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Does Financial Performance Shield Greenwashers? Evidence from European Firms

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Abstract: This paper attempts to examine the impact of greenwashing on firms' risk and the shielding effect of financial performance across different sustainability conditions. Using a sample of 457 non-financial firms from European countries and a two-step generalized method of moments (GMM) model, this study assesses the moderating role of financial performance in the relationship between greenwashing and firm risk. In this study, we use both total risk and market risk to measure firms' risk. To address construct validity, we operationalize greenwashing as the industry-adjusted abnormal gap between a firm's self-reported environmental, social, and governance (ESG) score and its controversy-adjusted ESG combined score, thereby capturing intentional ESG decoupling. We have documented that greenwashing increases firms' risk when sustainability conditions are not enough developed. Furthermore, our results reveal that financial performance effectively mitigates the adverse impact of greenwashing on firm risk primarily under transitioning (medium) sustainability conditions. Overall, our findings indicate that the risk effects of greenwashing are context-dependent across different sustainability development levels.

Keywords: greenwashing; total risk; systematic risk; agency theory; legitimacy theory.

JEL classification: Q56; G32.

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1. INTRODUCTION

After the Paris Agreement in 2015 and Sustainable Development Goals set by the United Nations (UN), firms started to adopt sustainability goals in their agendas. Furthermore, public awareness has increased towards the environmental and social activities of firms as more funds flow into these activities (Matos, 2020) and investors start to pay more attention to sustainability activities (Amel-Zadeh and Serafeim, 2018). ESG-friendly investment strategies help investors to avoid high risk associated with companies that conduct undesirable business activities (Ahmed *et al.*, 2021). Whereas ESG activities are known for their risk-mitigating features, they may also be used opportunistically to divert investors' attention as noted by (Lueg *et al.*, 2019). The overstatement of ESG-related activities which are known as greenwashing is used strategically to attract more investors, to sell more products or to improve firm's image (Wolniak, 2016). Firms under pressure of regulatory environmental changes may mislead investors by overstating their sustainability-related performance (Marquis *et al.*, 2016). Holding that many countries are committed to meeting requirements of Green Deal, the firms operating in these countries may overstate their ESG-related activities and mislead their investors. However, greenwashing increases information asymmetry between firms and investors and has detrimental effects on the firms (Ledeboer and Kil, 2023). This lack of information transparency between firms and their investors has such detrimental consequences as underpricing of capital or inefficient allocation of it (Gregory, 2024). Firms with a great level of greenwashing have been found to be exposed to lower stock prices (Walker and Wan, 2012; Du, 2015; Testa *et al.*, 2018; Ghitti *et al.*, 2024). The main drivers of greenwashing are elusive as previous studies associated it with different firms characteristics such as; financial constraints (Zhang, 2022), profitability (Kim and Lyon, 2015), firm size (Marquis and Toffel, 2012) or high unsystematic risk (Gregory, 2024).

Since greenwashing has heterogeneous impacts on firms and the main motivation for it remains ambiguous, we aim to investigate the impact of greenwashing on firm risk (both total and market risk). Furthermore, many studies underscored the risk mitigating impact of profitability (Brown and Kapadia, 2007; Angel *et al.*, 2018; Ahmed *et al.*, 2024). We examine whether and how financial performance influences the impact of greenwashing on firm risk.

Prior studies allege that greenwashing is more severe in underdeveloped sustainability conditions, often at the expense of genuine green initiatives Lund-Thomsen *et al.* (2016) due to insufficient capacity Lim and Tsutsui (2012) and weak oversight (Yang *et al.*, 2020; Xu *et al.*, 2025). Conversely, in highly developed sustainability conditions, ESG is frequently used as a license to enter the market (Jamali *et al.*, 2017). Nevertheless, some studies defend the importance of sustainability for firms in underdeveloped sustainability conditions Zhang *et al.* (2018), arguing that firm-level sustainability initiatives can offset weak governmental Corporate Social Responsibility (CSR) oversight (Jauernig and Valentinov, 2019; Huang *et al.*, 2020). Therefore, we divide our sample based on the sustainability levels of country-year observations to observe the interaction between financial performance and greenwashing across low, medium, high, and very high sustainability environments. In doing so, we aim to examine whether and how greenwashing impacts firm risk in the shadow of financial performance under different institutional contexts. We empirically demonstrate that the risk of greenwashing and the risk-mitigating (shielding) effect of financial performance are not unified; rather, they are strictly contingent upon the country's sustainability conditions.

Section 2 of this study is devoted to literature review and main hypotheses development. In Section 3 and 4 we explain the theoretical framework, the main variables, and empirical strategy. We then present the results of main analysis in Section 5 and robustness tests in Section 6. Finally, in Sections 7 and 8 we present the conclusion, future research avenues and limitations of the study.

2. RELATED LITERATURE AND HYPOTHESES DEVELOPMENT

Although there is a growing body of literature on greenwashing, there is a limited number of papers that examine the impacts of greenwashing on the financial metrics of firms (Testa *et al.*, 2018; Gregory, 2024). In this way, Ghitti *et al.* (2024) used a sample of the 500 largest U.S. public companies and found that greenwashing decreases firm value. Another study conducted by Walker and Wan (2012), using over 100 top-performing Canadian firms, showed that greenwashing decreases firm value and greenhighlighting (equivalent sustainability-disclosure and sustainability-performance) has no impact on firm value. However, Gallas *et al.* (2025) revealed that the impact of greenwashing varies depending on the type of profitability measurement among European-listed banks. Whereas greenwashing has a positive impact on return on assets, it has a negative impact on return on equity and Tobin's Q. Another study conducted by Testa *et al.* (2018) documented that greenwashing deteriorates firm value using a sample of 3,490 publicly traded companies from 58 countries and 19 industries.

There is a limited number of papers focused on the risk and greenwashing relationship. Notably, Gregory (2024) discovered that greenwashing increases firm total risk and has no effect on systematic risk using a sample of firms from 70 countries over the period 2012–2022. An Australian-based study conducted by Mirza *et al.* (2025) documented that firms' one-period-lag greenwashing is positively associated with risk reduction, while two-period-lag greenwashing is marginally associated with it. Furthermore, Liu *et al.* (2024) documented that greenwashing increases stock price crash risk using a dataset of Chinese A-share listed companies from 2014 to 2021. Based on these mixed findings, we develop our hypotheses (H1 and H2) as follows.

