas & Burbano, 2011). This intersection is then reflected in the difference between the target reduction and the actual reduction in CO2 equivalents emissions. For H2 and H4, the sector of the firm will also be categorized in the level of emission intensity. This newly formed variable will be used as a moderator.

To be complete, in other qualitative research methods, greenwashing has been measured by looking further into the way of presenting their green goals in ESG-related reports (Yu et al., 2020) or by looking at the perceived greenwashing of consumers and other stakeholders (Szabo & Webster, 2021). Even though they may give a deeper understanding of greenwashing, these statistics are hard to quantify, and therefore not used in this analysis.

3.1.4. Control variables

The control variables consist of several variables outside greenwashing which may have an impact on the economic performance of the firm. The control variables from Eikon are: *country, sector, operating income (OI), CO2 emissions (CO), year of reduction target (ERT), reduction policy (ERP), total employees (EMP) total assets, ISO 14000 or EMS certification* (*Green_Certificate*). The sector will also be used in the form of a moderator (*H2, H4)*. Some control variables regarding the characteristics of a firm's board are retrieved from BoardEx (2023). These include: *gender ratio*, *nationality mix*, *average age, the average number of qualifications, and the average number of non-executive directors.*

Country is the home country of the firm and the *sector* refers to the sector the firm is operating in. Firm size is measured by the total number of employees and total operating income. A higher size of the firm reflects higher leverage and higher acquirements of both financial and strategic resources (Crook et al. 2008; Ibhagui & Olokoyo, 2018). This influences the performance of the firm. Return on assets and return on investment are profitability ratios that provide how much profit a firm can generate from respectively its assets and investments. Thus, these variables also influence the economic performance of the firm by reflecting the ability to use the resources to create a higher performance (Bosse et al., 2009).

ISO 14000 or EMS certification answers the question whether the company claims to have an ISO 14000 or EMS certification. This will be added as a dummy variable, where not having a certificate is signed a 0, and having either or both of these certificates is signed a 1. *Board diversity* answers the question whether the firm has a policy regarding the gender diversity of its board. Studies suggest that stakeholder engagement and board diversity create an internal environment in which performance can differentiate (Ararat et al., 2015; Shehata et al., 2017). *Environment partnership* answers the question whether the firm reports on partnerships or initiatives with specialized NGOs, industry organizations, or (supra-)governmental organizations which are focused on improving environmental issues. According to Miras-Rodríguez et al. (2015), these last three variables represent an active attitude toward climate action, which may have an effect on both the level of greenwashing as well as on the performance of the firm. The effect of board diversity may also influence the performance of a firm (García-Meca et al., 2015). Vafaei et al. (2015) suggest that board diversity is positively associated with financial performance after controlling for other firm-specific characteristics.

Boards with both men and women, both young and older, and with different nationalities tend to better adapt to the changing competitive and regulatory environment, making their strategies more profitable.

3.2. Empirical model and estimation

The basic empirical model (1) displays all the different variations that will be used within the analyses. It is estimated as follows:

$$\textbf{(1)}\ \boldsymbol{EP_{ist} = \beta_0 + \beta_1 G_{ist} + \beta_2 G_{ist} * \mathrm{EII}_s + \beta_3 C_{ist} + \varepsilon}$$

In this model, G_{ist} refers to the level of greenwashing by firm *i* in sector *s* at time *t*. EP_{ist} refers to the economic performance of the firm. $G_{ist} * \mathrm{EII}_s$ represents the interaction term between greenwashing and the emission-intensive industry. C_{ist} reflects all control variables.

First, a correlation matrix and a summary of the descriptive statistics are displayed to indicate an overview of all the variables used including their correlation, number of observations, average, standard deviation, minimum, and maximum. Second, several OLS regressions will be conducted (cross-sectional) to test whether firms with higher levels of greenwashing also show higher levels of economic performance. Thereafter, a Hausman test should determine whether a fixed effects or a random effects model can be used. A fixed effects model allows to control for all time invariant omitted variables. However, it does not directly allow for causal dynamics. Since it is hypothesized that both variations within and variation between firms are present, and the fact that firm characteristics also affect the results, the fixed effects model would, if supported by the Hausman test, fit best. This would allow for fixed effects with time-varying firm characteristics. Thereafter, by including lagged variables, it may provide a better indication of a causal relation. If, for example, a firm is exposed to greenwashing at time *t*, the effect on its performance may only be visible after a year (t+1) or two (t+2). By using this panel analysis, the dynamic relation between greenwashing and economic performance within a firm is tested. However, a form of causality can never be fully proven. A dummy for the industry is also created in these models. If the specific firm operates in an emission-intensive industry, it gets a 1, otherwise a 0. Thereafter, several robustness checks will be performed to critically evaluate the assumptions made in the different models. Other measurements of the dependent and independent variables are used.

In addition, several tests will be done to measure possible reversed causality, multicollinearity, heteroskedasticity, and endogeneity (omitted variable bias). If any of these are present, the model should be adapted to overcome these methodological issues.

