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How Greenwashing Affects Firm Risk: An International Perspective

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Abstract: The effects of greenwashing as a corporate strategy on firm risk are not well defined. I construct a greenwashing measure for 3973 companies from 70 countries from 2012 to 2022. Using Dynamic Panel Modeling, I find results suggesting that greenwashing is a complex phenomenon with both positive and negative consequences. While it can improve a firm's public image and potentially enhance its financial performance, it may also lead to increased risk and misallocation of resources. Greenwashing firms have a lower weighted average cost of capital due to a higher debt-to-capital ratio. They are larger, have higher institutional ownership, and lower dividend yields. On the other hand, greenwashing firms have more ESG-related controversies that can hurt firm revenues and market value, they have higher unsystematic risk, and they have lower dividend yields and return on equity. I also find evidence that there is a feedback relationship between ESG ratings and greenwashing. There is no evidence that government mandates on ESG reporting inhibit greenwashing. The implication is that ESG scoring that emphasizes reporting ESG activities while informing investors also encourages greenwashing.

Keywords: greenwashing; systematic risk; unsystematic risk; ESG; resource allocation

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1. Introduction

A 2022 Harris Poll, surveying 1491 executives, revealed that a striking 80% rated their organizations' environmental initiatives as above average. However, 58% conceded that green hypocrisy is prevalent, acknowledging that their companies have exaggerated their sustainability efforts (Google Cloud 2022).

The term greenwashing was first used by environmentalist Jay Westervelt in a 1986 essay promoting towel reuse in the hospitality industry (Pearson 2010; Wolniak and Hąbek 2015; Guo et al. 2018). There is no generally accepted definition of the term greenwashing. The concept remains ambiguous (Seele and Gatti 2017).

Many researchers (Ramus and Montiel 2005; Gillespie 2008; Stamoulakis and Bridwell 2009; Vos 2009; Furlow 2010; Mitchell and Ramey 2011) use the Oxford English Dictionary definition: "disinformation disseminated by an organization so as to present an environmentally responsible public image". Others use the definition of the organization Greenpeace: "the act of misleading consumers regarding the environmental practices of a company or the environmental benefits of a product or service" (Fliegelman 2009; Parguel et al. 2009, 2011; Gallicano 2011; Delmas and Cuerel Burbano 2011; Chen and Chang 2013).

de Freitas Netto et al. (2020) identify types of greenwashing based on a systemic review from 2010 to 2020. Selective disclosure is when firms do not disclose negative environmental information and promote positive information. Decoupling behavior is when the firm uses symbolic actions to deflect attention to minor issues or issues it can control. The signaling of corporate pragmatic legitimacy is when corporations signal that they are meeting environmental goals they have failed to meet.

In this paper, I adopt a view where the level of effort of a firm in advertising and reporting its ESG activities is at variance with its level of effort in actual ESG activities as

a measure of greenwashing. This is a broad measure of greenwashing, as it ignores that a firm may not have to put as much effort as another firm to be ESG compliant. It also, unfortunately, mixes several previous definitions of greenwashing into one measure as well as captures legitimate information that may be helpful to consumers and investors. Thus, it is a noisy measure.

Greenwashing of course presents a host of problems to the market. For investors, it hides risks that the company is exposed to, thus leading them to undercharge capital and subsequently leading to inefficient allocation of capital. For consumers, it leads to misallocation of consumption and misallocation of personal investment.

Despite the voluminous literature on greenwashing, there have previously been few attempts at estimating the effects of greenwashing on the financial aspects of firms. The previous research has concentrated primarily on the effect of greenwashing on the market value of the firm's shares. Walker and Wan (2012), Du (2015), Testa et al. (2018a), and Ghitti et al. (2020) all find that greenwashing decreases the value of a greenwashing firm's stock shares. The reason for this is not clear. Zhang (2022a) finds that greenwashing activities by firms are associated with the firms being financially constrained. Kim and Lyon (2015) find that greenwashing is associated with higher profits and increased regulation. Marquis and Toffel (2011, 2012) propose that greenwashing is associated with increased firm size. Gregory (2023) finds that greenwashing is promoted by low stock price volatility, high costs of capital, and high information asymmetry between managers and shareholders.

The previous research has been limited in exploring the effects of greenwashing on financial metrics because the greenwashing measure used is an endogenous variable. I use a methodology that addresses this based on the errors-in-variables technique proposed by Griliches and Hausman (1986). By treating the Greenwash score used here as an endogenous variable, and realizing it is negatively correlated with the error term, this reveals a much richer and accurate set of results.

In this research, I examine the financial outcomes of greenwashing by constructing a greenwashing index using Refinitiv ESG component scores. I find that overall, the results suggest that greenwashing is a complex phenomenon with both positive and negative consequences. While it can improve a firm's public image and potentially enhance its financial performance, it may also lead to increased risk and misallocation of resources. Greenwashing firms have a lower weighted average cost of capital due to a higher debt-to-capital ratio. They are larger, have higher institutional ownership, and lower dividend yields. On the other hand, greenwashing firms have more ESG-related controversies that can hurt firm revenues and market value, they have higher unsystematic risk, and return on equity. I also find evidence that there is a feedback relationship between ESG ratings and greenwashing.

Section 2 details the previous literature. Section 3 describes the materials and methods used in this research. Section 4 presents the results. Section 5 discusses the results. Section 6 presents the conclusion.

2. Literature Review

2.1. Greenwashing and Public Attitudes

Greenwashing has a long and considerable literature of investigation. Kangun et al. (1991) first address the problems with environmental advertising. They examined 18 periodicals from 1989 to 1990 for environmental advertising. A total of 58% of the environmental ads had at least one misleading claim by expert judges with environmental backgrounds.

Carlson et al. (1993) take a similar approach with environmental ads using MBA students guided by a matrix typology. The judges found 60% of the environmental ads to be misleading.

Manrai et al. (1997) investigate "green-claims" and country disposition. Moderate claims of greenness led to more favorable product evaluations than stronger claims. Country development also had a positive effect on product evaluation.

Newell et al. (1998) examine the effects of misleading environmental claims on consumer perceptions of ads. They find that higher perceived deception leads to less corporate credibility. They find that higher deception results in less favorable attitudes toward the ad. Higher levels of perceived deception also lead to less favorable attitudes toward the brand. And higher deception results in decreased purchase intentions. Greer and Bruno (1996) provided a detailed study of the misleading environmental claims of twenty corporations and their actual environmental performance.

Kärnä et al. (2001) investigate if green advertising reflects sound decisions in the Finnish forestry industry. They find that in general, the advertisements reflect the company's environmental decisions.

Laufer (2003) argues that corporate ESG reporting has many parallels with financial reporting. Greenwashing here is a form of "moral hazard". This shifts the risk of social non-compliance from management onto shareholders and consumers. Laufer notes the inadequacy of reporting standards such as the Global Reporting Initiative (GRI) to address this moral hazard. He argues for the need for independent auditors of ESG performance, like that which prevails in financial reporting.

Bazillier and Vauday (2009) view corporate social responsibility and advertising as strategic complements. They explore unsubstantiated claims in a theoretical and empirical framework. They find that advertising effort has a positive effect on the level of corporate social responsibility.

Chen and Chang (2013) research the effect of greenwashing on consumer perceptions. They find that greenwashing decreases trust in companies. This leads to greater consumer confusion. They also find that greenwashing increases the perceived risk of a company's products.

Nyilasy et al. (2014) investigate the effects of green advertising and a corporation's environmental performance on brand attitudes and purchase intentions. They find that greater green advertising results in more unfavorable brand attitudes.

Chen et al. (2014) research the effect of greenwashing on consumer word-of-mouth advertising of brands. They find that greenwashing hurts perceived quality and satisfaction.

Rahman et al. (2015) examine the effect of greenwashing on consumer participation in hotel industry environmental programs. They find greenwashing increases consumer skepticism and decreases participation.

Parguel et al. (2015) examine whether evoking nature can mislead consumers about a brand's ecological image. They find that it does, especially if the consumer has low ecological knowledge.

Aji and Sutikno (2015) investigate consumer attitudes toward green labeling in Indonesia. They find that greenwashing increases consumer skepticism and perceived risk. However, at the same time, it increases trust.

Akturan (2018) explore the effect of greenwashing on green brand equity. He finds that greenwashing harms green brand associations and brand credibility. He finds that greenwashing indirectly influences green brand equity and purchase intention.

Schmuck et al. (2018) examine the differing effects of vague and deliberately misleading advertising. They find that vague claims do not hurt company brands while misleading claims do.

Wang et al. (2019) examine the impact of greenwashing of one brand on the purchase intention of green products from other brands. Further, they test the mediating role of greenwashing perception of the entire industry and the moderating role of brand attitudes towards other brands in the industry. Their results suggest that the greenwashing behavior of one brand negatively affects consumers' purchase intention of green products from other brands in the industry. Their results also indicate that the greenwashing perception of the entire industry partially mediates the relationship between the greenwashing behavior of a brand and the purchase intention of green products from other brands.

Gatti et al. (2019) provide a systematic review of the literature on greenwashing. They find that though greenwashing may be successfully used to influence consumers'

perceptions about a firm's CSR activities, it carries with it risks of negative effects on consumers' attitudes and financial performance.

Examining the reaction of consumers to greenwashing, Nguyen et al. (2019) demonstrate that greenwashing is negatively associated with green purchase intentions and that green skepticism mediates this negative association.

Pimonenko et al. (2020) check the impact of greenwashing on companies' green brands in Ukraine. They find that greenwashing leads to a decline in the company's green brand. They also find that the strongest factor influencing greenwashing is information on the company's official website.

Szabo and Webster (2021) examine the effects of green marketing on environmental and product perceptions. Perceived greenwashing is positively associated with green risk. Greenwashing is negatively associated with green value, brand attitudes, and purchase intentions. Greenwashing is also negatively related to happiness.

The literature on the effects of greenwashing on the public's attitudes towards companies that greenwash has focused almost entirely on consumer attitudes, with little notice paid to the effects of greenwashing on investor, manager, and employee attitudes. This is a glaring omission.

2.2. Drivers of Greenwashing

Munshi and Kurian (2005) examine greenwashing in light of postcolonial theory. They argue that corporate social responsibility is a long-term corporate strategy for social acceptance. It reflects public relations. This is not backed up by actual deeds. Public relations are in an asymmetric hierarchy of relations amongst Western shareholders, the Western public, and Third World citizens who play little role in the hierarchy. This asymmetry allows corporations to talk about ecological aims without giving up their goal of corporate profits.

Ramus and Montiel (2005) find low rates of adoption of specific environmental policies. They find that service companies are more likely to commit to environmental policies than to act on them.

Vos (2009) argues that greenwashing is a recent strategy for corporations. It arose from the use of marketing to counter environmental regulations that began in the 1970s. He argues this led to appearing environmentally friendly and began to be good for company profitability. This was a shift from the traditional corporate response of denying environmental "unfriendliness". He makes the case that the strongest reason for greenwashing is economic.

Cherry and Sneirson (2010) examine the stark contrast between BP's cultivated green image and its disastrous environmental record. They determine that the reason for greenwashing is a corporate culture based on shareholder primacy.

Parguel et al. (2011) examine the effect of a company's corporate social responsibility (CSR) ratings on the perceived effect of its corporate communications. A company's CSR rating has a direct effect on the perceived intrinsic motives of the company's communications on ESG issues. So much so, that Parguel et al. propose that ratings may deter greenwashing.

Delmas and Cuerel Burbano (2011) make a systematic analysis of the drivers of greenwashing. They define a greenwashing firm as engaging in two behaviors: poor environmental performance and positive communication about its environmental performance. They list twelve drivers for greenwashing: first, Law and Uncertain Regulatory Environment; second, Activist, NGO, and Media Monitoring; third, Consumer Demand; fourth, Investor Demand; fifth, Competitive Pressure; sixth, Firm Characteristics, such as size, industry, profitability, lifecycle stage, and particular resources and competencies; seventh, Incentive Structure and Culture; eighth, Effectiveness of Intra-Firm Communication; ninth, Organizational Inertia; tenth, Optimistic Bias; eleventh, Narrow Decision Framing; and twelfth, Hyperbolic Intertemporal Discounting. In the conclusion, they also mention limited and imperfect information about environmental performance. They make no distinction about the contribution of these drivers.