H1*: Greenwashing increases firm risk.*

H2*: Financial performance negatively moderates the relationship between greenwashing and firm risk.*

An emerging-country-based study conducted by Li *et al.* (2023), has shown that greenwashing contributes to the financial performance of Chinese companies. Whereas this relationship weakened with stringent environmental regulations, it was reversed with low media favourability. In a parallel vein, Purnamasari and Umiyati (2024) documented that greenwashing has a positive impact on financial performance and this impact is strengthened with internal audit quality. Another Chinese-based study conducted by Chen and Dagestani (2023) has shown that greenwashing increases firm value and this impact strengthens with local directors and political connections. Furthermore, they noted that polluting firms, firms audited by the Big 4, and firms with mandatory disclosure benefit from greenwashing more than their counterparts. On the other hand, Ali *et al.* (2025) used a dataset from Chinese enterprises and documented that greenwashing diminishes the positive impact of environmental innovation on firm performance. By focusing on Chinese A-share agribusinesses, Wang and Tian (2025)

documented that greenwashing has a negative impact on return on assets, and this impact is mediated by green innovation. Using a cross-national firm-level sample, Xu *et al.* (2025) found that greenwashing decreases stock market value. This negative impact is more pronounced for companies with higher ESG commitment and operating in emerging markets. However, country factors such as culture and institutions are beyond the economic development level in explaining sustainability development (Cai *et al.*, 2016).

Therefore, we examine whether greenwashing increases firm risk under different sustainability conditions by considering the Sustainable Development Index (SDI), rather than general country development levels. This index is obtained from the Sustainable Development Report created by the Sustainable Development Solutions Network (SDSN) (Sachs *et al.*, 2025). As profit is often prioritized over ethical behaviours and social welfare in underdeveloped sustainability conditions Vives (2008), companies in these environments are more likely to shield their greenwashing activities through financial performance. Therefore, we develop our third hypothesis (H3) as follows.

***H3**: The risk-enhancing effect of greenwashing is more strongly alleviated by financial performance when sustainability conditions are underdeveloped.*

Figure no. 1 depicts our research framework.

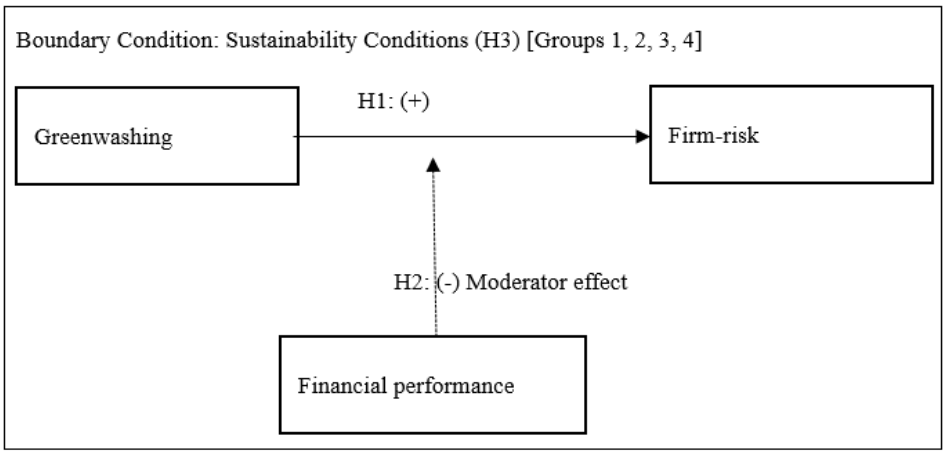

Figure no. 1 – Research framework

3. THEORETICAL FRAMEWORK

If firms adhere to the rules of the game (pressures) set by humans, society, the state, and institutions, they will succeed, remain stable, and remain competitive (La Porta *et al.*, 1998). Through the lens of *institutional isomorphism theory*, both formal and informal pressures exerted by external groups lead organizations to change their traditional business activities to more modern ones. Therefore, firms need to understand the norms, societal rules, and prestige pressures set by society (Saurabh *et al.*, 2024).

However, agency theory holds that managers follow their self-interest instead of improving firms' financial or social performance. In line with this theory, conflict of interest and information asymmetry between managers and stakeholders increase when firms greenwash (Mao, 2019). As investors cannot distinguish the difference between actual and disclosed social performance, it may result in stakeholders paying more attention to the positive tone (Donkor *et al.*, 2022). In line with this, unethical managers may prioritize short-term financial performance instead of considering all stakeholders' interests (Velte, 2025). Furthermore, *legitimacy theory* stipulates that managers choose various strategies to remain legitimate (Patten, 1992). According to this theory, an organization attempts to change bad perceptions into positive ones. As part of the legitimation process, an organization may conform to or change social perceptions and values (Dowling and Pfeffer, 1975). If companies change their activities or the perception of their activities, they should disclose them publicly (Cormier and Gordon, 2001). Kuruppu *et al.* (2019)argues that based on the different legitimation phases (i.e., gain, maintain, or repair), public disclosure differs. Therefore, it is worth noting that environmental and social disclosure has a legitimate motivation (O'Donovan, 2002).

Based on agency and legitimacy theories (Ross, 1973; Shocker and Sethi, 1973; Jensen and Meckling, 1976), we assume that greenwashing is related to higher firm risk. Furthermore, this risk is more pronounced in country-year observations with a lower sustainability level. Institutional voids, which can be described as the existence of weak and multiple informal institutions, have been associated with more opportunistic behaviour (Doh *et al.*, 2017). To clarify the conceptual mechanism of this relationship, we argue that high profitability creates a 'shielding effect' operating through the investors' pricing channel. Specifically, superior financial returns shield the firm and its management from investors' market penalties (i.e., adverse risk pricing) by inducing an economic tolerance for greenwashing. Moreover, this risk is alleviated by high profitability, especially in country-year observations with lower sustainability levels. Since country-year observations with a high sustainability level are associated with more intensive oversight and accountability for environmental and social activities (Xu *et al.*, 2025), observations in these categories are less likely to represent the risk mitigation impact of profitability.