4. Empirical results

4.1. Descriptive statistics

Table 1. Matrix of correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Sales per Emp.	1							
(2) Net Sales	0.046	1						
(3) Operating Income	0.026	0.220	1					
(4) Greenwashing	-0.021	0.146	0.093	1				
(5) CO emissions	-0.030	0.606	0.154	0.807	1			
(6) Reduction Target	0.015	-0.153	-0.054	-0.005	-0.088	1		
(7) ROA	0.002	0.194	0.028	-0.036	-0.045	-0.034	1	
(8) ROI	0.000	0.082	0.011	-0.052	-0.049	-0.029	0.528	1

As stated in the methodology, a merged dataset is created with several variables from the Eikon and BoardEx databases. While some variables with only positive integers were not normally distributed, these variables are now in a form of a natural logarithm (ln). Besides, every variable that is not a dummy will be standardized so the results will be more reliable. For the aggregation of the board data, averages have been taken. The table (*appendix 1*) shows an overall correlation table with all the variables used in the analysis. The most important variables are presented in table 1 above. A descriptive table with a summary of all variables has also been created (*appendix 2)*. Overall, this matrix of correlations suggests almost no multicollinearity, assuming a benchmark of > 0.6. However, net sales (2) seem to have a high level of correlation with number of employees (9). These are both proxies for firm size and will therefore only be used separately.

The graph on CO emissions (*Appendix 3*) depicts the average (ln) CO2 emissions and equivalent greenhouse gasses from 2002 to 2022. The left graph (0) represents all the firms from the database that do not own a green certificate. The right graph represents all the firms from the database that do own either an ISO-14000 certificate or an EMS certificate, or both. The average of all firms displays a reduction in emissions over the last two decades.
However, in contradiction to what an environmental-related certificate should result in, the average emissions of firms owning a green certificate are much higher than the average emission of firms without a green certificate. Besides, the emissions have declined less sharply compared to firms without a certificate. Then it could be assumed that this graph is a visualization of corporate-level greenwashing. Firms that do have a green certificate, and thereby showing their efforts in reducing their impact on the environment, show higher levels of emissions and a smaller reduction. Aune et al. (2012), on the other hand, relate this to EU policy. The European Parliament agreed on a climate and energy package to achieve a 20% reduction in greenhouse gas emissions and a 20% share of renewables by 2020. To achieve this, firms with the highest levels of emission were urged to report on their emissions, often through a certificate such as the ISO-14000 or EMS certificates. This way, the EU could better monitor emission-intensive firms and thereby better adapt their policies regarding sustainability matters. This explains the higher levels of CO emissions of firms with a green certificate compared to firms without a green certificate.

Table 2. The relationship between greenwashing and firm performance: OLS results

Dependent Variable	(1) Return On Assets	(2) Return On Assets	(3) Return On Assets
Greenwashing	-.039***	.007	.002
	(.005)	(.009)	(.01)
Emission Reduction Target		-.012	-.013
		(.008)	(.008)
Emission Reduction Policy		.148***	.134**
		(.052)	(.056)
Return on Investment		.593***	.54***
		(.011)	(.011)
Employees		-.031***	-.032***
		(.009)	(.01)
Target Percentage		-.003	0
		(.008)	(.008)
Green Certificate		.005	.014
		(.016)	(.017)
Gender Ratio			-.006
			(.059)
Nationality Mix			.045
			(.028)
Average Board Age			-.007***
			(.002)
Executive Directors			-.071
			(.052)
Number of Qualifications			-.024*
			(.014)
_cons	.106***	-.085*	.354***
	(.005)	(.052)	(.128)
No. Observations	13898	3917	3561
R-squared	.004	.417	.397
Country Dummies	No	Yes	Yes
Year Dummies	No	Yes	Yes

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*

4.2. Baseline results

The results of the OLS regressions are visible in *table 2*. In the first column (1), only a regression of greenwashing on firm performance (return on assets) is run, without any control variables or dummies. The effect seems significant with a coefficient of -.039. However, as expected, the R-squared is barely zero. Without any control variables, it is almost impossible to explain the variance within the model. Therefore, in the second column (2), the control variables regarding emission policies and firm characteristics are added. Besides, now a country and a year dummy are added. Immediately, the R-squared increases to .417, even though the number of observations has decreased significantly. A much larger share of the variance is explained in this model. However, the effect of greenwashing on firm performance has become statistically insignificant. We can therefore not conclude anything on this coefficient. The variables that are indeed significant are emission reduction policy (.148), return on investments (.593), and the number of employees (-.031). The first would imply that firms with a emission reduction policy show a higher level of firm performance, regardless of whether greenwashing is involved. The second suggests that return on investments has a positive relationship with return on assets. This may be due to the relatively high multicollinearity between both variables. The third would suggest that an increase in total employees will result in lower firm performance. In the third column (3), characteristics of the board are added. The R-squared (.397) stays quite stable compared to the second model. Besides, the relationship between greenwashing and firm performance remains insignificant. The added variable that is significant, on the other hand, is the average age of the board. Age would have a negative effect on firm performance. But this effect is rather small (-.007), and thereby negligible. To also find results on the effects within a firm, considering time periods, I created another set of panel data models in table 3. Besides, the return on investments is dropped out, because of the high collinearity found in the OLS. At the bottom, for every model, it is stated whether the lagged variables for greenwashing and the industry moderator are added.