Lyon and Maxwell (2011) consider a theoretical model of a firm's disclosure of environmental information under an environmental auditing firm. They find that while auditing inhibits greenwashing, it also inhibits the firm from reporting some relevant environmental information.

Examining the greenwashing of firms in 46 countries, Marquis and Toffel (2011) find that smaller firms are more likely to greenwash. They also find that more visible firms—those that were larger and did greater environmental damage—were especially less likely to practice selective disclosure in institutional contexts where the government and civil society were more connected to globalization. They find evidence that the global environmental movement is affecting corporate practices.

Marquis and Toffel (2012) examine the characteristics that make firms choose to greenwash. They find that firms elect to do selective disclosure of environmental information when they are large companies but less so when they have a large environmental impact.

Wu and Shen (2013) conducted a study of 162 banks in 22 countries. They identify three motives for banks participating in CSR activities. These are strategic choice, altruism, and greenwashing. They find a positive relationship between CSR and various measures of financial performance. This relationship was nonexistent for banks greenwashing their activities while making no substantive changes.

Lyon and Montgomery (2013) theorize that the use of social media by external stakeholders decreases the use of greenwashing.

Lyon and Montgomery (2015) perform a review of the literature on greenwashing. They define greenwashing as misleading communication. They detail eleven varieties of misleading communication. They also list twelve drivers of greenwashing. They note that the literature is limited on the effects of greenwashing. The effects tend to point to the effects being negative on the firm's financial and market brand.

Marquis et al. (2016) explore when firms are going to engage in selective disclosure. Firms selectively disclose less when they are firms that damage the environment more, especially when they are in countries that have stronger protections for property rights.

Berrone et al. (2017) investigate sources of differences in the impacts of environmental actions. They find environmental actions increase environmental legitimacy. Some actions decrease legitimacy if environmental performance deteriorates. Intense scrutiny from nongovernmental organizations can lead to decreased legitimacy.

Seele and Gatti (2017) find that existing definitions of greenwashing place too much emphasis on misleading. Existing definitions do not incorporate unjust allegations. They propose a revised definition of greenwashing. Greenwashing is the co-creation of an external accusation toward an organization with regard to presenting a misleading green message.

Testa et al. (2018b) explore the influence of institutional pressures on environmental practices. Pressure from suppliers and shareholders contributes to corporate greening. Pressure from customers and industrial associations tends to encourage greenwashing.

de Freitas Netto et al. (2020) conducted a systematic review of the literature to define greenwashing and find its characteristics and forms. In general, there are two competing definitions of greenwashing. First, there is greenwashing as selective disclosure, where firms have poor environmental performance and positive environmental communications. Second, there is greenwashing as decoupling, where corporations make statements to satisfy stakeholders in terms of sustainability but without concrete action. In terms of forms, there are two identified. There is the claim of greenwashing where the company claims a product or brand that is created to make a misleading environmental claim. There is also executional greenwashing, where the company suggests nature-evoking elements in its advertising to suggest that its products or brands are environmentally friendly.

Arouri et al. (2021) demonstrate that heightened competition in product markets serves to curtail the practice of greenwashing.

Nishitani et al. (2021) investigate whether corporate environmental activities to meet UN sustainable development goals amongst Vietnamese firms are a form of greenwashing.

They find that companies that incorporate sustainable development goals are more likely to improve their environmental performance. But this was mediated by the strong government pressure they were under to meet the sustainable development goals.

Ferrón-Vílchez et al. (2021) research how greenwashing affects managerial behavior. Their findings indicate that managers who perceive greenwashing start to form negative feelings about the greenwasher. This hurts their willingness to start or continue the business relationship with the greenwasher. This is moderated by the "green attitude" of the manager, with a higher green attitude leading to less of a relationship.

Mbanyele et al. (2022) examine the effects of mandatory CSR reporting on CSR scores, environmental innovation, and quality of innovation. They find that mandatory CSR reporting leads to higher CSR scores. It also leads to greater innovation and quality of innovation. This effect is greatest for firms with weaker corporate governance and weaker CSR disclosure standards before mandatory reporting.

Zhang (2022b) examines firm product quality in light of environmental regulation. He finds environmental regulation has a positive effect on product quality for low-pollution firms. There is a negative impact on product quality from environmental regulation for pollution-heavy firms. Financial constraints motivate pollution-heavy firms to decrease their product quality. This promotes greenwashing.

Zhang (2022a) creates a peer-relative greenwash score to measure greenwashing by companies. He finds that companies' greenwashing decisions are motivated by financial constraints.

García-Sánchez et al. (2022) examine the relationship between Global Reporting Initiative (GRI) certification and greenwashing. They use an international sample of 1939 companies (15,219 observations from 2002 to 2017). They find that GRI certification leads to less greenwashing.

Ruiz-Blanco et al. (2022) investigate the characteristics that make a company pursue greenwashing. They provide evidence that companies in environmentally sensitive industries greenwash less than their counterparts in other industries, as well as companies following the GRI guidelines. Companies that issue a sustainability report greenwash less than those that do not. Companies in industries with proximity and high visibility greenwash more than their counterparts.

According to Hu et al. (2023), disparities in ESG ratings reveal that firms with heightened internal oversight and significant external investor scrutiny display a reduced, and at times negligible, propensity for corporate greenwashing.

Gregory (2023) finds that greenwashing is promoted by low stock price volatility, high costs of capital, and high information asymmetry between managers and shareholders.

The literature on the drivers of greenwashing has thus far been extensive in terms of quantifiable drivers, with little attention paid to ideological and psychological drivers.

2.3. Financial Effects of Greenwashing

Walker and Wan (2012), in a study of top Canadian firms in highly polluting industries, find that greenwashing and symbolic environmental activities by firms harm financial performance. They measure financial performance using return on assets and do not control for endogeneity.

Mahoney et al. (2013) examine if standalone company corporate social responsibility reports are a form of greenwashing. They do this by comparing the CSR performance scores of issuers versus non-issuers. They find that companies issuing CSR reports have higher scores. They conclude that issuing reports is not a form of greenwashing.

Du (2015) investigates the market valuation effects of Chinese firms named greenwashing firms. The exposure of greenwashing leads to a significant negative return for the named firms. This effect is found to come from two sources. There is a competitive effect for environmentally friendly firms and a contagious effect for potential environmental wrongdoers.

Kim and Lyon (2015) extend the literature by incorporating the idea of undue modesty by firms in environmental advertising. They call this "brownwashing". They then look at the difference in drivers between greenwashing and brownwashing firms. They find that firm growth leads to greenwashing as a result of anticipation of increased interactions with stakeholders in the regulatory environment. They find that deregulation and lower profits lead to brownwashing.

Testa et al. (2018a) analyze the impact of different types of environmental communication strategies on firm value and operating performance using a panel of 3490 publicly traded companies from 58 countries and 19 industries. They find that greenwashing does not pay, whereas brownwashing is associated with lower financial performance.

Sun and Zhang (2019) provide an evolutionary game theoretical model of greenwashing, allowing for government regulation. They find that while government regulation can inhibit greenwashing, government tax subsidies will still encourage greenwashing to some extent.

Ghitti et al. (2020) propose a measure of greenwashing based on the difference between the Newsweek Green Rankings and the Datastream Environmental, Social, and Governance score. They find that the greenwashing measure negatively affects Tobin's Q estimate and conclude that greenwashing decreases the firm's value in the long run. They also find that the greenwashing variable is negatively affected by corporate board size and whether the firm adheres to Global Reporting Initiative reporting and positively to corporate board independence.

Li et al. (2023) examine the effect of greenwashing on corporate financial performance as measured by return on assets. They used the information on 735 Chinese firms from 2013 to 2017. They find that greenwashing has a positive effect on return on assets. This relationship is weakened by local environmental regulation and reversed by low media favorability.

Li et al. (2023) present evidence that greenwashing exerts a positive influence on corporate financial performance (CFP). However, they note that this effect diminishes under stringent environmental regulations and is entirely negated when media coverage is unfavorable towards firms in China.

In their 2023 study, Xia and colleagues analyze a cohort of Chinese firms, uncovering compelling evidence that corporations often resort to greenwashing their environmental performance primarily in anticipation of future investment and financing needs. Furthermore, the research reveals a pronounced tendency for companies burdened with higher debt levels to engage in such deceptive practices.

The literature thus far on the financial effects of greenwashing has focused entirely on the returns side of finance, with little attention paid to risk.

3. Materials and Methods

3.1. Data

The ESG data are from Refinitiv. I use the CSRStrategy (a score that reflects a company's practices to communicate that it integrates the economic (financial), social, and environmental dimensions into its day-to-day decision-making processes), Emissions (a score that measures a company's commitment and effectiveness towards reducing environmental emission in the production and operational processes), and ResourceUse (a score that reflects a company's performance and capacity to reduce the use of materials, energy or water, and to find more eco-efficient solutions by improving supply chain management (Thompson Reuters Eikon 2017). I divide the demeaned CSRStrategy score by the mean of the Emissions score and the ResourceUse score. The idea here is that greenwashing firms will advertise their environmental accomplishments more than they act upon them. The definition of greenwashing measured here follows that of de Freitas Netto et al. (2020). It captures all aspects of their three definitions of greenwashing. The variable is then regressed against the overall ESG score for each firm and the error term is taken as the measure of greenwashing. Table 1 gives the basic statistics on the Greenwash score for all

3973 firms in the sample. The sample period is from 2002 to 2022. The firm financial data are from Bloomberg.

Table 1. Greenwash variable and correlation with ESG score and greenwash dummy variables.

Statistic	Greenwash
Mean	0.4138927
Std. dev.	5.132731
Skewness	49.12677
Kurtosis	3187.111
90th percentile	1.912004
75th percentile	0.5432797
25th percentile	−0.6019885

Correlations				
	ESG	**Greenwash**	**Greenwash75%**	**Greenwash25%**
ESG	1.0000			
Greenwash	−0.0014	1.0000		
Greenwash75%	−0.0102	0.2758	1.0000	
Greenwash25%	0.2767	−0.1458	−0.1182	1.0000

Greenwash is the greenwashing variable constructed by dividing the demeaned Refinitiv CSRStrategy score by the arithmetic mean of the Refinitiv Emissions score and the ResourceUse score. Greenwash25% is a dummy variable that takes on a value of 1 if the Greenwash variable is lesser than or equal to −0.6019885, and 0 otherwise. Greenwash75% is a dummy variable that takes on a value of 1 if the Greenwash variable is greater or equal to 0.5432797, and 0 otherwise. ESG is the Refinitiv ESG score. The correlation coefficients are Pearson correlation coefficients.

To further refine the process, I create two dummy variables. Greenwash75%, which takes on a value of 1 if the firm has a Greenwash score of 0.5432797 or greater, and 0 otherwise. This is taken as representing greenwashing firms. Greenwash25%, which takes on a value of 1 if the Greenwash score is less than or equal to −0.6019885, and 0 otherwise. This represents "brownwashing" firms. Brownwashing firms are firms whose environmental activities are not overly promoted.

To give some idea of the appropriateness of the classification, consider the case of Volkswagen in 2015. The data for the Greenwash variable would have come out in the first part of the year. Based on Volkswagen's scores, the firm would have a Greenwash score of 1.23. This means it would be in the Greenwash75% category. Volkswagen followed an aggressive growth strategy. The company expected to triple its sales in the US with the promotion of clean diesel technology (Muller 2013). In September 2015, the Environmental Protection Agency (EPA) accused Volkswagen of defrauding emission tests through software installed on its cars (Davenport and Ewing 2015). Volkswagen admitted to cheating on 11 million diesel vehicles around the world to circumvent emissions tests in the USA and elsewhere. Internal changes in manufacturing led to an improvement in their Greenwash score in 2016 of 0.62, still in the Greenwash75% set, but improving.