4. DATA AND METHODOLOGY

4.1. Sample selection

This study uses a sample of firms from European countries between the years 2015 and 2024. Given that Europe is a unique continent committed to being the first carbon-neutral continent, and the firms operating in this region are pioneers in sustainable performance (Zahid *et al.*, 2022), CSR conditions have a major impact on European firms (Velte, 2025). We included the United Kingdom (UK) and Switzerland in our sample since they are also committed to net-zero emission goals and have strong trade integration with other European countries (Department for Business Energy & Industrial Strategy, 2022; Swiss Confederation, 2025). Primary data were obtained from the LSEG database (formerly known as Eikon with Datastream). Financial firms have been omitted due to their unique capital structure characteristics. Furthermore, continuous variables are winsorized at the 1% and 99% levels to

handle outliers. The final dataset of this study consists of 457 non-financial firms. Table no. 1 shows the distribution of firms across countries.

Table no. 1 – Sample distribution by country

Country	Number of firms	Percentage (%)
UK	90	19.7
France	63	13.8
Germany	50	10.9
Switzerland	39	8.5
Spain	28	6.1
Sweden	32	7.0
Finland	20	4.4
Netherlands	30	6.6
Denmark	16	3.5
Italy	16	3.5
Poland	13	2.8
Austria	10	2.2
Belgium	16	3.5
Portugal	6	1.3
Luxembourg	7	1.5
Ireland	13	2.8
Greece	8	1.8
Total	457	100

4.2. Independent variable

There are different categories of greenwashing prominent in empirical research. First, it can be measured as decoupling between the external ESG actions and internal ESG actions based on one ESG database (e.g., LSEG) Hawn and Ioannou (2016), which often reflects symbolic disclosure. Second, it can be measured as the divergence between different databases (e.g., Bloomberg and LSEG) (Hauch, 2026). Third, it can be measured through the divergence between raw disclosed ESG performance and verified combined ESG performance (Long *et al.*, 2025) which explicitly accounts for ESG incidents and controversy risk.

Prior research describes greenwashing as a form of decoupling strategy, through the use of such channels as green labels, social accreditation, codes of conduct, and policy claims (Roulet and Touboul, 2015). Building on this theoretical premise, we operationalize greenwashing as the industry-adjusted abnormal gap between a firm's self-reported ESG score and its controversy-adjusted ESG combined score. By isolating this abnormal variance, our measure effectively distinguishes routine sustainability frictions from intentional misrepresentation. Therefore, we use the difference between actual ESG performance and disclosed ESG performance from LSEG as a proxy for greenwashing, following previous studies (Chen and Dagestani, 2023; Long *et al.*, 2025; Zeng *et al.*, 2025). ESG scores from LSEG are adjusted through ESG controversies of firms and verified as the ESG combined score. The ESG combined score covers sustainability activities of firms regarding environmental, social, and governance metrics (Shakil *et al.*, 2025). Once we compute the divergence between disclosed and verified ESG scores, we standardize it for each industry to reveal the relative divergence as shown in Equation (1).

$$GW_{it} = \left[\frac{ESGdis_{i,t} - \overline{ESGdis}}{\sigma\text{dis}}\right] - \left[\frac{ESG\text{verif}_{i,t} - \overline{ESG\text{verif}}}{\sigma\text{verif}}\right] \quad (1)$$

In Equation (1); GW_{it} represents the standardized divergence of the greenwashing index for firm *i* in year *t* in its industry. $ESGdis_{i,t}$ stands for the earlier disclosed ESG score of company *i* at the time of *t,* while $\overline{ESGdis}$ and σdis stand for mean value of ex-ante disclosed ESG scores and standard deviation of disclosed ESG scores of companies operating in the same industry respectively. $ESGverif_{i,t}$ stands for *ex-post* verified ESG score of company *i* at time of *t,* while $\overline{ESGverif}$ and σverif stand for mean value of verified ESG scores and standard deviations of verified ESG scores of companies operating in the same industry respectively. Figure no. 2 shows the intensity of greenwashing across years and across countries.

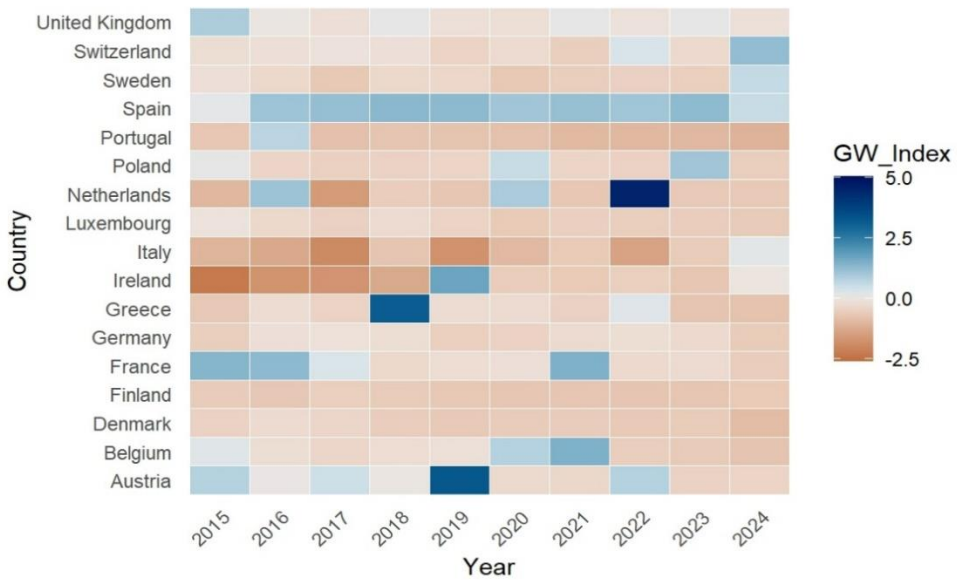

Figure no. 2 – Heatmap of Greenwashing (2015-2024)

4.3. Dependent variable

Various risk types have been used in the literature to measure firm risk. In this regard, some studies focus on the total and market risks of firms (Korinth and Lueg, 2022; Landi *et al.*, 2022; Khorilov and Kim, 2024) whereas others employ Altman (1968) Z-score (Cohen, 2023; Habermann and Fischer, 2023) Ohlson (1980) O-score (Truong *et al.*, 2025) or Zmijewski (1984) ZM-score (Meles *et al.*, 2023) based on key financial figures. On the other hand, some studies use market-based risk indicators such as Merton (1974) model (Shahrour *et al.*, 2021) or Bharath and Shumway (2008) model (Meles *et al.*, 2023).