Table 3. Fixed effects models on the effect of greenwashing on firm performance

Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
	$ROA_{(t)}$	$ROA_{(t)}$	$ROA_{(t)}$	$ROA_{(t)}$	$ROA_{(t)}$	$ROA_{(t)}$
$Greenwashing_{(t)}$	-.007			.094		
	(.04)			(.072)		
$Greenwashing_{(t-1)}$		-.032**			-.029	
		(.012)			(.029)	
$Greenwashing_{(t-2)}$			.001			-.032
			(.01)			(.022)
$Greenwashing_{(t)}$*Emission Intensive Industry				-.135*		
				(.081)		
$Greenwashing_{(t-1)}$*Emission Intensive Industry					-.003	
					(.032)	
$Greenwashing_{(t-2)}$*Emission Intensive Industry						.041*
						(.024)
Control Variables						
Emission Reduction Target	.017	-.005	-.003	.018	-.005	-.003
	(.012)	(.022)	(.017)	(.012)	(.022)	(.017)
Emission Reduction Year	.007	.017	.012	.006	.017	.011
	(.011)	(.021)	(.017)	(.011)	(.021)	(.017)
Emission Reduction Policy	.103	.228	.029	.101	.227	.043
	(.096)	(.208)	(.131)	(.096)	(.208)	(.131)

Number of Employees	.324***	.274*	.151	.319***	.275*	.166
	(.092)	(.154)	(.164)	(.092)	(.154)	(.164)
Gender Ratio	.012	-.007	.184	.009	-.007	.182
	(.129)	(.238)	(.174)	(.129)	(.238)	(.174)
Nationality Mix	-.114	-.901***	-.172	-.112	-.901***	-.184
	(.09)	(.168)	(.124)	(.09)	(.168)	(.124)
Average Board Age	0	.002	.008	0	.002	.007
	(.005)	(.008)	(.006)	(.005)	(.008)	(.006)
Executive Directors	-.196	.36	-.328	-.204	.361	-.31
	(.196)	(.338)	(.283)	(.196)	(.338)	(.283)
Number of Qualifications	.049	.123	.099	.051	.123	.096
	(.041)	(.078)	(.06)	(.041)	(.078)	(.06)
Green Certificate	-.021	-.02	-.011	-.017	-.02	-.007
	(.051)	(.098)	(.066)	(.051)	(.098)	(.065)
_cons	-.084	-.614	-.467	-.057	-.613	-.46
	(.342)	(.602)	(.462)	(.342)	(.602)	(.462)
No. Observations	3561	2172	2134	3561	2172	2134
Adj R^2	.009	.038	.011	.011	.038	.013
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Lagged variables	No	Yes	Yes	No	Yes	Yes
Industry moderator	No	No	No	Yes	Yes	Yes

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

The first fixed effects model (1) in table 3 reflects the basic regression on the effect of greenwashing on firm performance over time, whilst controlling for any firm-specific attributes that do not vary across time. Possible reversed causality is thereby most likely ruled out. The coefficient of greenwashing has a value of -.007. The effect is rather small and besides not significant. Therefore, it is hard to conclude anything from this first model. In the second model (2), a lagged term of greenwashing is added. This is greenwashing at time t-1. The value is negative and significant at a 95% interval (-.032). It suggests that greenwashing at t-1 has a negative effect on firm performance at time t. The adjusted R^2 has increased compared to the first model, from .009 to .038. However, the explanation of variance within the model is still not high. In the third model (3), the lagged term on greenwashing alters from t-1 to t-2, to check whether greenwashing at an earlier point causes different results. Interestingly, the coefficient of greenwashing at t-2 turned positive again (.001). At the same time, the value has become insignificant again, and the adjusted R^2 dropped back. Overall, from these first three fixed effects models, we can merely conclude that greenwashing at a certain point in time has a negative effect on the firm performance one year later. This would reject our first and third hypotheses, stating that the effect of greenwashing on firm performance is respectively positive or hump-shaped.

For models four to six, I added an interaction effect between greenwashing and being in an emission-intensive industry, the industry moderator (*GW*EII*). Model (4) does this regarding greenwashing at time t. The effect of greenwashing on firm performance is now positive (.094). However, the interaction term's value is negative and significant at a 90% interval (-.135). This may suggest that a firm engaging in greenwashing in an emission-intensive industry causes the firm to lower its firm performance, while firms greenwashing in other industries, on the contrary, show higher firm performance. In the fifth model (5), the same is done, but again including a lagged variable of one on greenwashing and the added interaction term. Here, the adjusted R^2 has increased compared to model four. The coefficient of greenwashing at t-1 is negative and not significant. This also holds for the interaction term. In the last model (6), the industry moderator and a lagged term at t-2 are added. Interestingly, the coefficient of the interaction term turns positive and significant on a 90% interval (.041). Greenwashing in emission-intensive industries may be increasing firm performance after two years compared to firms in other industries where the coefficient remains negative, but insignificant.