Table 2 gives a breakdown of the firms by developed and emerging markets as defined by Morgan Stanley.

Table 2 shows little difference in the proportion of emerging market firms for Greenwash75% firms versus Greenwash25% firms. The t-test statistic on the two means has a value of 1.347, which is significant at the 18% level. However, examination of the sample statistics shows that the Greenwash scores of developed market firms exhibit a larger positive skewness and a larger kurtosis than the emerging market firm sample (Skewness Developed Markets: 5.32; Skewness Emerging Markets: 2.15; Kurtosis Developed Markets: 89.04; Kurtosis Emerging Markets: 10.4). Huang et al. (2020) argue that emerging markets are more conducive to greenwashing. I do not find support for that here.

Table 2. Greenwash25% and Greenwash75% firms by type of market.

	Greenwash25%	Greenwash75% Firms	Average Greenwash Score
Developed Markets	79.30%	80.12%	1.1327
Emerging Markets	20.70%	19.88%	1.1633
Total	100.00% (993)	100.00% (993)	

Table 2 presents the percentage of Greenwash25% and Greenwash75% firms by type of international financial market as defined by MSCI. Greenwash is the greenwashing variable constructed by dividing the demeaned Refinitiv CSRStrategy score by the arithmetic mean of the Refinitiv Emissions score and the ResourceUse score. Greenwash75% is a dummy variable that takes on a value of 1 if the Greenwash variable is greater or equal to 0.5432797; Greenwash25% is a dummy variable, which takes on a value of 1 if the Greenwash score is less than or equal to −0.6019885, and 0 otherwise.

Table 3 exhibits the division of the firms by Bloomberg industrial sector.

Table 3. Frequency table by industrial sector.

Sector	Greenwash75%	Greenwash25%
Communication services	4.35%	6.51%
Consumer discretionary	11.67%	14.56%
Consumer staples	6.93%	4.96%
Energy	6.04%	3.65%
Financial	15.24%	19.56%
Health care	6.22%	11.15%
Industrial	18.63%	16.14%
Information technology	9.02%	8.85%
Materials	10.03%	8.05%
Real estate	5.89%	6.58%
Utilities	5.98%	2.06%
Total	100.0%	100.0%

This table presents the frequency count of firms by greenwashing type per industry sector as defined by Bloomberg. Greenwash75% is a dummy variable that takes on a value of 1 if the Greenwash variable is greater or equal to 0.5432797; Greenwash25% is a dummy variable, which takes on a value of 1 if the Greenwash score is less than or equal to −0.6019885, and 0 otherwise.

Table 3 shows that Greenwash75% firms are more likely in the sectors of consumer staples, energy, industrial, information technology, materials, and utilities, all of which impact environmentally sensitive areas. This is in contrast to the results of Ruiz-Blanco et al. (2022). The representation of greenwashing firms in all industrial sectors is rather striking. I do not find evidence that service firms are more likely to over-promote their ESG activities. This contradicts the results of Ramus and Montiel (2005).

Table 4 presents the financial and control variables used in this study.

There are some differences in the means between the Greenwash75% firms and the Greenwash25% firms. First, Greenwash75% firms have a lower weighted average cost of capital. There seems to be no difference in the individual component costs of capital. The difference in the debt-to-capital ratio may explain this. Greenwash75% firms have a higher debt-to-capital ratio. This means they may be using a greater ratio of less expensive debt financing to lower their weighted average cost of capital. Greenwash75% firms tend to be larger, as shown by the market cap and net cap exp figures. Greenwash75% firms also have a higher percentage of institutional ownership. Greenwash75% firms have a lower dividend yield on average and a higher prs score, indicating that they are located in countries with less political risk. Greenwash75% firms exhibit less idiosyncratic risk than Greenwash25% firms as shown by the standard deviations of their stock returns (sd). Table 5 exhibits the means of the Refinitiv component scores for the Greenwash75% and Greenwash25% firms.

There is no significant difference in the ESG scores between the two samples. Greenwash75% firms have higher Controversies scores than non-Greenwash75% firms. By

design, Greenwash75% is higher in CSRStrategy and lower in Emissions and ResourceUse. Greenwash75% firms and Greenwash25% firms have similar means in Management scores. Greenwash75% firms are in significant deficits in the remaining scores. This indicates that Greenwash75% firms not only fail to adhere to advertised environmental goals. They also fail to adhere to social and governance goals. The reason they do not differ in ESG scores may be due to over-emphasis in weighting on CSRStrategy in the overall ESG by the Refinitiv methodology.

Table 4. Descriptive statistics of the control variables by greenwashing type.

Greenwash75% Firms					
Variable	**Cod**	**Coe1**	**Coe2**	**Wacc**	**Roe**
Mean	0.040368	0.130162	0.253025	0.076793	−0.088265
Std. dev.	0.0274218	1.21832	6.538413	0.023553	2.777445
Skewness	3.149754	55.18615	18.41071	2.00091	7.714199
Kurtosis	14.66381	3134.422	446.2418	14.82095	−32.87136
Variable	**Roic**	**Beta**	**Capitalized R&D**	**Cash**	**Debt to Capital**
Mean	0.606672	1.252194	294.0016	1366.528	0.266391
Std. dev.	34.93642	0.836956	1674.04	8113.173	0.239201
Skewness	38.3259	1.595365	13.82451	26.1619	0.806909
Kurtosis	1629.776	9.723238	251.9066	965.4971	2.826381
Variable	**Dy**	**Fcff**	**Institutions**	**Liquidity**	**Market cap**
Mean	0.018651	−7.838208	0.455621	1.059327	8888.207
Std. dev.	0.025679	3412533	0.316024	1.620656	24,262.09
Skewness	5.376286	3.865442	0.367962	5.79004	6.731105
Kurtosis	85.72407	244.5395	1.925368	69.58286	62.00593
Variable	**Net Cap Ex**	**Prs**	**Sd**	**Greenwash**	**Tobin's Q**
Mean	427.5662	4.859058	0.40642	1.1393	1.832884
Std. dev.	2015.254	0.759815	0.273117	0.896457	12.07906
Skewness	1.049562	−1.549324	4.814169	4.6133	15.23264
Kurtosis	218.9585	4.004409	73.41002	71.4159	285.4799
Greenwash 25% Firms					
Variable	**Cod**	**Coe1**	**Coe2**	**Wacc**	**Roe**
Mean	0.040041	0.14875	0.038902	0.078693	−0.537574
Std. dev.	0.027127	2.54319	410.275	0.024475	49.45079
Skewness	3.241104	89.86709	−90.37732	1.720937	−109.8142
Kurtosis	15.57769	8961.758	8647.97	12.31475	12,342.5
t-stat	0.6552	−0.415	0.0303	−4.2409 ***	0.6391
Variable	**Roic**	**Beta**	**Capitalized R&D**	**Cash**	**Debt to Capital**
Mean	−2.122091	1.248254	273.5526	1259.135	0.255819
Std. dev.	299.7233	0.848425	1622.645	11,482.82	0.24114
Skewness	−103.1863	2.000917	12.64429	32.36819	0.918783
Kurtosis	11,549.81	17.543	206.9465	1368.853	3.045455
t-stat	0.5408	0.2531	0.6834	0.5229	2.3877 **
Variable	**Dy**	**Fcff**	**Institutions**	**Liquidity**	**Market Cap**
Mean	0.019512	9.519215	0.431152	1.032383	6537.521
Std. dev.	0.012941	4706.812	0.315235	1.976085	24,180.73
Skewness	87.77366	61.90042	0.488987	15.4196	14.06938
Kurtosis	8878.561	7040.848	2.096726	594.6619	304.8911
t-stat	−3.1626 ***	−0.0004	4.2227 ***	0.7551	5.288 ***

Table 4. *Cont.*

Variable	Net Cap Ex	Prs	Sd	Greenwash	Tobin's Q
Mean	294.642	4.712563	0.449769	−0.403442	1.848424
Std. dev.	4514.415	0.814684	0.55017	0.445346	40.83721
Skewness	−70.89889	−1.22266	93.40849	−0.005203	61.25014
Kurtosis	8191.681	3.179402	12,172.15	2.529361	5106.588
t-stat	1.6746 *	9.853 ***	−4.4691 ***	48.2828 ***	−0.0218

This table presents the control variables by greenwashing type. Greenwash25% is a dummy variable, which takes on a value of 1 if the Greenwash score is less than or equal to −0.6019885, and 0 otherwise. Greenwash75% is a dummy variable that takes on a value of 1 if the Greenwash variable is greater or equal to 0.5432797, and 0 otherwise. Cod is the after-tax cost of debt = pre-tax cost of debt (1 − tax rate). The average effective tax rate for the sector is used for this computation. Coe1 is estimated using the capital asset pricing model: cost of equity = risk-free rate + beta (risk premium). The average beta for the sector is used. I use the long-term treasury bond rate as the risk-free rate and a 5.5% risk premium. Coe2 is the dividend yield of the stock plus the reinvestment rate times the roe. Wacc is the market-weighted cod and coe1. Roe is the net income divided by the book value of equity. Fcff = EBIT(1-t) − (capital expenditures − depreciation) − change in non-cash working capital. Tobin's Q is estimated using the methodology of Peters and Taylor (2017). Beta is estimated by regressing weekly returns on stock against the local index using 5 years of data. Capitalized R&D is R&D expenses amortized over five years at the cost of capital. Cash is Cash and Marketable Securities reported in the balance sheet. Debt to capital is the market value of debt divided by the market value of debt plus the market value of equity. Institutions is the shares held by institutions/shares outstanding. Liquidity is the average number of shares traded divided by the number of shares outstanding. Market cap is the estimated market value of shares outstanding, obtained by multiplying the number of shares outstanding by the share price. Net cap exp is capital expenditures − depreciation. Prs is the political risk variable for the home country from ICRG. Sd is the standard deviation of daily stock returns over the year. Fcfe = net income − (capital expenditures − depreciation) − change in non-cash working capital − (principal repaid − new debt issued). *, **, and *** show significance at the 10%, 5% and 1% level respectively. t-stat te4st is for mean difference between the top quartile based on the Greenwashing variable versus the bottom quartile based on the greenwashing variable.

Table 5. Comparison of ESG scores between the Greenwash75% firms and Greenwash25% firms.

	Greenwash75% Mean	Greenwash25% Mean	t-Statistic for Different Means
ESG	49.99163	50.475	−1.474
Community	39.33427	52.75235	−24.7924 ***
Controversies	55.28866	49.08049	16.9706 ***
CSRStrategy	60.70247	47.9423	25.6172 ***
Emissions	19.24586	57.31986	−79.0299 ***
EnvInnovation	37.47043	53.09051	−33.6918 ***
Human Rights	41.6655	52.08016	−21.1818 ***
Management	49.42927	49.61114	−0.3359
Product Resp	35.86163	53.82615	−35.6395 ***
ResourceUse	21.63593	56.64817	−74.2362 ***
Shareholders	48.00174	50.03811	−3.6957 ***
Workforce	30.16618	55.06456	−48.0108 ***

ESG is the Refinitiv ESG score. Community, Controversies, CSRStrategy, Emissions, EnvInnovation, Human Rights, Management, Product Resp, ResourceUse, Shareholders, and Workforce are the category scores that go into determining the overall ESG score. Significance is signified by *, **, and *** at the 10%, 5%, and 1% levels, respectively. Greenwash25% is a dummy variable, which takes on a value of 1 if the Greenwash score is less than or equal to −0.6019885, and 0 otherwise.

In the preceding analysis, there is the question of whether the greenwashing variable is interrelated with the ESG variable. To test this, panel Granger causality tests were run. The results are presented in Table 6.

Table 6 shows that there is some concern that ESG scores cause the Greenwash variable. The ESG score does not Granger-cause the Greenwash75% dummy variable at the 5% significance level. The ESG score does Granger-cause the Greenwash25% level, causing some concerns about the interpretation of the Greenwash25% variable.