In this study, we use both the total and market risks of firms to provide a broader perspective. Total risk is calculated as the standard deviation of stock returns for each month,

and the beta of the capital asset pricing model (CAPM) is used to measure the systematic risk. Since beta values are not available prior to 2015 in the LSEG database, we set 2015 as the starting period. We use Equation (2) to compute total risk.

$$Risk_{it} = std(r_{i,t}) \tag{2}$$

In Equation (2), $Risk_{it}$, is the monthly total risk of firm *i* in year *t*, *r* represents monthly stock return, and *std* represents the standard deviation.

4.4. Moderator variable

As previously mentioned, we use profitability ratios as moderator variables. Firms that greenwash initially benefit from greenwashing, and it is not transformed into long-term sustainable profitability (Gallas *et al.*, 2025). In this way, we use the return on assets (ROA) to measure profitability. Based on agency and legitimacy theories, we assume that firms with operational efficiency decrease their risks at the expense of greenwashing. Similarly, we use return on equity (ROE) to measure the returns generated for shareholders and how effectively firms use shareholders' investments. Furthermore, we also use the earnings growth (EG) ratio to measure the effectiveness of sustainable profitability of firms.

4.5. Stratification by SDI

SDI is created by the SDSN, considering the conformity of countries to 17 different Sustainable Development Goals (SDGs) put forward by the UN across different years. This index ranges from 0 to 100, where 100 represents full conformity with the SDGs and 0 represents no commitment to the SDGs. Hence, in countries and during years with high sustainability commitments, greater oversight and accountability exist, and distinct social and environmental rules may curb the opportunistic behaviour of firms. We have divided our sample into four different classes based on the 25th, 50th, and 75th percentiles of SDI. In this way, we have labelled our four classes of observations as low, medium, high, and very high. Figure no. 3 depicts the SDI level across years and countries. As shown in this figure, countries with high income per capita levels lag behind other countries in terms of sustainability, suggesting that sustainability goes beyond economic development and is more closely related to cultural and institutional development (Cai *et al.*, 2016).

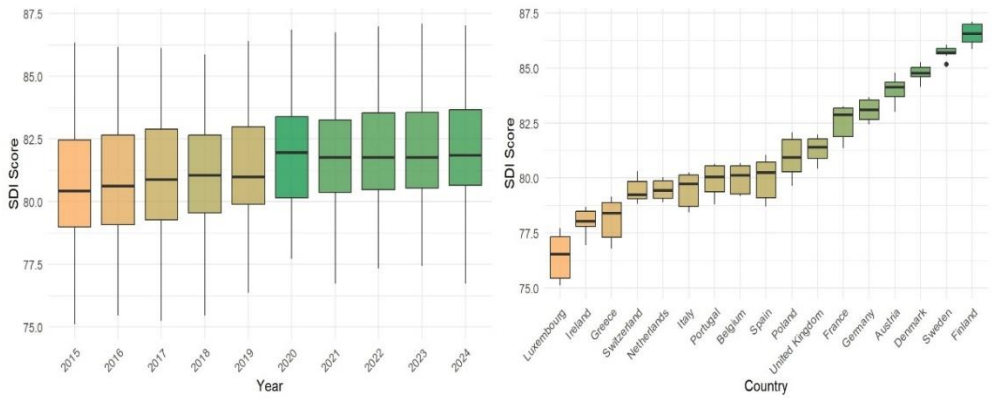

Figure no. 3 – Sustainability level across years and countries

4.6. Control variables

As for basic firm characteristics, prior research has included firm size, debt ratio, and market value as control variables (Gregory, 2024). We use several control variables to reveal basic firm characteristics and firm risk relationship. To measure debt ratio, we use total debt to total equity. Companies with higher debt ratios are more exposed to bankruptcy risk as noted by (Ben-Zion and Shalit, 1975). Additionally, we computed the market-to-book ratio as company market value divided by its book value of equity. In this sense, future growth expectations are associated with less risk (Philosophov and Philosophov, 2005). Additionally, we computed market to book ratio as company market value divided by its book value of equity. In this sense, future growth expectations are associated with less risk (Piotroski, 2007). Table no. 2 summarizes the variables used in this study.

Table no. 2 – Variable description

Abbreviation	Name	Description	Source
TR	Total risk	Standard deviation of the monthly stock returns for each year	LSEG
Beta	Systematic risk	Systematic risk of CAPM	LSEG
GW	Greenwashing index	Divergence between the ESG disclosed score and the ESG combined score	LSEG
ROA	Profitability ratio	Net income divided by average total assets	LSEG
SIZE	Firm size	Natural logarithm of firm's total assets	LSEG
LEV	Leverage ratio	Total debt divided by firms' total equity	LSEG
MTB	Market to book ratio	Firms market value divided by book value	LSEG
EG	Earnings Growth ratio	The difference in earnings between two consecutive years, divided by average total assets	LSEG
ROE	Return on equity	Net income divided by shareholders' equity	LSEG
SDI	Social Development Goals Index	Commitment level of countries to the Sustainable Development Goals set by the UN	SDSN

4.7. Empirical models

To examine the impact of greenwashing on firm risk, we use a system GMM model. Firm time-invariant factors may remain sticky and influence the association between firm risk and greenwashing. Therefore, we use this model to overcome biased estimates of our research results. The system GMM model introduced by Blundell and Bond (1998) is known for its endogeneity handling, which stems from time-invariant heterogeneity (Ali *et al.*, 2025). In our model, we treat GW, firm risk indicators (i.e., beta and total risk), and the interaction term as endogenous variables to account for reverse causality. All other control variables are treated as exogenous. Furthermore, we have conducted the Modified Wald test to check for the presence of heteroskedasticity. The Modified Wald test results confirmed the presence of heteroskedasticity in our model, and thus we used the robust option in our System GMM estimation. Equations (3) and (4) show the main models utilized in this study.

$$Risk_{it} = a_0 + a_1 GW_{it} + \gamma Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (3)$$

$$Risk_{it} = a_0 + a_1 GW_{it} + a_2 ROA_{it} + a_3 GW_{it} \# ROA_{it} + \gamma Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (4)$$

In Equations (3) and (4), $Risk_{it}$ stands for both total and systematic risk, GW_{it} for the greenwashing index, ROA_{it} for the profitability ratio, $Controls_{it}$ for control variables, μ for firm fixed effects, λ for year fixed effects, and ε for the error term respectively.