Overall, from models four to six, it seems that a firm engaging in greenwashing in an emission-intensive industry causes the firm to lower its firm performance, while firms greenwashing in other industries, on the contrary, show higher firm performance. On the other hand, while looking at greenwashing at time t-1 and t-2, the opposite occurs. At t-2, the effect of greenwashing on firm performance two years later turns positive for firms in emission-intensive industries, while firms outside these industries show a negative effect. This would partially reject the second hypothesis, stating that the positive effect of greenwashing on the economic performance of the firm is stronger in emission-intensive sectors. Indeed, operating in an emission-intensive industry alters the direction of the effect between greenwashing and firm performance. However, it completely rejects hypothesis four, stating that the tipping point of the hump-shaped relationship between greenwashing and economic performance becoming negative is reached earlier by firms in emission-intensive sectors. The results refute this hypothesis. While incorporating lagged terms of earlier time periods of greenwashing, the effect of greenwashing on firm performance turns from positive to negative in non-emission-intensive industries. For firms operating in emission-intensive industries, the opposite occurs. While incorporating lagged terms of earlier periods, the effect of greenwashing on firm performance turns from negative to positive.

4.3. Robustness checks

4.3.1. Testing empirical issues

There might be some limitations regarding the analyses that have been conducted in combination with the assumptions made beforehand. To check whether the found results are robust and significant enough to translate conclusions about the real-world economy, additional robustness checks have been done to check whether the analyses have underlying empirical issues. First, multicollinearity is tested. A VIF-test resulted in an average VIF value of 1.39 with no outliers above 1.88. Therefore, it is concluded that multicollinearity is not an issue regarding the results. This only was an issue between the return on assets and the return on investments. The return on assets is therefore removed from the fixed effects models. Second, a HET-test is conducted to check for heteroskedasticity. This test is significant, thus the model has no constant variance. To solve this, I have taken natural logarithms of several variables and all non-static variables have been standardized. This way, heteroskedasticity has been largely removed from the analyses. Third, a significant OV-test confirms the presence of omitted variable biases. Obviously, it is hard to incorporate all variables that may have an effect on firm performance. However, I have added the most influential variables according to the literature. Reversed causality has also been taken into consideration. To avoid this, in the fixed effects model, lagged terms have been added to guarantee the effect of greenwashing on firm performance, and thus not the other way around.

4.3.2. Alternative measures for firm performance

Beside the different tests, and the mitigation of most of these empirical limitations, some other regressions have been taken to account for biases in the main variables chosen. As a proxy for firm performance, I considered return on assets as the best comparison. However, other literature suggests other variables as proxy (Chemmanur et al., 2013; Morbey & Reithner, 1990; Walter et al., 2006). Therefore, I also ran the same regressions using profit margin and sales per employee. The results did change the values in very small margins. Thus, the return on assets turned out to be a representative indication of firm performance.

5. Discussion

5.1. Limitations

This paper has made an effort to assess the effect of greenwashing on firm performance. By measuring the discrepancy between a firm's symbolic action and its actual green performance, a proxy for greenwashing was formed. The reasoning behind the analysis has been substantiated by different literature on drivers and mechanics surrounding greenwashing practices. However, during this process, the empirical analysis including its assumptions and results showed some signs of limitations. The primary limitation of this study is the measurement of greenwashing. This was measured by the difference between the percentage of emissions reduction target set by the company and the total actual reduction in CO2 equivalents emission in tonnes. It was assumed that this discrepancy was only created by firms being untruthful (greenwashing firms) or silent (brown firms) about their poor environmental performance. Other possible reasons were thereby excluded. For example, firms may not reach their aimed target on emission reduction, because of a lack of resources to change their CSR strategies or to invest in green innovations (Katila & Shane, 2005), or a relatively large increase in production, which was not incorporated in the target set (Saeed Meo & Karim, 2022). These firms then appear to have a positive value for greenwashing, while in practice they were not able to reach their CO reduction target for other reasons. Perhaps, this could have been overcome by adding respectively a variable for the percentage of green resources and growth rate as control variables in the analysis. Then, other shortcomings for not reaching their target are partially incorporated, which makes the term greenwashing more reliable. Besides, this measurement of greenwashing does not differentiate on all four levels discussed by Torelli et al. (2019). Parts of dark-level greenwashing, such as corruption and illegal working conditions are not measured within this proxy. In addition, the effects of product-level greenwashing, such as the effect of green labeling is not considered. This may give an incomplete image of greenwashing overall.

Another acknowledgment is the overall dataset which only consists of European firms. These firms all have to comply with European laws and regulations. A part of the EU's Green Deal is to avoid greenwashing. By 2025, the commission is negotiating on a green taxonomy of activities and assets, and firms will have stricter obligations to report (more reliably) on their CSR initiatives (Dolge & Blumberga, 2021). A yearly audit from an external party will be legally required. On the contrary, these laws are less prominent in other parts of the world. Greenwashing in less developed countries is present, but less sophisticated.