Table 6. Panel Granger causality tests.

Null Hypothesis	F-Statistic	Probability
Greenwash does not cause ESG	2.05508	0.1282
ESG does not cause greenwash	3.34659	0.0353
Greenwash%75 does not cause ESG	2.24768	0.1057
ESG does not cause Greenwash75%	2.34360	0.0960
Greenwash25% does not cause ESG	1.99047	0.1367
ESG does not cause Greenwash25%	20.2932	2×10^{-9}

Granger causality test results using the methodology of Lopez and Weber (2017).

3.2. Main Methodology

There are three problems with the Greenwash variable that must be addressed. The first problem is endogeneity. The data underlying the ESG data are produced within the firm and are thus endogenous to it; therefore, we have to treat the associated Greenwash scores as endogenous variables also. Fortunately, this problem can be overcome with GMM estimation using instrumental variables.

The second problem, as noted in the introduction, is that the Greenwash variable has a noise component that is not traditionally dealt with in the literature. In applying GMM to the observed variables, the estimates are likely to be biased by the correlation of the ESG variables with the left-out individual effects and because of the negative correlation between the observed ESG variables and the disturbance term (Griliches and Hausman 1986). To overcome this, I use an EIV-type GMM estimator proposed by Griliches and Hausman (1986). In both instances, I control for industry, year, and country effects.

To illustrate the estimator employed, consider a simple model where the Greenwash score = x and the dependent variable = y. Ideally, we would like to measure the true Greenwash score z, but we cannot because some of the information has been imputed, so we are left with x. Ideally, I would like to regress as follows:

$$y_{it} = \alpha_i + \beta z_{it} + \eta_{it} \tag{1}$$

But due to the imputation of data, I observe the following:

$$x_{it} = z_{it} + v_{it} \tag{2}$$

where v_{it} is a noise term i.i.d. with variance σ_v^2. If I apply unadjusted estimators to y on x, I get the following:

$$y_{it} = \underline{\alpha} + \beta x_{it} - \beta v_{it} + \eta_{it} + (\alpha_i - \underline{\alpha}) \tag{3}$$

Panel data estimation can help eliminate some of the bias by differencing and going within by looking at the plims of the two estimators as follows:

$$plimb_d = \beta\left(1 - \frac{2\sigma_v^2}{var(dx)}\right) \tag{4}$$

$$plimb_w = \beta\left(1 - \frac{T-1}{T}\frac{\sigma_v^2}{var\left(\widetilde{x}\right)}\right) \tag{5}$$

where $dx = x_{it} - x_{it-1}$ and $\widetilde{x} = x_{it} - \underline{x}$, and similarly for other variables. Griliches and Hausman (1986) then note with computation of (4) and (5) that the investigator has the necessary ingredients to solve for the unknown σ_v^2 and β as follows:

$$\beta = \left[\frac{2b_w}{var(dx)} - (T-1)b_d/Tvar(\widetilde{x})\right] / \left[\frac{2}{var(dx)} - (T-1)/Tvar(\widetilde{x})\right] \tag{6}$$

$$\sigma_v^2 = \frac{(\beta - b_d)var(dx)}{2\beta} \tag{7}$$

The main relationships to be estimated are as follows:
First is

$$\begin{aligned} Dependent_{i,t} = \beta_0 \quad & +\beta_1 BETA_{i,t} + \beta_2 ERP_{i,t} + \beta_3 PRS_{i,t} + \beta_4 Market\ Cap_{i,t} \\ & +\beta_5 Debt\ to\ Capital_{i,t} + \beta_6 Liquidity_{i,t} + \beta_7 SD_{i,t} + \beta_8 MTB_{i,t} + \\ & \beta_9 Institution_{i,t} + \beta_{10} ESG_{i,t} + \beta_{11} Dependent_{i,t-1} + \varepsilon_{i,t} \end{aligned} \tag{8}$$

And second is

$$\begin{aligned} Dependent_{i,t} = \beta_0 \quad & +\beta_1 BETA_{i,t} + \beta_2 ERP_{i,t} + \beta_3 PRS_{i,t} + \beta_4 Market\ Cap_{i,t} \\ & +\beta_5 Debt\ to\ Capital_{i,t} + \beta_6 Liquidity_{i,t} + \beta_7 SD_{i,t} + \beta_8 MTB_{i,t} \\ & +\beta_9 Institution_{i,t} + \beta_{10} Community_{i,t} + \beta_{11} Controversies_{i,t} \\ & +\beta_{12} CSRStrategy_{i,t} \\ & +\beta_{13} Emissions_{i,t} + \beta_{14} EnvInnovation_{i,t} + \beta_{15} Human\ Rights_{i,t} \\ & +\beta_{16} Management_{i,t} + \beta_{17} ProductResp_{i,t} + \beta_{18} ResourceUse_{i,t} \\ & +\beta_{19} Shareholders_{i,t} + \beta_{20} Workforce_{i,t} + \beta_{21} Dependent_{i,t-1} \\ & +\varepsilon_{i,t} \end{aligned} \tag{9}$$

The instruments used are the lagged, differenced, and independent variables.

As can be seen, I follow the existing literature, using beta, market cap, debt to capital, and MTB as financial control variables on the cost of equity (Hail and Leuz 2006; Gebhardt et al. 2001; Dhaliwal et al. 2006; El Ghoul et al. 2011). Based on previous results, the beta, debt to capital, and MTB variables are expected to have positive coefficients as they add to firm risk. Market cap on the other hand is expected to have a negative coefficient. To this, I add liquidity as Saad and Samet (2017) find that liquidity risks affect the cost of capital, with more liquid stocks having a lower cost of capital. Intuitional ownership is included as Collins and Huang (2011) find that management entrenchment is associated with increases in the costs of equity capital, so I would expect the coefficient to be negative. The SD variable is included as a measure of unsystematic risk, so its coefficient is expected to be positive, and if markets are efficient, insignificant.

The signs on the ESG variables are not specified, as they are inconsistent in the prior literature, found to be both positive and negative, raising and lowering the cost of equity in emerging markets, which is part of what this research is about.

4. Results

Tables 7 and 8 present the estimation results for all firms from 2002 to 2022.

The estimation results of Table 7 show that the Greenwash variable is negative and insignificant for the costs of capital and its components and it is negative and significant for roe. This contradicts the findings of Li et al. (2023), who found a positive relationship between greenwashing and roa. The difference may be that Li et al.'s (2023) study only researched Chinese firms or that firms that are more strongly greenwashing use more debt in financing their assets, which could decrease book assets in the roa variable, but might increase the free cash flow to the firm and Tobin's Q through the effects of the deb tax shield.

The Greenwash variable is positive and significant for the fcff variable. This indicates that higher levels of greenwashing lead to higher levels of cash flow within the firm. The juxtaposition between the results on roe and fcff seems strange. This calls for further exposition in the discussion section. Gregory (2022) finds a strong positive relationship between CSRStrategy scores and fcff. The CSRStrategy scores make up part of the Greenwash score that the Greenwash variable is based on.

Table 7. GMM panel estimation of the Greenwash75% firms.

Panel A				
Variable	**Cod**	**Coe1**	**Coe2**	**Wacc**
Constant	−0.165219	−22.6685 *	389.9501 **	−0.067631
	(0.110323)	(13.48154)	(166.6404)	(0.060998)
Lagged dependent	0.633583 ***	0.2161 ***	−0.011671	0.406088 ***
	(0.025358)	(0.079202)	(0.007455)	(0.019398)
ESG_{t-1}	−0.000225 **	−0.0239 **	−0.26289 **	−0.000068
	(0.000104)	(0.011429)	(0.104794)	(0.000058)
$Greenwash_{t-1}$	−0.002355	−0.047766	−1.831615	−0.000879
	(0.001932)	(0.20859)	(1.907365)	(0.001076)
$Beta_{t-1}$	0.001451	0.047758	5.715737 ***	0.001817 **
	(0.001287)	(0.137584)	(1.466775)	(0.000713)
$Capitalized\_r\_d_{t-1}$	-3×10^{-7}	0.000011	−0.000424	8×10^{-8}
	(7×10^{-7})	(0.000087)	(0.000642)	(4×10^{-7})
$Cash_{t-1}$	-1×10^{-7} ***	-6×10^{-6} *	−0.000111	-4×10^{-8} ***
	(3×10^{-8})	(3×10^{-6})	(0.000219)	(1×10^{-8})
$Debt\ to\ capital_{t-1}$	0.0135838 **	0.733314	25.24925 ***	0.010476 ***
	(0.005484)	(0.580748)	(7.993463)	(0.003129)
Dy_{t-1}	−0.041689 *	2.310126	−26.77462	0.002408
	(0.022037)	(2.158735)	(33.12877)	(0.012314)
$Institutions_{t-1}$	0.022794 ***	−0.22093	−3.670592	0.006087 **
	(0.004903)	(0.4783)	(6.030775)	(0.002668)
$Liquidity_{t-1}$	−0.002377 ***	0.037345	−2.794261 **	−0.0016 ***
	(0.000694)	(0.077635)	(1.003685)	(0.000392)
$Market\ cap_{t-1}$	-6×10^{-8} **	3×10^{-6}	−0.000011	-6×10^{-9}
	(3×10^{-8})	(3×10^{-6})	(0.000041)	(2×10^{-8})
$Net\ cap\ exp_{t-1}$	5×10^{-7}	-6×10^{-7}	−0.000459	5×10^{-7}
	(4×10^{-7})	(0.00004)	(0.000328)	(2.15×10^{-7})
Prs_{t-1}	−0.049562 ***	0.547935	−2.373703	−0.011272 **
	(0.009962)	(1.077548)	(9.477178)	(0.005742)
Sd_{t-1}	0.030811 ***	0.471577	45.06418 ***	0.02524 ***
	(0.004641)	(0.493611)	(6.178366)	(0.002638)
Wald test	16,011.58 ***	596.43 ***	202.89 ***	9224.04 ***
J-stat	17,559.37	417.58	404.12	8679.33
Sargan Test Stat.	3.53	1.99	4.31	1.14
Panel B				
Variable	**Roe**	**Fcff**	**Tobin's Q**	
Constant	−21.77639	−7647.921	3.548734 ***	
	(68.51994)	(12,416.91)	(1.066889)	
Lagged dependent	0.97036 ***	0.039635 ***	0.535043 ***	
	(0.013048)	(0.005307)	(0.018313)	
ESG_{t-1}	−0.048104	16.32648	0.032683	
	(0.049515)	(10.14948)	(0.116891)	
$Greenwash_{t-1}$	−1.763176 **	1027.625 ***	8.991425 ***	
	(0.83188)	(178.1231)	(2.129017)	
$Beta_{t-1}$	−0.595167	144.2094	0.489118	
	(0.566625)	(117.3455)	(1.439217)	
$Capitalized\_r\_d_{t-1}$	−0.000272	0.016447	0.001904 **	
	(0.0003285)	(0.079881)	(0.000829)	
$Cash_{t-1}$	8×10^{-6}	0.000699	8×10^{-6}	
	(0.000018)	(0.002897)	(0.000038)	
$Debt\ to\ capital_{t-1}$	−13.31569 ***	3015.822 ***	11.15669 *	
	(2.821396)	(519.5267)	(6.534112)	
Dy_{t-1}	−7.732765	2214.034	−8.569795	
	(8.282472)	(1828.348)	(22.0855)	
$Institutions_{t-1}$	−0.142534	−220.7209	−16.53556 ***	
	(2.198849)	(418.1673)	(5.084892)	

Table 7. *Cont.*

$Liquidity_{t-1}$	−1.660865 ***	−90.20974	0.228984
	(0.331431)	(70.3406)	(0.825733)
$Market\ cap_{t-1}$	-2×10^{-6}	0.022477 ***	0.000042
	(0.000015)	(0.002834)	(0.000035)
$Net\ cap\ exp_{t-1}$	−0.000123	−0.581813 ***	−0.000299
	(0.000158)	(0.032448)	(0.000397)
Prs_{t-1}	−1.162805	4446.303 ***	7.556922
	(4.389683)	(914.6792)	(10.5051)
Sd_{t-1}	−1.621286	−2044.508 ***	1.922281
	(2.157193)	(427.919)	(5.404978)
Wald test	8603.77 ***	1474.28 ***	2833.13 ***
J-stat	8956.17	1503.69	2564.71
Sargan Test Stat.	2.56	2.63	4.33