5. RESULTS

Table no. 3 shows the descriptive statistics of all variables used in this study. Our descriptive statistics show that both risk and greenwashing have higher values in the high SDI group. Furthermore, in terms of risk and greenwashing, the low SDI group has the lowest values compared to the other groups of observations. On the other hand, the profitability ratio, namely ROA, has its highest value in the very high SDI group and its lowest value in the low SDI group. In contrast, our alternative financial performance indicator, EG, attains its highest value in the low SDI group and its lowest value in the very high SDI group. Furthermore, another alternative financial performance indicator, ROE, has its highest value in the medium SDI group, whereas it has its lowest value in the low SDI group.

To provide a clearer context, we benchmarked our descriptive statistics against prior empirical studies. The mean value of our Greenwashing index (GW) in the high SDI group is 0.078, which aligns closely with the distribution reported by (Chen and Dagestani, 2023). Additionally, the mean GW in the very high SDI group is -0.0029, consistent with the findings of (Long *et al.*, 2025). Regarding firm risk, while our mean Beta values across all SDI categories are in line with those in Gregory (2024) our total risk averages are generally lower than his reported values. Furthermore, the average ROE documented by Gregory (2024) corresponds closely to the mean ROE of our low SDI group. Finally, while our average ROA is highly consistent with the study by Liu *et al.* (2024), it remains higher than the mean ROA reported by (Gregory, 2024).

Table no. 3 – Descriptive statistics

	Mean	Min	Max	Std Dev
Low SDI				
Total Risk	0.0836	0.0256	0.5389	0.0416
Beta	0.98761	0.0388	2.748	0.4529
GW	-0.0719	-2.596	4.584	0.9494
ROA	0.0247	-3.292	0.501	0.1881
SIZE	22.78	14.318	26.270	1.519
LEV	1.678	0.434	3.6828	5.117
MTB	2.649	0.5965	6.166	1.847
EG	0.0902	-3.317	79.292	0.0902
ROE	-0.0222	-107.39	4.982	3.2320
Medium SDI				
Total Risk	0.0983	0.02328	1.4986	0.0710
Beta	1.019	0.0388	2.748	0.48453
GW	-0.00510	-2.149	4.3494	0.9151
ROA	0.0424	-2.8960	2.518	0.2057
SIZE	22.588	15.523	26.742	1.681
LEV	1.748	0.43468	3.6828	1.1175
MTB	2.389	0.59659	6.1665	0.5965
EG	0.0104	-0.669	3.5714	0.1515
ROE	0.2145	-13.951	27	1.611
High SDI				
Total Risk	0.13768	0.0296	49.960	1.462
Beta	1.1056	0.0388	2.748	0.5561
GW	0.0778	-1.8854	4.004	0.9186
ROA	0.0444	-0.9421	1.922	0.1258
SIZE	23.051	17.40	27.027	1.61657
LEV	1.660	0.43468	3.6828	1.0518
MTB	2.2427	0.59659	6.16653	1.6545
EG	0.0043	-0.7380	2.1074	0.1022
ROE	0.1567	-56.459	179.76	5.671
Very High SDI				
Total Risk	0.0914	0.0264	0.6905	0.0448
Beta	1.0153	0.03884	2.748	0.4113
GW	-0.0029	-2.099	5.0433	0.96422
ROA	0.04824	-0.46723	0.3994	0.07084
SIZE	22.793	15.438	27.2198	1.4297
LEV	1.5778	0.4346	3.6828	0.91595
MTB	2.441	0.5965	6.1665	1.7139
EG	0.00084	-0.5935	0.47748	0.06105
ROE	0.0979	-9.9143	2.322	0.4060

Table no. 4 shows the correlation between selected variables. It can be stated that there is no high level of correlation among the selected variables. The highest level of correlation is observed between SIZE and GW (0.23) and it is below the acceptable threshold level of 0.80 (Porter, 2010).

Table no. 4 – Correlation Matrix

	GW	ROA	LEV	SIZE	MTB
GW					
ROA	0.0099				
LEV	0.0543	-0.0631			
SIZE	0.2299	0.0557	0.2204		
MTB	-0.0386	0.2363	0.1698	-0.0550	

Tables no. 5 and no. 6 show the relationship between GW and firm risk. According to our results, GW increases firm total risk only under medium sustainability conditions. Therefore, we can conclude that in country-year observations with low and medium sustainability levels, investors react more strongly than in other groups of observations. Once a greenwashing scandal is exposed, it continues to increase and triggers other scandals in the same market, and thus risk increases are stronger in these environments than in other ones (Xu *et al.*, 2025). In this way, our H1 hypothesis is partially accepted. Considering the main control variables, the profitability ratio is negatively associated with total risk in all groups except for the *low SDI* group, whereas it is negatively related to systematic risk in all groups. Whereas the leverage ratio has been found to be positively correlated with firm total risk only in the *medium SDI* group, it has not been found to be positively related to firm risk in other groups. Furthermore, SIZE has been found to be negatively related to firm total risk, and the MTB ratio is negatively related to total risk in all groups except for the *low SDI group.*

Furthermore, Table no. 7 and no. 8 show moderating role of financial performance measured by ROA. Our results suggest that operational performance shields the reverse effect of GW in the *medium and very high SDI* groups considering total risk. However, market risk measured by beta is only mitigated through ROA in the *medium SDI* group.

Table no. 5 – The nexus between GW and TR across SDI Groups (GMM Model)

SDI Groups	**1 (low)**	**2 (medium)**	**3 (high)**	**4 (very high)**
TR_{t-1}	0.1340*	0.1582***	0.1997**	0.1650**
	(0.079)	(0.0556)	(0.0857)	(0.073)
GW	0.0020*	0.0060***	0.0013	-0.0005
	(0.0013)	(0.0018)	(0.0011)	(0.00101)
ROA	-0.1382	-0.1679***	-0.1623**	-0.0815**
	(0.0342)	(0.0240)	(0.0381)	(0.0379)
LEV	0.00008	0.0018***	0.00066	0.0013
	(0.0013)	(0.00061)	(0.00098)	(0.0013)
SIZE	-0.0055***	-0.0085***	-0.0068**	-0.0045***
	(0.00155)	(0.00080)	(0.0015)	(0.0012)
MTB	0.00052	-0.0010**	-0.0015**	-0.0018***
	(0.00058)	(0.00047)	(0.00076)	(0.0006)
AR(1) Test (p-value	0.000	0.000	0.000	0.000
AR(2) Test (p-value	0.699	0.300	0.559	0.319
Hansen Test (p-value)	0.063	0.490	0.143	0.809
Number of Instruments	41	40	24	38
Number of Groups	155	286	216	190
Number of Observations	902	922	1080	991
Instrument Collapse	YES	YES	YES	YES
Lag Depth (GMM)	1 to max	1 to max	1 to max	1 to max