Simply because the environmental legislation is more flexible, European MNEs are incentivized to move their polluting production processes to such places. Then, conveying the green talk will be more convincing in the home country. The public availability of data from such countries is quite low. However, adding this data may have altered the results.

In the paragraph on robustness checks, some other empirical issues have been addressed. Even though most issues including heteroscedasticity, multicollinearity, and reversed causality have been solved for the most part. The significance of the ov-test confirms the presence of an omitted variables bias. The limitation here is that not all factors that may influence firm performance are included in the models, simply because this would be impossible with the limited data available. This may also be the main reason for the low adjusted R^2 in the fixed effects models. Therefore, the conclusions made from these regressions are not representative.

5.2. Practical implications

While remaining unnoticed, greenwashing has proven to be a good strategy to improve firm performance in the short run. However, in practicality, greenwashing does also lead to market failures and disruptions of the efforts to reduce climate change. For managers, regulators, and NGOs that seek to implement policies to reduce the amount of greenwashing, this paper has hopefully contributed to a better understanding of the drivers behind, and the possible consequences of greenwashing in different sectors within Europe. This way, firms and organizations can together find ways to reduce the asymmetric and untruthful information of greenwashing firms and thereby their negative impact on the climate.

5.3. Suggestions for further research

All in all, this paper has made an effort to elaborate on why firms greenwash in the first place and aimed to find evidence for this by conducting research using panel data from the Refinitiv Eikon and BoardEx databases. By giving an overview of the more relevant topics regarding greenwashing, this paper can hopefully be seen as a valuable addition to the existing literature on greenwashing and firm performance. Additionally, this paper might give other insights on how to approach greenwashing in a quantitative way. However, the results from the different models are not at a significance level to draw conclusions on the effect of greenwashing on firm performance. Therefore, further research might thereby delve deeper into ways to create empirical models and other ways of measuring greenwashing that may be of significance to the literature.

In addition, further research could focus on firms from other parts of the world, where greenwashing is perhaps easier to identify. Actual scandals regarding large MNEs engaging in greenwashing also require further investigation. To add to this, qualitative research on scandals regarding greenwashing might give an extension to the existing literature.

6. Conclusion

In order to contribute to the ongoing research on the role of firms and their impact on the environment, this paper has made an effort to assess the effect of greenwashing on firm performance. Even though the vast majority of firms are benevolent towards the urgent need in supporting the climate, some firms have taken advantage of this development by creating a discrepancy between their symbolic actions (green talk) and their actual green performance (green walk). This created a proxy for greenwashing. Thereafter, in the light of the debate on whether the economic benefits of greenwashing outweigh the possible risks involved, this study answers the following research question: *What is the effect of greenwashing on the performance of firms?* To answer this, four hypotheses have been set up based on underlying theories that are substantiated by different literature on drivers and mechanics surrounding greenwashing practices, stating that engaging in greenwashing higher firm performance. But when caught by stakeholders or media, greenwashing may backfire, and in turn lower firm performance. In addition, the risk of disclosure and pressures from stakeholders were discussed. Mainly in emission-intensive sectors, where greenwashing is more likely to be identified and subsequently punished.

The results, in contrast to the hypotheses, suggest the opposite. Without moderating for emission-intensive industries, greenwashing at a certain point in time has a negative effect on the firm performance one year later. This would reject the first and third hypotheses, stating that the effect of greenwashing on firm performance is respectively positive or hump-shaped. While including the emission-intensive industry moderator, it is indicated that a firm engaging in greenwashing in an emission-intensive industry causes the firm to lower its firm performance in the beginning, while firms greenwashing in other industries show higher firm performance. While incorporating lagged terms of earlier time periods of greenwashing, the effect of greenwashing on firm performance turns from positive to negative in non-emission-intensive industries. For firms operating in emission-intensive industries, the opposite occurs. While incorporating lagged terms of earlier periods, the effect of greenwashing on firm performance turns from negative to positive.

This research has shown that the presence of greenwashing for European MNEs is evident. Firms are incentivized by several drivers, and in many cases, *not walking the talk* is still rewarding. However, at some point, firms will have to adapt to the increasing awareness and regulations against greenwashing in order to save the climate.

Bibliography

Allen, C., Metternicht, G., & Wiedmann, T. (2018). Initial progress in implementing the Sustainable Development Goals (SDGs): A review of evidence from countries. Sustainability Science, 13(5), 1453-1467. https://doi.org/10.1007/s11625-018-0572-3

Al-Tuwaijri, S. A., Christensen, T. E., & Hughes, K. E. (2004). The relations among environmental disclosure, environmental performance, and economic performance: A simultaneous equations approach. Accounting, Organizations and Society, 29(5-6), 447-471. https://doi.org/10.1016/S0361-3682(03)00032-1

Ararat, M., Aksu, M., & Tansel Cetin, A. (2015). How Board Diversity Affects Firm Performance in Emerging Markets: Evidence on Channels in Controlled Firms: Board Diversity in Emerging Markets. Corporate Governance: An International Review, 23(2), 83-103. https://doi.org/10.1111/corg.12103