The table shows the results of the Dynamic Panel estimation of the models above in the text. Cod is the after-tax cost of debt = pre-tax cost of debt (1 − tax rate). The average effective tax rate for the sector is used for this computation. Coe1 is estimated using the capital asset pricing model: cost of equity = risk-free rate + beta (risk premium). The average beta for the sector is used. I use the long-term treasury bond rate as the risk-free rate and a 5.5% risk premium. Coe2 is the dividend yield of the stock plus the reinvestment rate times the roe. Wacc is the market-weighted cod and coe1. Roe is net income divided by the book value of equity. Fcff = EBIT(1-t) − (capital expenditures − depreciation) − change in non-cash working capital. Tobin's Q is estimated using the methodology of Peters and Taylor (2017). ESG is the Refinitiv ESG score. Greenwash75% is a dummy variable that takes a value of 1 if the Greenwash score of the firm is greater than or equal to 0.5432797, and 0 otherwise. Beta is estimated by regressing weekly returns on stock against the local index using 5 years of data. Capitalized R&D is R&D expenses amortized over five years at the cost of capital. Cash is Cash and Marketable Securities reported in the balance sheet. Debt to capital is the market value of debt divided by the market value of debt plus the market value of equity. Institutions is the shares held by institutions/shares outstanding. Liquidity is the average number of shares traded divided by the number of shares outstanding. Market cap is the estimated market value of shares outstanding, obtained by multiplying the number of shares outstanding by the share price. Net cap exp is capital expenditures – depreciation. Prs is the political risk variable for the home country from ICRG. Sd is the standard deviation of daily stock returns over the year. Industry, year, and country effects are controlled for, but not reported to save space. Standard errors are reported in parentheses. *, **, and *** signify significance at the 10%, 5%, and 1% levels, respectively. The Sargan Test Stat. tests the null hypothesis of no endogeneity.

Table 8. GMM panel estimation of the Greenwash25% firms.

Panel A				
Variable	**Cod**	**Coe1**	**Coe2**	**Wacc**
Constant	−0.017869	−51.597 ***	835.7895 ***	−0.00863
	(0.11014)	(15.4181)	(187.5596)	(0.05994)
Lagged dependent	0.624365 ***	0.136261 *	−0.012166 *	0.402434 ***
	(0.023606)	(0.079651)	(0.007323)	(0.019263)
ESG_{t-1}	−0.000264 **	−0.010642	0.188968	−0.000135
	(0.000113)	(0.01229)	(0.118527)	(0.000063)
$Greenwash\%_{t-1}$	−0.000131	0.155215	15.9106 ***	−0.000328
	(0.002956)	(0.311434)	(3.002526)	(0.001641)
$Beta_{t-1}$	0.000491	0.091072	4.91887 ***	0.000292
	(0.001263)	(0.135771)	(1.452976)	(0.000727)
$Capitalized\_r\_d_{t-1}$	1×10^{-7}	0.000024	−0.000628	1×10^{-7}
	(7×10^{-7})	(0.000087)	(0.000686)	(4×10^{-7})
$Cash_{t-1}$	-1×10^{-7} ***	-6×10^{-6} *	−0.000056	-5.23×10^{-8} ***
	(3×10^{-8})	(3×10^{-6})	(0.000222)	(2×10^{-8})
$Debt\ to\ capital_{t-1}$	0.021281 ***	1.088172 **	19.74158 **	−0.004032
	(0.00504)	(0.553438)	(8.003301)	(0.002833)
Dy_{t-1}	−0.0211619	2.089545	−54.92034	0.007273
	(0.021902)	(2.13265)	(34.07108)	(0.012218)
$Institutions_{t-1}$	0.026163 ***	−0.642482	−6.436216	0.010715 ***
	(0.004864)	(0.474382)	(6.063471)	(0.002694)
$Liquidity_{t-1}$	−0.001084	0.035771	−3.89205 ***	−0.001025 **
	(0.000694)	(0.082012)	(1.069974)	(0.000407)
$Market\ cap_{t-1}$	9×10^{-8} ***	-5×10^{-7}	0.000015	2×10^{-8}
	(3×10^{-8})	(3×10^{-6})	(0.000042)	(2×10^{-8})
$Net\ cap\ exp_{t-1}$	5×10^{-8}	3×10^{-7}	−0.000434	5×10^{-7} **
	(4×10^{-7})	(0.00004)	(0.000339)	(2×10^{-7})

Table 8. *Cont.*

Prs_{t-1}	−0.052223 ***	−0.036407	−0.879218	−0.012514 **
	(0.009995)	(1.094598)	(10.03531)	(0.005791)
Sd_{t-1}	0.032179	0.521433	44.24676 ***	0.024156 ***
	(0.004637)	(0.493372)	(6.280086)	(0.002655)
Wald test	16,052.26 ***	619.10 ***	326.98 ***	9241.57 ***
J-stat	15,556.39	828.54	303.27	7741.86
Sargan Test Stat.	4.27	2.07	2.94	1.48
		Panel B		
Variable	**Roe**	**Fcff**	**Tobin's Q**	
Constant	57.54216	−45,890.33 **	700.0146 ***	
	(69.55669)	(18,176.51)	(116.7255)	
Lagged dependent	0.9672 ***	0.042526 ***	0.524484 ***	
	(0.012985)	(0.00527)	(0.018342)	
ESG_{t-1}	−0.010805	31.90115 ***	0.278061 **	
	(0.048116)	(10.48269)	(0.12815)	
$Greenwash_{t-1}$	−0.78244	−659.8523 **	−3.630398	
	(1.345613)	(281.0291)	(3.222903)	
$Beta_{t-1}$	−1.125604 **	198.6383 *	1.323236	
	(0.548384)	(114.3442)	(1.415136)	
$Capitalized\_r\_d_{t-1}$	−0.000338	−0.037978	0.002166 ***	
	(0.000341)	(0.077482)	(0.000808)	
$Cash_{t-1}$	5×10^{-6}	−0.000269	0.000053	
	(0.000017)	(0.002802)	(0.000036)	
Debt to $capital_{t-1}$	−9.56078 ***	2342.761 ***	7.325271	
	(2.515088)	(481.5311)	(6.221891)	
Dy_{t-1}	−3.39639	1992.18	−31.51679	
	(8.308403)	(1775.743)	(21.58297)	
$Institutions_{t-1}$	0.238508	−300.085	−8.615618	
	(2.114772)	(406.3984)	(4.979876)	
$Liquidity_{t-1}$	−1.6537 ***	−78.82085	−0.256244	
	(0.334455)	(72.29874)	(0.834794)	
Market cap_{t-1}	2×10^{-6}	0.021825 ***	-7×10^{-6}	
	(0.000015)	(0.002754)	(0.000036)	
Net cap exp_{t-1}	−0.000058	−0.57157 ***	−0.000106	
	(0.00016)	(0.032154)	(0.000397)	
Prs_{t-1}	−2.157985	4234.678 ***	2.987093	
	(4.385726)	(907.1999)	(10.56725)	
Sd_{t-1}	−0.88024	−2328.84 ***	4.789153	
	(2.096634)	(422.5131)	(5.325104)	
Wald test	8736.52 ***	1518.33 ***	2890.15 ***	
J-stat	9321.18	1452.63	3034.25	
Sargan Test Stat.	0.03	3.30	4.37	

The table shows the results of the Dynamic Panel estimation of the models above in the text. Cod is the after-tax cost of debt = pre-tax cost of debt (1 − tax rate). The average effective tax rate for the sector is used for this computation. Coe1 is estimated using the capital asset pricing model: cost of equity = risk-free rate + beta (risk premium). The average beta for the sector is used. I use the long-term treasury bond rate as the risk-free rate and a 5.5% risk premium. Coe2 is the dividend yield of the stock plus the reinvestment rate times the roe. Wacc is the market-weighted cod and coe1. Roe is the net income divided by the book value of equity. Fcff = EBIT(1-t) − (capital expenditures − depreciation) − change in non-cash working capital. Tobin's Q is estimated using the methodology of Peters and Taylor (2017). ESG is the Refinitiv ESG score. Greenwash25% is a dummy variable, which takes on a value of 1 if the Greenwash score is less than or equal to −0.6019885, and 0 otherwise. Beta is estimated by regressing weekly returns on stock against the local index using 5 years of data. Capitalized R&D is R&D expenses amortized over five years at the cost of capital. Cash is Cash and Marketable Securities reported in the balance sheet. Debt to capital is the market value of debt divided by the market value of debt plus the market value of equity. Institutions is the shares held by institutions/shares outstanding. Liquidity is the average number of shares traded divided by the number of shares outstanding. Market cap is the estimated market value of shares outstanding, obtained by multiplying the number of shares outstanding by the share price. Net cap exp is capital expenditures – depreciation. Prs is the political risk variable for the home country from ICRG. Sd is the standard deviation of daily stock returns over the year. Industry, year, and country effects are controlled for but not reported to save space. Standard errors are reported in parentheses. *, **, and *** signify significance at the 10%, 5%, and 1% levels, respectively. The Sargan Test Stat. tests the null hypothesis of no endogeneity.

The Greenwash variable exhibits a positive and significant coefficient on Tobin's Q variable. This implies that high greenwashing firms are associated with a higher long-term value. This is in contrast with previously reported work by Ghitti et al. (2020). They found a negative relationship between their greenwashing variable and their estimate of Tobin's Q. One possible explanation is the difference in the estimate of Tobin's Q. Ghitti et al. use only the market value of debt and equity divided by the book value of debt and equity. I use the methodology of Peters and Taylor (2017), which adjusts for the value of firm intangible assets.

The ESG score is negative and significant for the cost of debt and the cost of equity. The cost of debt result is similar to the results of Raimo et al. (2021), Eliwa et al. (2021), and Apergis et al. (2022). The cost of equity result expands upon the results of Ng and Rezaee (2015) who also find that ESG scores have a negative relationship with the cost of equity estimates.

Interestingly, for firms using a high greenwashing strategy, there is a negative relationship between institutional ownership and Tobin's Q. Buchanan et al. (2018) find a strong positive relationship between institutional ownership and Tobin's Q, for example. Their hypothesis is that firms with higher institutional ownership monitor firms and prevent them from over-investing in ESG-related activities and thus make them less prone to certain risks. The results here complicate such an interpretation. While greenwashing firms might be "underinvesting" in ESG activities, it is difficult to understand why monitoring by institutional investors would then result in a drag on Tobin's Q.

The Greenwash variable is positive and significant for the coe2 variable. This signifies that brownwashing leads to a higher cost of equity capital. The Greenwash variable is negative and significant for the fcff variable, in contrast to the findings for the Greenwash75% data. This is similar to brownwashing having a negative effect on fcff. Brownwashing firms have Refinitiv Emissions and ResourceUse scores higher than CSRStrategy scores in their makeup. Gregory (2022) finds a generally negative relation between Emissions and ResourceUse and fcff. This also supports the results of Kim and Lyon (2015) and Testa et al. (2018a).

Gregory (2022) also finds a positive and significant relationship between Refinitiv ESG scores and fcff, as is found here in Table 8. Table 8 exhibits a positive and significant coefficient on ESG for Tobin's Q in contrast to the findings of Shi et al. (2015) but similar to the findings of Surroca et al. (2010), Sharma and Thukral (2016), Kim et al. (2019), and Kurt and Peng (2021). Further, the ESG score is negative and significantly related to the cost of debt, as with the previous results.

As a further robustness test, I regress the dependent variables on the Greenwash score and the squared Greenwash score. I use the squared score to help capture any non-linearities in the relationship as the results of Table 9 indicate there may be sign changes in regards to the Greenwash score with some of the dependent variables. The results are exhibited in Table 9.