Table no. 6 – The nexus between GW and Beta across SDI Groups (GMM Model)

SDI Groups	**1 (low)**	**2 (medium)**	**3 (high)**	**4 (very high)**
$Beta_{t-1}$	0.889***	0.946***	0.900***	0.874***
	(0.074)	(0.052)	(0.034)	(0.047)
GW	0.0039	-0.006	0.0212	-0.0240
	(0.0139)	(0.0141)	(0.0095)	(0.0406)
ROA	-0.5595***	-0.661***	-0.6008***	-0.6276**
	(0.1522)	(0.2835)	(0.2101)	(0.2064)
LEV	-0.0032	0.0100	-0.0051	0.0009

SDI Groups	1 (low)	2 (medium)	3 (high)	4 (very high)
	(0.0051)	(0.0065)	(0.0037)	(0.00650)
SIZE	0.0029	0.0019	-0.0122	0.0027
	(0.0059)	(0.0058)	(0.0152)	(0.0089)
MTB	0.0032	0.0011	0.0018	-0.003
	(0.0038)	(0.0039)	(0.0034)	(0.0036)
AR(1) Test (p-value	0.000	0.000	0.000	0.000
AR(2) Test (p-value	0.681	0.472	0.237	0.600
Hansen Test (p-value)	0.285	0.522	0.729	0.647
Number of Instruments	40	29	23	35
Number of Groups	156	288	221	190
Number of Observations	878	915	1085	993
Instrument Collapse	YES	YES	YES	YES
Lag Depth (GMM)	1 to max	1 to 3	3 to 4	2 to max

Table no. 7 – Moderating role of ROA in the GW-TR nexus (GMM)

SDI Groups	1 (low)	2 (medium)	3 (high)	4 (very high)
TR_{t-1}	0.0677*	0.1381*	0.1490**	0.1226*
	(0.0819)	(0.0647)	(0.071)	(0.0705)
GW	0.00171	0.00760	0.0028	0.00043
	(0.0028)	(0.0023)	(0.0022)	(0.0016)
ROA	-0.1503***	-0.1769***	-0.1416	-0.0814**
	(0.0379)	(0.0294)	(0.0298)	(0.0355)
GW#ROA	-0.0282	-0.0531*	-0.0292	-0.0520**
	(0.0535)	(0.0313)	(0.0322)	(0.0232)
LEV	0.0003	0.0017***	0.00103	0.0013
	(0.0014)	(0.00064)	(0.00100)	(0.0013)
SIZE	-0.0059***	-0.0080***	-0.0075**	-0.0053***
	(0.0015)	(0.0008)	(0.0014)	(0.0012)
MTB	0.0004	-0.0010**	-0.0020**	-0.0025***
	(0.00058)	(0.00046)	(0.00084)	(0.00072)
AR(1) Test (p-value	0.000	0.000	0.000	0.000
AR(2) Test (p-value	0.986	0.287	0.405	0.220
Hansen Test (p-value)	0.065	0.390	0.149	0.882
Number of Instruments	50	50	42	47
Number of Groups	155	286	216	190
Number of Observations	902	922	1080	991
Instrument Collapse	YES	YES	YES	YES
Lag Depth (GMM)	1 to max	1 to max	1 to max	1 to max

Table no. 8 – Moderating role of ROA in the GW-Beta nexus (GMM)

SDI Groups	1 (low)	2 (medium)	3 (high)	4 (very high)
$Beta_{t-1}$	0.876***	0.937***	0.969***	0.755
	(0.077)	(0.0452)	(0.0317)	(0.064)
GW	-0.0026	0.0221	0.0535	-0.0094
	(0.0196)	(0.0207)	(0.0574)	(0.0513)
ROA	-0.6011***	-0.7854***	-0.5485***	-0.7705***
	(0.1609)	(0.2839)	(0.1973)	(0.2516)
GW#ROA	0.1132	-0.6475*	-0.2090	-0.3020
	(0.2682)	(0.3712)	(0.5875)	(0.5877)
LEV	-0.0025	0.0096	-0.0049	-0.0017
	(0.0045)	(0.0060)	(0.0040)	(0.0092)
SIZE	0.0043	-0.00114	-0.0107	0.0069

SDI Groups	1 (low)	2 (medium)	3 (high)	4 (very high)
	(0.0060)	(0.0053)	(0.0094)	(0.0108)
MTB	0.0038	-0.00024	-0.0018	-0.0085
	(0.0037)	(0.0035)	(0.0045)	(0.0054)
AR(1) Test (p-value	0.000	0.000	0.000	0.000
AR(2) Test (p-value	0.762	0.746	0.314	0.060
Hansen Test (p-value)	0.243	0.263	0.253	0.464
Number of Instruments	50	33	43	41
Number of Groups	156	288	221	190
Number of Observations	878	915	1085	993
Instrument Collapse	YES	YES	YES	YES
Lag Depth (GMM)	1 to max	1 to 3	2 to max	3 to max

6. ROBUSTNESS TESTS

To validate the robustness of our results, we reconduct our main regression models by substituting the profitability ratio with alternative financial performance ratios; earnings growth (EG) and return on equity (ROE).

$$Risk_{it} = a_0 + a_1 GW_{it} + a_2 EG_{it} + a_3 GW_{it}\#EG_{it} + \gamma Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it} \qquad (5)$$

Equation (5) represents our robustness tests model. Where EGit represents earnings growth and other variables are defined previously.

Table no. 9 and no. 10 show the moderating role of EG in the GW-risk relationship. The robustness of our model is validated only for the medium SDI groups. Therefore, these results partially support our H2 and H3 hypotheses.