Aune, F. R., Dalen, H. M., & Hagem, C. (2012). Implementing the EU renewable target through green certificate markets. Energy Economics, 34(4), 992-1000. https://doi.org/10.1016/j.eneco.2011.07.006

Bartley, T., & Child, C. (2014). Shaming the Corporation: The Social Production of Targets and the Anti-Sweatshop Movement. American Sociological Review, 79(4), 653-679. https://doi.org/10.1177/0003122414540653

Berrone, P., Fosfuri, A., & Gelabert, L. (2017). Does Greenwashing Pay Off? Understanding the Relationship Between Environmental Actions and Environmental Legitimacy. Journal of Business Ethics, 144(2), 363-379. https://doi.org/10.1007/s10551-015-2816-9

BoardEx. (2023). BoardEx Data Feeds. BoardEx. https://boardex.com/products/data-feeds

Bosse, D. A., Phillips, R. A., & Harrison, J. S. (2009). Stakeholders, reciprocity, and firm performance. Strategic Management Journal, 30(4), 447-456. https://doi.org/10.1002/smj.743

Brand, C. (2016). Beyond 'Dieselgate': Implications of unaccounted and future air pollutant emissions and energy use for cars in the United Kingdom. Energy Policy, 97, 1-12. https://doi.org/10.1016/j.enpol.2016.06.036

Chemmanur, T. J., Cheng, Y., & Zhang, T. (2013). Human capital, capital structure, and employee pay: An empirical analysis. Journal of Financial Economics, 110(2), 478-502. https://doi.org/10.1016/j.jfineco.2013.07.003

Crook, T. R., Ketchen, D. J., Combs, J. G., & Todd, S. Y. (2008). Strategic resources and

performance: A meta-analysis. Strategic Management Journal, 29(11), 1141-1154. https://doi.org/10.1002/smj.703

Delmas, M. A., & Burbano, V. C. (2011). The Drivers of Greenwashing. California Management Review, 54, 64-87.

Delmas, M., & Blass, V. D. (2010). Measuring corporate environmental performance: The trade-offs of sustainability ratings: Measuring Corporate Environmental Performance: the Trade-Offs of Sustainability Ratings. Business Strategy and the Environment, 19(4), 245-260. https://doi.org/10.1002/bse.676

Dolge, K., & Blumberga, D. (2021). Economic growth in contrast to GHG emission reduction measures in Green Deal context. Ecological Indicators, 130, 108153. https://doi.org/10.1016/j.ecolind.2021.108153

Du, X. (2015). How the Market Values Greenwashing? Evidence from China. Journal of Business Ethics, 128(3), 547-574. https://doi.org/10.1007/s10551-014-2122-y

Dye, R. A. (2001). An evaluation of “essays on disclosure” and the disclosure literature in accounting. Journal of Accounting and Economics, 32(1-3), 181-235. https://doi.org/10.1016/S0165-4101(01)00024-6

Eccles, R. G., Ioannou, I., & Serafeim, G. (2014). The Impact of Corporate Sustainability on Organizational Processes and Performance. Management Science, 60(11), 2835-2857. https://doi.org/10.1287/mnsc.2014.1984

García-Meca, E., García-Sánchez, I.-M., & Martínez-Ferrero, J. (2015). Board diversity and its effects on bank performance: An international analysis. Journal of Banking & Finance, 53, 202-214. https://doi.org/10.1016/j.jbankfin.2014.12.002

Hanss, D., & Böhm, G. (2012). Sustainability seen from the perspective of consumers: Sustainability seen from the perspective of consumers. International Journal of Consumer Studies, 36(6), 678-687. https://doi.org/10.1111/j.1470-6431.2011.01045.x

Ibhagui, O. W., & Olokoyo, F. O. (2018). Leverage and firm performance: New evidence on the role of firm size. The North American Journal of Economics and Finance, 45, 57-82. https://doi.org/10.1016/j.najef.2018.02.002

Johnsson, F., Karlsson, I., Rootzén, J., Ahlbäck, A., & Gustavsson, M. (2020). The framing of a sustainable development goals assessment in decarbonizing the construction industry – Avoiding “Greenwashing”. Renewable and Sustainable Energy Reviews, 131, 110029. https://doi.org/10.1016/j.rser.2020.110029

Kalesnik, V., Wilkens, M., & Zink, J. (2020). Green Data or Greenwashing? Do Corporate Carbon Emissions Data Enable Investors to Mitigate Climate Change? SSRN Electronic Journal. https://doi.org/10.2139/ssrn.3722973

Katila, R., & Shane, S. (2005). When Does Lack of Resources Make New Firms Innovative? Academy of Management Journal, 48(5), 814-829. https://doi.org/10.5465/amj.2005.18803924

Kim, E.-H., & Lyon, T. P. (2015). Greenwash vs. Brownwash: Exaggeration and Undue Modesty in Corporate Sustainability Disclosure. Organization Science, 26(3), 705-723. https://doi.org/10.1287/orsc.2014.0949