The Greenwash score is only significant and negative for the roe dependent variable. This is in agreement with the previous results for the Greenwash75% variable. The overall effect of a rise in the Greenwash variable would be to increase the roe.

ESG is found to be negative and significant for cod and coe1, similar to the results in Table 8. ESG is found to have a positive and significant coefficient for Tobin's Q, similar to the results in Table 9. Also, here, I regress the standard deviation of the firm's stock returns on the independent variables as a measure of undiversified risk. The coefficient is positive and significant at the 5% level. This signifies that greenwashing increases undiversified risk.

The results above indicate that ESG scores have a positive effect on greenwashing. An examination of the relationship between the subcomponents of the ESG score and the ESG score from Refinitiv is examined below in Table 10 from an OLS Regression. Refinitiv does not publish the exact methodology used in combining the subcomponents into the ESG score (Refinitiv 2022).

Table 9. GMM estimation with non-linear effects of greenwashing.

Panel A				
Variable	**Cod**	**Coe1**	**Coe2**	**Wacc**
Constant	0.127467	1.857779 ***	62.76071	0.047291
	(0.113677)	(0.498711)	(61.73358)	(0.045082)
Lagged dependent	0.419978 ***	0.022493 ***	−0.2158 ***	0.258442 ***
	(0.042874)	(0.00374)	(0.030407)	(0.028604)
ESG_{t-1}	−0.00057 ***	−0.00268 ***	0.0102232	0.000011
	(0.000156)	(0.000672)	(0.0588986)	(0.000091)
$Greenwashing_{t-1}$	0.000117	0.00099	0.114635	0.000024
	(0.000162)	(0.000663)	(0.131528)	(0.000081)
$Greenwash^2{}_{t-1}$	0.000591	-7×10^{-6}	0.340312	−0.000474
	(0.001294)	(0.005485)	(0.397888)	(0.000691)
$Beta_{t-1}$	0.0055219 **	0.051013 ***	0.5230278	0.001065
	(0.002421)	(0.010174)	(0.84713)	(0.001214)
$Capitalized\_r\_d_{t-1}$	7×10^{-7}	0.000025 ***	−0.00012	-7×10^{-7}
	(1×10^{-6})	(6×10^{-6})	(0.000581)	(7×10^{-7})
$Cash_{t-1}$	2×10^{-7}	3×10^{-6} **	0.000157 *	1.4×10^{-7}
	(3×10^{-7})	(1×10^{-6})	(0.000091)	(1.5×10^{-7})
Debt to $capital_{t-1}$	0.06719 ***	0.431241 ***	−1.185715	0.003038
	(0.012456)	(0.053185)	(4.769625)	(0.006653)
Dy_{t-1}	−0.058469	−0.454787 *	28.6098 *	−0.012794
	(0.056225)	(0.236288)	(17.16509)	(0.028924)
$Institutions_{t-1}$	−0.002468	0.131269 ***	2.042217	−0.003288
	(0.00826)	(0.033284)	(2.923953)	(0.004199)
$Liquidity_{t-1}$	−0.001129	−0.00124	0.220668	−0.000652
	(0.001162)	(0.004704)	(0.333007)	(0.000578)
Market cap_{t-1}	-1.6×10^{-7}	-1×10^{-6} ***	−0.000044 *	6×10^{-10}
	(1.1×10^{-7})	(4×10^{-7})	(0.000026)	(5×10^{-8})
Net cap exp_{t-1}	-1.2×10^{-7}	-9×10^{-6} ***	0.000049	6×10^{-7} *
	(6.3×10^{-7})	(3×10^{-6})	(0.000178)	(3×10^{-7})
Prs_{t-1}	−0.035339 **	−0.115956	−4.123022	−0.016876 *
	(0.017201)	(0.07653)	(5.746157)	(0.008984)
Sd_{t-1}	0.031425	0.314923 ***	2.545288	0.023573 ***
	(0.008913)	(0.036206)	(3.639662)	(0.004445)
Wald test	4665.72 ***	4491.36 ***	184.20 ***	3336.16 ***
J-stat	5001.24	4347.58	356.21	4004.19
Sargan Test Stat.	3.16	2.08	2.39	1.97
Panel B				
Variable	**Roe**	**Fcff**	**Tobin's Q**	**Sd**
Constant	−5.517916	−7319.559 *	−239.9534	0.05021
	(8.935884)	(3796.759)	(154.4048)	(0.00314)
Lagged dependent	0.516463 ***	0.095607 ***	0.35317 ***	0.13985 ***
	(0.026503)	(0.013914)	(0.1234)	(0.0088)
ESG_{t-1}	0.005304	4.688113	0.636791 **	−0.00201 ***
	(0.009413)	(5.309426)	(0.255868)	(0.0003)
$Greenwashing_{t-1}$	−0.031016 ***	−1.608566	0.087094	0.00646 **
	(0.009235)	(5.013279)	(0.243765)	(0.0032)
$Greenwash^2{}_{t-1}$	0.210176 **	1.6026	0.133282	0.35412
	(0.081769)	(5.8119)	(2.001813)	(0.58723)
$Beta_{t-1}$	−0.215539	12.86161	−0.574624	0.0878 ***
	(0.1443)	(78.46858)	(3.94218)	(0.004533)
$Capitalized\_r\_d_{t-1}$	−0.000034	0.076024	−0.001687	6×10^{-6}
	(0.000113)	(0.040632)	(0.001864)	(5×10^{-6})
$Cash_{t-1}$	0.000056 ***	0.047557 ***	−0.000034	-1.3×10^{-6}
	(0.00002)	(0.009205)	(0.000601)	(6.2×10^{-7})
Debt to $capital_{t-1}$	2.199588 ***	801.2547 **	−24.54285	0.0542 ***
	(0.806777)	(389.3348)	(21.64264)	(0.01756)

Table 9. *Cont.*

Dy_{t-1}	−12.81213 ***	−4050.511 **	−49.20734	−0.16869
	(3.324323)	(1699.84)	(87.18703)	(0.0817)
$Institutions_{t-1}$	−0.634455	917.6662 ***	−7.668536	−0.23213 ***
	(0.469067)	(269.3322)	(12.67008)	(0.01478)
$Liquidity_{t-1}$	0.052842	−91.98945	−0.237169	0.02424 ***
	(0.062117)	(34.99246)	(1.67327)	(0.001953)
$Market\ cap_{t-1}$	−0.000016 ***	0.010108 ***	−0.000053	-7×10^{-7}
	(6×10^{-6})	(0.002543)	(0.000144)	(2.2×10^{-6})
$Net\ cap\ exp_{t-1}$	-5×10^{-6}	−0.780886	0.000301	−0.01252
	(0.000036)	(0.018775)	(0.000933)	(0.03876)
Prs_{t-1}	0.356266	2679.781 ***	52.54887 *	−0.03607 **
	(1.062659)	(580.9638)	(28.10396)	(0.01724)
Sd_{t-1}	−0.631564	141.977	2.050788	
	(0.512532)	(283.0456)	(14.5307)	
Wald test	1456.37 ***	7176.43 ***	202.81 ***	352.331 ***
J-stat	1531.62	6566.34	232.19	623.89
Sargan Test Stat.	0.61	0.02	2.75	2.61

The table shows the results of the Dynamic Panel estimation of the models above in the text. Cod is the after-tax cost of debt = pre-tax cost of debt (1 − tax rate). The average effective tax rate for the sector is used for this computation. Coe1 is estimated using the capital asset pricing model: cost of equity = risk-free rate + beta (risk premium). The average beta for the sector is used. I use the long-term treasury bond rate as the risk-free rate and a 5.5% risk premium. Coe2 is the dividend yield of the stock plus the reinvestment rate times the roe. Wacc is the market-weighted cod and coe1. Roe is the net income divided by the book value of equity. Fcff = EBIT(1-t) − (capital expenditures − depreciation) − change in non-cash working capital. Tobin's Q is estimated using the methodology of Peters and Taylor (2017). ESG is the Refinitiv ESG score. Greenwash is the Greenwash score detailed in the text above. $Greenwash^2$ is the squared Greenwash score. Beta is estimated by regressing weekly returns on stock against the local index using 5 years of data. Capitalized R&D is R&D expenses amortized over five years at the cost of capital. Cash is Cash and Marketable Securities reported in the balance sheet. Debt to capital is the market value of debt divided by the market value of debt plus the market value of equity. Institutions is the shares held by institutions/shares outstanding. Liquidity is the average number of shares traded divided by the number of shares outstanding. Market cap is the estimated market value of shares outstanding, obtained by multiplying the number of shares outstanding by the share price. Net cap exp is capital expenditures − depreciation. Prs is the political risk variable for the home country from ICRG. Sd is the standard deviation of daily stock returns over the year. Industry, year, and country effects are controlled for but not reported to save space. Standard errors are reported in parentheses. *, **, and *** signify significance at the 10%, 5%, and 1% levels, respectively. The Sargan Test Stat. tests the null hypothesis of no endogeneity.

As Table 10 shows, CSRStrategy, defined as the score which measures a company's practices to communicate that it integrates the economic (financial), social, and environmental dimensions into its day-to-day decision-making processes, has the largest effect in determining a firm's ESG score. In that greenwashing is in part defined as communicating selectively too much about social and economic dimensions not substantiated by performance, this brings up the possibility of a feedback loop between greenwashing and ESG scoring via the practices of ESG rating firms.

If, as demonstrated in Table 10, ESG rating firms give higher weights in determining their ESG scores to firms that communicate about environmental and social dimensions without reckoning for greenwashing, this leads to a feedback loop. Greenwashing firms will be encouraged to increase their greenwashing to obtain better ESG ratings.

To test this further, I conduct Granger causality tests between the Greenwash variable, the ESG score, and the CSRStrategy score. The results are shown in Table 11.

There is evidence that greenwashing Granger-causes CSRStrategy of the firm and that CSRStrategy causes ESG, as also affirmed in the results of Table 11 and from Refinitiv (2022). In return, ESG Granger-causes greenwashing at the 3.5% level. So, the evidence supports that there is a weak feedback loop between greenwashing and ESG rating scores. This implies that greenwashing behavior is not penalized much in the Refinitiv ESG scores.

Lastly, I re-estimate the main model, dividing the sample by developed markets and emerging markets as suggested by an anonymous referee. The results are presented in Tables 12 and 13.

Table 10. OLS Regression of the Refinitiv ESG score on the subcomponents.

Variable	Coefficient (Standard Error)
Constant	12.02475 *** (0.566053)
Community	0.010648 *** (0.004055)
Controversies	−0.015143 *** (0.005809)
CSRStrategy	0.338770 *** (0.004169)
Emissions	0.001737 (0.005501)
EnvInnovation	0.018980 *** (0.004848)
Human Rights	0.026302 *** (0.004295)
Management	0.269564 *** (0.003882)
Product Resp	0.021278 *** (0.004613)
ResourceUse	0.014846 ** (0.006373)
Shareholders	0.066404 *** (0.003667)
Workforce	0.012507 ** (0.004966)
Adj. R^2	0.628793

ESG is the Refinitiv ESG score. The independent variables are the subcomponents used to determine the Refinitv ESGG score. Standard errors are in parentheses. *, **, and ** signify significance at the 10%, 5%, and 1% levels, respectively.

Table 11. Granger causality tests between the greenwash, ESG, and CSRStrategy scores.

Hypothesis	F-Statistic	Prob.
CSRStrategy does not Granger-cause ESG	7.71041	0.0005
ESG does not Granger-cause CSRStrategy	85.4429	1×10^{-37}
Greenwash does not Granger-cause ESG	2.05508	0.1282
ESG does not Granger-cause Greenwash	3.34659	0.0353
Greenwash does not Granger-cause CSRStrategy	5.18517	0.0056
CSRStrategy does not Granger-cause Greenwash	7.34646	0.0007

Granger causality test results using the methodology of Lopez and Weber (2017).