Table no. 9 – Moderating role of EG in the GW-TR nexus (GMM)

SDI Groups	1 (low)	2 (medium)	3 (high)	4 (very high)
TR_{t-1}	-0.0071	0.1505**	0.1505**	0.2285*
	(0.211)	(0.0631)	(0.068)	(0.1322)
GW	0.0092	0.0044*	0.0018	0.0038
	(0.0080)	(0.0022)	(0.0015)	(0.0064)
EG	0.0003	-0.0033	-0.0153	-0.067**
	(0.0011)	(0.0025)	(0.0210)	(.0224)
GW#EG	0.0063	-0.0160*	-0.0262	-0.0589
	(0.0063)	(0.01606)	(0.0242)	(0.0721)
LEV	0.0011	0.0025***	0.0024**	0.0014
	(0.0011)	(0.0007)	(0.0010)	(0.0013)
SIZE	-0.0085**	-0.0093***	-0.0076***	-0.0045*
	(0.0023)	(0.0011)	(0.0013)	(0.0017)
MTB	-0.00038	-0.0028***	-0.0033***	-0.00247***
	(0.00051)	(0.0005)	(0.0007)	(0.00069)
AR(1) Test (p-value	0.039	0.000	0.000	0.000
AR(2) Test (p-value	0.648	0.340	0.191	0.400
Hansen Test (p-value)	0.081	0.463	0.873	0.460
Number of Instruments	46	49	41	43
Number of Groups	155	286	216	190
Number of Observations	902	922	1080	991
Instrument Collapse	YES	YES	YES	YES
Lag Depth (GMM)	2 to max	1 to max	1 to max	2 to max

Table no. 10 – Moderating role of EG in the GW-Beta nexus (GMM)

SDI Groups	**1 (low)**	**2 (medium)**	**3 (high)**	**4 (very high)**
$Beta_{t-1}$	0.8111***	0.7682***	0.9808***	0.8850***
	(0.074)	(0.0693)	(0.0240)	(0.0451)
GW	0.0945	-0.00994	0.0215	0.0081
	(0.0610)	(0.0350)	(0.0349)	(0.0440)
EG	0.00001	-0.0338***	-0.2138	-0.4750**
	(0.0036)	(0.0120)	(0.1928)	(0.1865)
GW#EG	0.0191	-0.1341*	0.1205	0.4182
	(0.0237)	(0.0751)	(0.3292)	(0.5761)
LEV	0.0026	0.0177***	-0.0038	0.0061
	(0.0059)	(0.0055)	(0.0034)	(0.0066)
SIZE	-0.0196*	0.0010	-0.0125*	-0.0011
	(0.0114)	(0.0090)	(0.0063)	(0.0110)
MTB	-0.0025	-0.0068*	-0.007**	-0.0091***
	(0.0039)	(0.0038)	(0.0034)	(0.0031)
AR(1) Test (p-value	0.000	0.000	0.000	0.000
AR(2) Test (p-value	0.865	0.245	0.268	0.102
Hansen Test (p-value)	0.280	0.522	0.333	0.338
Number of Instruments	46	46	42	43
Number of Groups	156	288	221	190
Number of Observations	878	915	1085	993
Instrument Collapse	YES	YES	YES	YES
Lag Depth (GMM)	2 to max	2 to max	2 to max	2 to max

Furthermore, we replace our main financial performance indicator, ROA, with ROE. Unlike ROA, which focuses on asset efficiency, ROE captures the impact of the firm's financial leverage and capital structure. Equation (6) shows our alternative model used in this study.

$$Risk_{it} = a_0 + a_1 GW_{it} + a_2 ROE_{it} + a_3 GW_{it} \# ROE_{it} + \gamma Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (6)$$

In Equation (6), ROE_{it} represents return on equity and other variables were defined previously.

Tables no. 11 and no. 12 show the moderating role of ROE in the GW-risk relationship. Our results show that the risk-increasing effect of GW is mitigated through financial performance (ROE) under *medium sustainability* conditions in line with the findings presented in Tables no. 7 and no. 9.

However, regarding total risk, the results are different. Likely driven by the financial leverage component embedded in ROE, total risk is not decreased with GW. While ROE masks GW engagements against market risk, it fails to protect firms from total risk. In this way, as suggested by Wang and Tian (2025), a robust and optimized financial structure acts as an internal governance mechanism to curb greenwashing related risk.

Table no. 11 – Moderating role of ROE in the GW-TR nexus (GMM)

SDI Groups	1 (low)	2 (medium)	3 (high)	4 (very high)
TR_{t-1}	0.043	0.1486**	0.1744***	0.0708
	(0.064)	(0.060)	(0.0644)	(0.1370)
GW	0.0016	0.0032*	0.0016	0.00081
	(0.0016)	(0.0018)	(0.0018)	(0.0073
ROE	-0.0305***	-0.0172**	-0.0081	-0.0206***
	(0.0067)	(0.0076)	(0.0118)	(0.0074)
GW#ROE	-0.0032	-0.00038	-0.0046	-0.0238
	(0.0108)	(0.0086)	(0.0119)	(0.0213)
LEV	0.0011	0.0030***	0.0016*	0.0008
	(0.0005)	(0.0006)	(0.0008)	(0 .0010)
SIZE	-0.0073***	-0.0079***	-0.006***	-0.0059***
	(0.0014)	(0.0010)	(0.0011)	(0.0017)
MTB	-0.00003	-0.0015***	-0.0028***	-0.0029***
	(0.00042)	(0.00049)	(0.0008)	(0.0008)
AR(1) Test (p-value	0.000	0.000	0.000	0.003
AR(2) Test (p-value	0.481	0.221	0.349	0.334
Hansen Test (p-value)	0.141	0.441	0.692	0.638
Number of Instruments	50	50	42	44
Number of Groups	155	286	216	190
Number of Observations	902	922	1080	991
Instrument Collapse	YES	YES	YES	YES
Lag Depth (GMM)	1 to max	1 to max	1 to max	2 to max

Table no. 12 – Moderating role of ROE in the GW-Beta nexus (GMM)

SDI Groups	1 (low)	2 (medium)	3 (high)	4 (very high)
$Beta_{t-1}$	0.834***	0.929	0.9762***	0.8739***
	(0.0633)	(0.0565)	(0.029)	(0 .0492)
GW	0.04106	-0.0314	0.0557	-0.0169
	(0.0418)	(0.0525)	(0.0400)	(0.0353)
ROE	-0.135**	0.0284	-0.0393	-0.1019
	(0.060)	(0.081)	(0.0777)	(0.0570)
GW#ROE	0.08246	-0.2701*	-0.1006	0.0315
	(0.1059)	(0.1670)	(0.1549)	(0.1225)
LEV	0.00072	0.0063	-0.0023	0.0036
	(0.0053)	(0.0070)	(0.0033)	(0.0067)
SIZE	-0.00645	0.0095	-0.0145	-0.00077
	(0.0087)	(0.0104)	(0.0089)	(0.0075)
MTB	0.0015	-0.0021	-0.0049	-0.0087**
	(0.0043)	(0.0033)	(0.0059)	(0.00367)
AR(1) Test (p-value	0.000	0.001	0.000	0.000
AR(2) Test (p-value	0.790	0.142	0.290	0.242
Hansen Test (p-value)	0.507	0.206	0.570	0.582
Number of Instruments	47	44	43	44
Number of Groups	156	288	221	190
Number of Observations	878	915	1085	993
Instrument Collapse	YES	YES	YES	YES
Lag Depth (GMM)	2 to max	3 to max	2 to max	2 to max