King, A. A., & Lenox, M. J. (2000). Industry Self-Regulation Without Sanctions: The Chemical Industry's Responsible Care Program. Academy of Management Journal, 43(4), 698-716. https://doi.org/10.2307/1556362

King, B. G. (2008). A Political Mediation Model of Corporate Response to Social Movement Activism. Administrative Science Quarterly, 53(3), 395-421. https://doi.org/10.2189/asqu.53.3.395

Lyon, T. P., & Maxwell, J. W. (2011). Greenwash: Corporate Environmental Disclosure under Threat of Audit. Journal of Economics & Management Strategy, 20(1), 3-41. https://doi.org/10.1111/j.1530-9134.2010.00282.x

Lyon, T. P., & Montgomery, A. W. (2013). Tweetjacked: The Impact of Social Media on Corporate Greenwash. Journal of Business Ethics, 118(4), 747-757. https://doi.org/10.1007/s10551-013-1958-x

Manning, S., Boons, F., von Hagen, O., & Reinecke, J. (2012). National contexts matter: The co-evolution of sustainability standards in global value chains. Ecological Economics, 83, 197-209. https://doi.org/10.1016/j.ecolecon.2011.08.029

Marquis, C., Toffel, M. W., & Zhou, Y. (2016). Scrutiny, Norms, and Selective Disclosure: A Global Study of Greenwashing. Organization Science, 27(2), 483-504. https://doi.org/10.1287/orsc.2015.1039

Miras-Rodríguez, M. del M., Carrasco-Gallego, A., & Escobar-Pérez, B. (2015). Has the CSR engagement of electrical companies had an effect on their performance? A closer look at the environment: Has CSR an Effect on the Performance? Business Strategy and the Environment, 24(8), 819-835. https://doi.org/10.1002/bse.1848

Morbey, G. K., & Reithner, R. M. (1990). How R&D Affects Sales Growth, Productivity and

Profitability. Research-Technology Management, 33(3), 11-14. https://doi.org/10.1080/08956308.1990.11670656

Parguel, B., Benoît-Moreau, F., & Larceneux, F. (2011). How Sustainability Ratings Might Deter 'Greenwashing': A Closer Look at Ethical Corporate Communication. Journal of Business Ethics, 102(1), 15-28. https://doi.org/10.1007/s10551-011-0901-2

Refinitiv Eikon Datastream. (2023). Datastream Macroeconomic Analysis. https://www.refinitiv.com/en/products/datastream-macroeconomic-analysis

Rohleder, M., Wilkens, M., & Zink, J. (2022). The effects of mutual fund decarbonization on stock prices and carbon emissions. Journal of Banking & Finance, 134, 106352. https://doi.org/10.1016/j.jbankfin.2021.106352

Saeed Meo, M., & Karim, M. Z. A. (2022). The role of green finance in reducing CO2 emissions: An empirical analysis. Borsa Istanbul Review, 22(1), 169-178. https://doi.org/10.1016/j.bir.2021.03.002

Scanlan, S. J. (2017). Framing fracking: Scale-shifting and greenwashing risk in the oil and gas industry. Local Environment, 22(11), 1311-1337. https://doi.org/10.1080/13549839.2017.1345877

Seele, P., & Gatti, L. (2017). Greenwashing Revisited: In Search of a Typology and Accusation-Based Definition Incorporating Legitimacy Strategies: Greenwashing Revisited. Business Strategy and the Environment, 26(2), 239-252. https://doi.org/10.1002/bse.1912

Shakil, M. H. (2021). Environmental, social and governance performance and financial risk: Moderating role of ESG controversies and board gender diversity. Resources Policy, 72, 102144. https://doi.org/10.1016/j.resourpol.2021.102144

Shehata, N., Salhin, A., & El-Helaly, M. (2017). Board diversity and firm performance: Evidence from the U.K. SMEs. Applied Economics, 49(48), 4817-4832. https://doi.org/10.1080/00036846.2017.1293796

Siano, A., Vollero, A., Conte, F., & Amabile, S. (2017). "More than words": Expanding the taxonomy of greenwashing after the Volkswagen scandal. Journal of Business Research, 71, 27-37. https://doi.org/10.1016/j.jbusres.2016.11.002

Sun, Z., & Zhang, W. (2019). Do government regulations prevent greenwashing? An evolutionary game analysis of heterogeneous enterprises. Journal of Cleaner Production, 231, 1489-1502. https://doi.org/10.1016/j.jclepro.2019.05.335

Surroca, J., Tribó, J. A., & Zahra, S. A. (2013). Stakeholder Pressure on MNEs and the Transfer of

Socially Irresponsible Practices to Subsidiaries. Academy of Management Journal, 56(2), 549-572. https://doi.org/10.5465/amj.2010.0962

Szabo, S., & Webster, J. (2021). Perceived Greenwashing: The Effects of Green Marketing on Environmental and Product Perceptions. Journal of Business Ethics, 171(4), 719-739. https://doi.org/10.1007/s10551-020-04461-0

Torelli, R., Balluchi, F., & Lazzini, A. (2020). Greenwashing and environmental communication: Effects on stakeholders' perceptions. Business Strategy and the Environment, 29(2), 407-421. https://doi.org/10.1002/bse.2373