As can be seen, in developed markets, ESG activities are associated with lower costs of capital and thus lower systematic risks. Greenwashing, in general, has no effect on systematic risks. ESG positively affects greater free cash flow to the firm. In emerging markets, both ESG and greenwashing are associated with a lower after-tax cost of debt, but only greenwashing is associated with a lower weighted cost of capital. Thus, it may be the case that in emerging markets, greenwashing firms are better able to take advantage of lower-cost debt and use a greater amount of debt in their capital structure to lower their overall cost of debt. This is somewhat held up by the group means of the debt-to-capital variable, for which the mean is 0.251 for developed market firms and 0.279 for emerging market firms. Further, it is only for emerging market firms that ESG activities positively influence Tobin's Q, showing that ESG activities add value to the firm.

Table 12. GMM panel estimation developed markets.

Panel A				
Variable	**Cod**	**Coe1**	**Coe2**	**Wacc**
Constant	−1.0410 ***	−1.3251 ***	0.2448	−0.2429 ***
	(0.0556)	(0.1055)	(0.2743)	(0.0267)
Lagged dependent	0.9979 ***	0.0253 ***	0.7127 ***	0.6335 ***
	(0.0183)	(0.0023)	(0.0315)	(0.0171)
ESG_{t-1}	−0.0002 **	−0.0011 ***	−0.0008 *	−0.0001 **
	(0.00009)	(0.0002)	(0.0004)	(000004)
$Greenwash_{t-1}$	−0.0006	−0.0014	−0.0002	−0.0003
	(0.0009)	(0.0018)	(0.0043)	(0.0004)
$Beta_{t-1}$	0.004 ***	0.0108 ***	0.0203 **	0.0032 **
	(0.0015)	(0.0031)	(0.0074)	(0.0008)
$Capitalized\_r\_d_{t-1}$	-2×10^{-6}	2.6×10^{-6}	9.4×10^{-6}	2.5×10^{-7}
	(1.4×10^{-6})	(2.8×10^{-6})	(6.8×10^{-6})	(7×10^{-7})
$Cash_{t-1}$	-3.4×10^{-7} *	8.4×10^{-7} **	1.7×10^{-6} **	-4×10^{-7} ***
	(1.8×10^{-7})	(3.4×10^{-7})	(8.2×10^{-7})	(8×10^{-8})
Debt to $capital_{t-1}$	0.012 **	0.3722 ***	0.1376 ***	−0.0035
	(0.0053)	(0.0099)	(0.0266)	(0.0024)
Dy_{t-1}	−0.0253	0.0268	−0.1472	−0.009
	(0.0284)	(0.0554)	(0.1329)	(0.0138)
$Institutions_{t-1}$	−0.0135 ***	−0.0317 ***	0.0084	−0.0065 ***
	(0.0041)	(0.0084)	(0.0202)	(0.0021)
$erLiquidity_{t-1}$	0.0024 ***	−0.0037 ***	0.0013	0.0008 **
	(0.0006)	(0.0011)	(0.0027)	(0.0003)
Market cap_{t-1}	-1.6×10^{-7} **	-2.3×10^{-7} *	-9.3×10^{-9}	-4.6×10^{-8}
	(6.3×10^{-8})	(1.2×10^{-7})	(3×10^{-7})	(3×10^{-8})
Net cap exp_{t-1}	1.4×10^{-7}	1.4×10^{-6} *	7.3×10^{-7}	5.4×10^{-7} **
	(4.4×10^{-7})	(8.6×10^{-7})	(2.1×10^{-6})	(2.1×10^{-7})
Prs_{t-1}	−0.1998 ***	−0.2584 ***	−0.0234	−0.0494 **
	(0.0105)	(0.02)	(0.0523)	(0.005)
Sd_{t-1}	−0.0019	0.0954 ***	0.0197	0.0178 ***
	(0.0044)	(0.0087)	(0.0213)	(0.0022)
Wald test	15,411.36 ***	954.22 ***	254.75 ***	8796.11 ***
J-stat	6145.232	315.48	356.29	234.1
Sargan Test Stat.	3.23	2.03	3.12	1.03
Panel B				
Variable	**Roe**	**Fcff**	**Tobin's Q**	
Constant	−0.7527	3971.292 ***	52.7222	
	(1.9361)	(1496.561)	(95.9824)	
Lagged dependent	0.0939 ***	0.0766 ***	0.8067 ***	
	(0.0111)	(0.0078)	(0.0237)	
ESG_{t-1}	−0.0009	10.3451 ***	0.1421	
	(0.003)	(2.3964)	(0.1495)	
$Greenwash_{t-1}$	0.0036	1.101427	−0.2673	
	(0.0284)	(23.36195)	(1.4237)	
$Beta_{t-1}$	0.0073	52.33865	0.7074	
	(0.0511)	(40.32975)	(2.5197)	
$Capitalized\_r\_d_{t-1}$	0.00003	0.4716 ***	0.0001	
	(0.00004)	(0.0346)	(0.0023)	
$Cash_{t-1}$	3×10^{-6}	−0.013 ***	6×10^{-6}	
	(5.4×10^{-6})	(0.0035)	(0.0003)	
Debt to $capital_{t-1}$	−0.508 ***	−241.9305 *	−2.0229	
	(0.1774)	(134.2153)	(8.5837)	
Dy_{t-1}	0.3991	941.3956	19.5762	
	(0.9069)	(721.0619)	(45.2116)	
$Institutions_{t-1}$	0.1182	−112.0565	1.739	
	(0.1375)	(109.4858)	(6.7906)	

Table 12. *Cont.*

$Liquidity_{t-1}$	−0.0155	17.58673	0.5818
	(0.0187)	(14.90388)	(0.9369)
$Market\ cap_{t-1}$	-5.4×10^{-7}	−0.005 ***	0.00004
	(2×10^{-6})	(0.0013)	(0.0001)
$Net\ cap\ exp_{t-1}$	-2.4×10^{-6}	−0.9746 ***	−0.0001
	(0.00001)	(0.011)	(0.0007)
Prs_{t-1}	0.0296	−568.6526 *	−11.6828
	(0.3699)	(287.1639)	(18.3769)
Sd_{t-1}	−0.5013 ***	−418.6948 ***	0.0293
	(0.153)	(116.0419)	(7.4743)
Wald test	7786.77 ***	1002.16 ***	1578.62 ***
J-stat	596.23	527.68	569.2
Sargan Test Stat.	1.26	2.14	4.11

The table shows the results of the Dynamic Panel estimation of the models above in the text. Cod is the after-tax cost of debt = pre-tax cost of debt (1 − tax rate). The average effective tax rate for the sector is used for this computation. Coe1 is estimated using the capital asset pricing model: cost of equity = risk-free rate + beta (risk premium). The average beta for the sector is used. I use the long-term treasury bond rate as the risk-free rate and a 5.5% risk premium. Coe2 is the dividend yield of the stock plus the reinvestment rate times the roe. Wacc is the market-weighted cod and coe1. Roe is the net income divided by the book value of equity. Fcff = EBIT(1-t) − (capital expenditures − depreciation) − change in non-cash working capital. Tobin's Q is estimated using the methodology of Peters and Taylor (2017). ESG is the Refinitiv ESG score. Greenwash75% is a dummy variable that takes a value of 1 if the Greenwash score of the firm is greater than or equal to 0.5432797, and 0 otherwise. Beta is estimated by regressing weekly returns on stock against the local index using 5 years of data. Capitalized R&D is R&D expenses amortized over five years at the cost of capital. Cash is Cash and Marketable Securities reported in the balance sheet. Debt to capital is the market value of debt divided by the market value of debt plus the market value of equity. Institutions is the shares held by institutions/shares outstanding. Liquidity is the average number of shares traded divided by the number of shares outstanding. Market cap is the estimated market value of shares outstanding, obtained by multiplying the number of shares outstanding by the share price. Net cap exp is capital expenditures − depreciation. Prs is the political risk variable for the home country from ICRG. Sd is the standard deviation of daily stock returns over the year. Industry, year, and country effects are controlled for but not reported to save space. Standard errors are reported in parentheses. *, **, and *** signify significance at the 10%, 5%, and 1% levels, respectively. The Sargan Test Stat. tests the null hypothesis of no endogeneity.

Table 13. GMM panel estimation emerging markets.

Panel A				
Variable	**Cod**	**Coe1**	**Coe2**	**Wacc**
Constant	0.0337 *	0.4062 ***	−0.4205 ***	0.1235 ***
	(0.0199)	(0.1277)	(0.1369)	(0.015)
Lagged dependent	0.6699 ***	0.9301 ***	0.3611 ***	0.5908 ***
	(0.0304)	(0.0291)	(0.0382)	(0.0312)
ESG_{t-1}	−0.0005 ***	−0.0006	0.0006	0.00008
	(0.0001)	(0.0006)	(0.0006)	(0.00008)
$Greenwash_{t-1}$	−0.0072 ***	−0.0085	0.0052	−0.0026 **
	(0.0019)	(0.0088)	(0.0093)	(0.0012)
$Beta_{t-1}$	0.0073 ***	0.0215 ***	0.0041	0.003 ***
	(0.0017)	(0.0079)	(0.0084)	(0.0011)
$Capitalized\_r\_d_{t-1}$	8×10^{-7}	−0.00001	−0.00002	-1.2×10^{-6}
	(4.4×10^{-6})	(0.00002)	(0.00002)	(2.8×10^{-6})
$Cash_{t-1}$	-3.1×10^{-7}	2.6×10^{-7}	-5.3×10^{-6} ***	-1.1×10^{-6}
	(3.8×10^{-7})	(1.8×10^{-6})	(1.9×10^{-6})	(2.5×10^{-7})
Debt to $capital_{t-1}$	0.025 ***	0.1803 ***	0.214 ***	0.0057
	(0.0082)	(0.037)	(0.0406)	(0.0049)
Dy_{t-1}	0.0001	0.5328 ***	−0.3241 **	−0.0222
	(0.0298)	(0.1176)	(0.1256)	(0.0193)
$Institutions_{t-1}$	−0.0416 ***	−0.0874 **	0.0991 **	−0.0249 ***
	(0.0084)	(0.0394)	(0.0417)	(0.0054)
$Liquidity_{t-1}$	−0.0011	−0.0005	0.009 *	−0.0009
	(0.001)	(0.0049)	(0.005)	(0.0007)
$Market\ cap_{t-1}$	-7×10^{-7} ***	-1.5×10^{-6}	6.1×10^{-7}	-2.7×10^{-9}
	(2×10^{-7})	(9.7×10^{-7})	(1×10^{-6})	(1.3×10^{-7})
$Net\ cap\ exp_{t-1}$	1.7×10^{-6} *	3.5×10^{-6}	-3×10^{-6}	9.4×10^{-7}
	(1×10^{-6})	(4.4×10^{-6})	(4.6×10^{-6})	(6.4×10^{-7})