7. DISCUSSION

Based on the agency and legitimacy theories, we have concluded that financial performance helps to offset the risk-increasing features of GW. Since financial performance is used by managers to send signals that they have specific business successes, it mitigates the overstatement impact of ESG performance. However, this situation is confirmed by our robustness test only in environments where the level of sustainable development is transitional. There are restricted but uncertain regulations on GW activities in developing markets (Yang *et al.*, 2020). According to Huang *et al.* (2020), weak governmental enforcement and unfair competition in developing markets lead to more greenwashing activities. However, investors in these markets react more strongly and may express heightened concern about the company's ESG activities, which leads to more adverse market reactions (Xu *et al.*, 2025).

On the other hand, in countries with a lower development level, unethical behaviours are more common (Na *et al.*, 2018). Poor governance and lack of transparency in these countries lead executives to adopt more opportunistic practices (Viana *et al.*, 2022). Additionally, the information asymmetry that is associated with opportunistic behaviours is more severe in these countries (Christopher *et al.*, 2012). Nevertheless, firms' characteristics become more important with the development level. Yet, it does not mean that there is always a linear relationship between countries' development status and firm characteristics; rather, it could well be that there is a threshold development effect (Doidge *et al.*, 2007) . In this way, we found that the negative impact of greenwashing matters more in the low and medium SDI group and can be alleviated with good financial performance in transitional sustainable environment.

Our results corroborate the findings of Liu *et al.* (2024) and Mirza *et al.* (2025), which used Chinese and Australian companies, respectively. Based on the SDI classification, these countries' commitment levels to sustainability are close to the countries in our sample in the low category. However, our study extends this existing empirical evidence by revealing that the risk-enhancing effect of greenwashing is highly context-dependent. While prior studies such as Gregory (2024) documented no impact of greenwashing on systematic risk, we also did not find any impact of greenwashing on it. Nevertheless, we found that in some cases, financial performance mitigates the adverse impact of greenwashing on systematic risk.

8. SUMMARY

8.1. Conclusion

This study examined the impact of greenwashing on firm risk under different sustainability conditions using both total and market risk. Our main regression results show that engagement in greenwashing activities increases firm risk specifically in environments with medium sustainability performance. Through the lens of *agency theory,* the information asymmetry between principals and agents stemming from greenwashing activities elevates firm risk. Since ESG reporting suffers from restricted comparability, it intensifies agency problems. To remain legitimate, firms often overstate their ESG activities. Our results indicate that investors penalize greenwashing by increasing firm risk in both low and medium sustainability environments. However, critical divergence emerges in the moderating role of

financial performance. While high profitability fails to mitigate this risk in severely underdeveloped (low SDI) markets—likely due to deep institutional voids and lack of trust in financial reporting, it effectively acts as a shield in transitioning (medium SDI) conditions. A decent financial performance covers up the opportunistic behaviour, as investors in these regions prioritize financial returns over ethical concerns.

8.2. Theoretical implications

Regarding theoretical implications, this study's core contribution to the literature is uncovering the non-linear, macro-institutional boundaries of the shielding effect. We extend the traditional firm-level ESG discussions by demonstrating an institutional threshold effect. The risk-mitigating power of financial performance does not operate universally; it is inactive in severely underdeveloped economies due to market apathy and dissipates in highly developed regimes due to investor complacency and reliance on strict state enforcement. The performance-induced tolerance strictly peaks at the inflection point of transitioning economies, providing a novel macro-level perspective to agency and legitimacy theories.

8.3. Managerial and policy implications

For managerial and policy implications, our findings offer specific warnings. Rather than relying on symbolic green communication in transitioning environments, managers should prioritize operational benefits for investors. Since our findings indicate that financial performance acts as a shield, firms in these regions should focus on genuine operational efficiency (as reflected by ROA) rather than leverage-driven financial engineering (i.e., ROE), which fails to mitigate risk entirely. For stakeholders and policymakers, it is highly risky to focus solely on stated sustainability activities in these transitioning regions without strict verification. Policymakers must realize that standard ESG disclosures are easily masked by high profitability; therefore, they should evaluate such activities with stricter, independent audits that look beyond the firm's financial health.

8.4. Research implications

The main motivation for greenwashing remains ambiguous, and previous studies have documented heterogeneous impacts on firm performance. In this study, we used 457 non-financial firms from European countries and concluded that the impact of greenwashing on firms' risk varies depending on the sustainability conditions and firms' financial performance. Further studies are recommended to investigate this relationship in more detail. Furthermore, we compared the firms based on the country-year sustainability development levels; other studies may come across different results when considering different benchmarking criteria (i.e., civil law vs. common law countries or market-based vs. bank-based countries). We used the divergence between the initially disclosed ESG performance and validated ESG performance as a proxy for greenwashing. Future studies are recommended to use different greenwashing indicators such as the divergence between different databases – e.g., the divergence between Bloomberg and LSEG (Ghitti *et al.*, 2024) –, or residuals obtained from the regression models – e.g., regressing relative CSR strategy against ESG performance; (Gregory, 2024). While we focused on the divergence of composite ESG scores, analysing

the divergence of individual pillars (i.e., environmental, social, and governance) may yield different conclusions regarding firm performance.

This study has several limitations. First, we have used the LSEG database to determine the greenwashing index, but this database may not fully reflect the total ESG performance of firms. Furthermore, we used both total risk and market risk to measure firm risk. Future studies are recommended to use different idiosyncratic risk indicators to capture firm risk more precisely. In this study, we used *institutional theory, legitimacy theory and agency theory,* to explain the impact of greenwashing on firms' risk. Future studies are encouraged to focus on alternative theoretical frameworks to explain the impact of greenwashing on firms' performance.

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