Vafaei, A., Ahmed, K., & Mather, P. (2015). Board Diversity and Financial Performance in the Top 500 Australian Firms: Board Diversity and Financial Performance. Australian Accounting Review, 25(4), 413-427. https://doi.org/10.1111/auar.12068

Wagner, M., & Schaltegger, S. (2004). The Effect of Corporate Environmental Strategy Choice and Environmental Performance on Competitiveness and Economic Performance: European Management Journal, 22(5), 557-572. https://doi.org/10.1016/j.emj.2004.09.013

Walker, K., & Wan, F. (2012). The Harm of Symbolic Actions and Green-Washing: Corporate Actions and Communications on Environmental Performance and Their Financial Implications. Journal of Business Ethics, 109(2), 227-242. https://doi.org/10.1007/s10551-011-1122-4

Walter, A., Auer, M., & Ritter, T. (2006). The impact of network capabilities and entrepreneurial orientation on university spin-off performance. Journal of Business Venturing, 21(4), 541-567. https://doi.org/10.1016/j.jbusvent.2005.02.005

Wolf, J. (2014). The Relationship Between Sustainable Supply Chain Management, Stakeholder Pressure and Corporate Sustainability Performance. Journal of Business Ethics, 119(3), 317-328. https://doi.org/10.1007/s10551-012-1603-0

Yu, E. P., Luu, B. V., & Chen, C. H. (2020). Greenwashing in environmental, social and governance disclosures. Research in International Business and Finance, 52, 101192. https://doi.org/10.1016/j.ribaf.2020.101192

Appendix

A1: matrix of correlation on all variables

Table 1. matrix of correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)		(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
(1) SE	1.000																	
(2) lnNS	0.046	1.000																
(3) OI	0.026	0.220	1.000															
(4) lnCOTR	-0.021	0.146	0.093	1.000														
(5) lnCO	-0.030	0.606	0.154	0.807	1.000													
(6) ERT	0.015	-0.153	-0.054	-0.005	-0.088	1.000												
(7) ROA	0.002	0.194	0.028	-0.036	-0.045	-0.034	1.000											
(8) ROI	0.000	0.082	0.011	-0.052	-0.049	-0.029	0.528	1.000										
(9) lnEMP	-0.048	0.792	0.117	0.193	0.653	-0.150	0.141	0.059	1.000									
(10) ERTP	0.011	-0.206	-0.043	-0.200	-0.270	0.518	0.010	0.021	-0.209	1.000								
(11) GenderRatio	-0.014	-0.187	0.036	0.192	0.171	-0.058	-0.013	-0.007	-0.100	-0.070	1.000							
(12) NationalityMix	0.025	0.244	0.039	0.062	0.201	-0.083	-0.047	-0.017	0.222	-0.053	-0.063	1.000						
(13) avgAge	-0.020	0.010	0.002	0.002	0.048	0.042	-0.036	-0.032	0.087	-0.010	-0.025	0.061	1.000					
(14) avgNED	0.022	0.253	0.005	0.017	0.093	-0.030	-0.033	-0.023	0.147	-0.067	-0.334	0.158	0.132	1.000				
(15) avgNOQ	0.013	0.169	0.058	0.076	0.179	-0.085	-0.059	-0.025	0.137	-0.071	-0.093	0.340	0.059	0.223	1.000			
(16) avgTB	-0.001	-0.006	0.009	-0.010	0.009	0.034	0.095	0.040	0.025	-0.032	0.060	-0.125	0.297	-0.127	-0.118	1.000		
(17) GreenCertificate	0.003	0.342	0.036	0.329	0.439	-0.085	0.013	0.006	0.386	-0.136	-0.038	0.093	0.095	0.109	0.122	0.013	1.000	
(18) country	0.027	0.184	0.089	0.059	-0.011	0.007	-0.013	-0.008	-0.107	-0.024	-0.173	-0.035	-0.083	0.137	0.017	-0.102	0.014	1.000

A2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
SE	40012	3181.394	82992.862	-326554	8754250
lnNS	43531	13.706	2.527	0	23.05
OI	44084	3202368.4	38159196	-1.585e+08	2.931e+09
lnCOTR	14009	3.337	2.204	-4.605	12.969
GW	14065	11.325	3.033	-4.605	19.33
ERT	4788	2026.956	6.68	2018	2053
ROA	42611	4.257	17.389	-985.77	358.88
ROI	42683	6.744	59.203	-5820.92	2883.21
lnEMP	40023	7.746	2.215	0	13.424
ERTP	4404	47.118	31.795	.52	100
GenderRatio	30979	.816	.155	.2	1
NationalityMix	30557	.252	.26	0	.9
avgAge	27580	56.703	5.15	30	86
avgNED	30980	.765	.183	0	1
avgNOQ	30980	1.784	.588	0	4.417
avgTB	30980	5.941	3.309	0	37.975
Green Certificate	20575	.543	.498	0	1
country	54054	15.362	9.368	1	37

A3: Graph on average CO emissions from 2002-2022 sorted by green certificate