Table 13. *Cont.*

Prs_{t-1}	−0.0027	−0.1142 ***	0.1067 ***	−0.0229 ***
	(0.0057)	(0.0361)	(0.0392)	(0.0041)
Sd_{t-1}	0.0185 **	−0.141 ***	0.1857 ***	−0.0023
	(0.0074)	(0.0361)	(0.0375)	(0.0049)
Wald test	8791.36 ***	1034.12 ***	1284.25 ***	5456.73 ***
J-stat	5145.76	545.17	587.32	473.18
Sargan Test Stat.	3.45	2.42	2.54	1.79
		Panel B		
Variable	**Roe**	**Fcff**	**Tobin's Q**	
Constant	0.4339	−11,905.77 **	2.4297	
	(0.2779)	(4774.168)	(9.2687)	
Lagged dependent	0.1223 ***	−0.2261 ***	0.6904 ***	
	(0.0146)	(0.0239)	(0.1369)	
ESG_{t-1}	0.0004	13.8105	0.1807 ***	
	(0.0011)	(21.3615)	(0.0394)	
$Greenwash_{t-1}$	0.0081	0.3688	0.4715	
	(0.0162)	(307.0381)	(0.5626)	
$Beta_{t-1}$	−0.0191	95.3921	−0.2099	
	(0.0151)	(277.0715)	(0.5323)	
$Capitalized\_r\_d_{t-1}$	0.00003	0.1151	−0.0002	
	(0.00004)	(0.6977)	(0.0013)	
$Cash_{t-1}$	9.7×10^{-7}	−0.3876 ***	-9.2×10^{-6}	
	(3.3×10^{-6})	(0.0614)	(0.0001)	
Debt to $capital_{t-1}$	−0.7905 ***	4824.852 ***	−2.4878	
	(0.0715)	(1325.999)	(2.5753)	
Dy_{t-1}	0.4135 *	−5156.839	−1.638	
	(0.2262)	(4223.444)	(7.9474)	
$Institutions_{t-1}$	0.1668 **	319.4693	−1.1205	
	(0.0727)	(1361.058)	(2.5267)	
$Liquidity_{t-1}$	0.0036	79.5697	0.2364	
	(0.0089)	(172.7392)	(0.3165)	
Market cap_{t-1}	4.4×10^{-6} **	−0.0117	0.00003	
	(1.8×10^{-6})	(0.0293)	(0.00006)	
Net cap exp_{t-1}	7.5×10^{-6}	−0.7786 ***	−0.0002	
	(7.9×10^{-6})	(0.14264)	(0.0003)	
Prs_{t-1}	−0.0463	3059.178 **	−2.5191	
	(0.0794)	(1335.948)	(2.6784)	
Sd_{t-1}	−0.3995 ***	−3913.06 ***	−2.401	
	(0.0687)	(1247.927)	(2.3775)	
Wald test	5563.21 ***	1562.16 ***	1326.55 ***	
J-stat	499.85	498.36	601.24	
Sargan Test Stat.	2.46	2.35	3.78	

The table shows the results of the Dynamic Panel estimation of the models above in the text. Cod is the after-tax cost of debt = pre-tax cost of debt (1 − tax rate). The average effective tax rate for the sector is used for this computation. Coe1 is estimated using the capital asset pricing model: cost of equity = risk-free rate + beta (risk premium). The average beta for the sector is used. I use the long-term treasury bond rate as the risk-free rate and a 5.5% risk premium. Coe2 is the dividend yield of the stock plus the reinvestment rate times the roe. Wacc is the market-weighted cod and coe1. Roe is the net income divided by the book value of equity. Fcff = EBIT(1-t) − (capital expenditures − depreciation) − change in non-cash working capital. Tobin's Q is estimated using the methodology of Peters and Taylor (2017). ESG is the Refinitiv ESG score. Greenwash75% is a dummy variable that takes a value of 1 if the Greenwash score of the firm is greater than or equal to 0.5432797, and 0 otherwise. Beta is estimated by regressing weekly returns on stock against the local index using 5 years of data. Capitalized R&D is R&D expenses amortized over five years at the cost of capital. Cash is Cash and Marketable Securities reported in the balance sheet. Debt to capital is the market value of debt divided by the market value of debt plus the market value of equity. Institutions is the shares held by institutions/shares outstanding. Liquidity is the average number of shares traded divided by the number of shares outstanding. Market cap is the estimated market value of shares outstanding, obtained by multiplying the number of shares outstanding by the share price. Net cap exp is capital expenditures − depreciation. Prs is the political risk variable for the home country from ICRG. Sd is the standard deviation of daily stock returns over the year. Industry, year, and country effects are controlled for but not reported to save space. Standard errors are reported in parentheses. *, **, and *** signify significance at the 10%, 5%, and 1% levels, respectively. The Sargan Test Stat. tests the null hypothesis of no endogeneity.

5. Discussion

I develop a greenwashing metric for 3973 companies across 70 countries, covering the period from 2012 to 2022, using Refinitiv ESG component scores. This metric utilizes the CSRStrategy score, which indicates a company's approach to integrating economic, social, and environmental considerations into its decision-making. This score is divided by the average of the Emissions score, which assesses a company's dedication and effectiveness in reducing environmental emissions, and the ResourceUse score, which evaluates a company's ability to minimize the use of materials, energy, or water while enhancing eco-efficiency through better supply chain management (Thompson Reuters Eikon 2017). The resulting variable is then regressed against the Refinitiv ESG score, and the residual becomes the Greenwash score. This regression helps differentiate the impacts of greenwashing from actual ESG activities, a topic that has been overlooked in the existing literature (Ruiz-Blanco et al. 2022; Yu et al. 2020). The Greenwash score aligns closely with the greenwashing definitions provided by de Freitas Netto et al. (2020).

I categorize the data into groups based on the Greenwash variable, with Greenwash75% representing firms in the highest quartile of Greenwash scores and Greenwash25% representing those in the lowest quartile, which are characterized as "brownwashing" firms, which are those that perform better environmentally than they disclose. According to Huang et al. (2020) and Marquis et al. (2016), greenwashing is more prevalent in emerging markets due to factors like unfair competition, easily misled consumers, and weak government enforcement. However, the data in Table 2 indicate no significant difference in the percentages of the Greenwash75% and Greenwash25% firms across different market types. While the average Greenwash score is slightly higher in emerging markets (1.13) compared to developed markets (1.16), this difference is not statistically significant. The results reveal that higher political risk correlates with lower greenwashing scores, suggesting that firms are less likely to greenwash in more stable countries. Political risk is particularly influential in emerging markets (Bilson et al. 2002). I used the MSCI definition for emerging markets, and a different definition might yield varied results, warranting further exploration. While Huang et al. (2020) suggest that emerging markets are more conducive to greenwashing due to lower competition, I do not find evidence supporting this claim.

There are notable distinctions between greenwashing firms and brownwashing firms. Greenwashing firms generally have a lower weighted average cost of capital, although their component costs of capital do not differ significantly. This difference may be attributed to their higher debt-to-capital ratio, indicating that they utilize a greater proportion of inexpensive debt financing to reduce their overall cost of capital. Additionally, greenwashing firms are usually larger and have a greater share of institutional ownership. On average, they also provide lower dividend yields and are often based in politically stable countries. Furthermore, greenwashing firms display less firm-specific risk compared to brownwashing firms, as evidenced by their standard deviation means.

There is no significant difference in the ESG scores between the two samples. Greenwashing firms have more ESG-related controversy scores than brownwashing firms. By design, greenwashing is higher in advertising their ESG efforts and lower in Emissions and ResourceUse. Greenwashing firms are significantly behind brownwashing firms in respecting human and worker rights, product responsibility, shareholder rights, community responsibility, and environmental innovation. This indicates that greenwashing firms not only fail to adhere to advertised environmental goals, they also fail to adhere to social and governance goals. The reason they do not differ in ESG scores may be due to overemphasis in weighting on ESG communication and advertising in the overall ESG score by the Refinitiv methodology.

What are the effects of greenwashing on the cost of financing for the firm? The issue is complicated by the relationship between the effects of ESG disclosure and greenwashing. I have tried to address this by regressing the Greenwash variable on the ESG score. The relevant literature shows that higher ESG scores lead to a lower cost of debt (Raimo et al. (2021), Eliwa et al. (2021), and Apergis et al. (2022)). And that higher ESG scores lead

to a lower cost of equity (Ng and Rezaee (2015)). I obtain similar results here controlling for greenwashing.

I do not find that greenwashing in and of itself affects the cost of capital except in emerging markets. Greenwashing firms may obtain a lower cost of debt due to higher ESG scores, and they take advantage of this by using more debt to lower their overall weighted average cost of capital. However, greenwashing is found to increase the firm's idiosyncratic or firm-specific risk.

However, this higher use of debt of course could mean that firms with higher greenwashing scores are more subject to financial constraints. Zhang (2023) argues that financial constraints motivate pollution-heavy firms to decrease their product quality. This promotes greenwashing. However, as noted above, the higher ESG scores that may be obtained via greenwashing can lead to lower costs of debt, thus encouraging the use of debt. The chain of causality here is not clear. The results argue that debt use has no significant effect on greenwashing, as the coefficient is insignificant at conventional levels. Thus, it seems more likely that greenwashing precedes high debt use. However, more work is required on this subject.

Operationally, greenwashing is associated with a lower return on equity. The results all uniformly exhibit a negative relation between greenwashing and the return on equity, though insignificantly for brownwashing firms. This follows previous results on the return on assets by Walker and Wan (2012). This is in contrast to the work of Li et al. (2023), who found a positive relationship between greenwashing and roa. This would also go along with the research of Newell et al. (1998), Chen and Chang (2013), Nyilasy et al. (2014), Chen et al. (2014), Rahman et al. (2015), Aji and Sutikno (2015), Akturan (2018), Schmuck et al. (2018), Wang et al. (2019), Nguyen et al. (2019), and Szabo and Webster (2021). They all provide evidence of how greenwashing behaviors can harm consumer attitudes, which affect purchasing behaviors. This effect on purchasing behaviors affects the level and volatility of firm revenues, which affect the return on equity.

However, as the results also show, greenwashing has a mixed relationship with free cash flow to the firm. For greenwashing firms, greenwashing activity is associated with higher free cash flow to the firm, while for brownwashing firms, it is associated with lower free cash flow. The differences between return on equity and free cash flow to the firm principally lie in that free cash flow to the firm includes depreciation expenses and changes in net working capital. If the firm does not reinvest to allow for the depreciation of assets and borrows through net working capital to pay cash to investors, it will have a higher free cash flow. This implies that firms that indulge in heavier greenwashing are making up for the effects of greenwashing on the return on equity by short-term cash flows to creditors and shareholders through less reinvestment to the firm. The effects found here for the Greenwash variables are similar to what Gregory (2022) finds for the ESG score on free cash flow to the firm.

This brings into question whether Gregory (2022) was actually measuring the effects of greenwashing or whether I here am measuring the effects of the ESG variable. I have attempted to guard against this by regressing the Greenwash variable against the ESG score and using the orthogonalized residual. I have also used dummy variables with low correlations with the ESG score.

Of course, the question is why is greenwashing associated with a declining roe and an increasing free cash flow for firms that make heavy use of greenwashing strategies? By definition, the only connection between free cash flow and row is that both contain net income. Free cash flow to the firm contains earnings before taxes and interest, depreciation, capital expenditures, and changes to net operating working capital. Table 4 shows that firms making greater use of greenwashing have lower average fcff than firms making less use of greenwashing, while their roe is on average higher. Part of this is explained by the fact that the average capital expenditure value for firms that make greater use of greenwashing is much higher, as is shown in Table 4. So there may be an association between greenwashing and net capital expenditures.

CSRStrategy, which represents a score assessing how well a company integrates economic, social, and environmental considerations into its daily decision-making, has the most significant influence on a firm's ESG score. Given that greenwashing can be partially defined as the selective communication of social and economic dimensions that lack substantiation through actual performance, this raises the potential for a feedback loop between greenwashing practices and ESG scoring as assessed by ESG rating firms. If, as shown in Table 10, ESG rating firms assign greater weight to the environmental and social communications of firms without accounting for the possibility of greenwashing, this could create a feedback loop. Consequently, firms engaging in greenwashing may feel incentivized to amplify their greenwashing efforts to achieve higher ESG ratings.

There is evidence suggesting that Greenwash Granger influences the CSRStrategy of the firm, which in turn affects ESG, as indicated by the findings in Table 11 and supported by Refinitiv (2022). Furthermore, it appears that ESG Granger influences greenwashing. This suggests a weak feedback loop between greenwashing and ESG rating scores. Consequently, it may be interpreted that greenwashing behavior is not significantly penalized in the Refinitiv ESG scores.

Further, the findings suggest that the reward from greenwashing comes in part from enhanced ESG scores; as for greenwashing firms, higher ESG scores are associated with lower costs of debt and equity. However, this lower cost of equity and debt for greenwashing firms leads to a slightly higher use of debt in financing for greenwashing firms and a lower average free cash flow to the firm as the greenwashing firms make use of it for greater capital expenditures that do not seem to provide greater shareholder compensation on average.

In terms of long-term effects on the firm's risks, these results raise the issue that firms may become "addicted" to greenwashing as a means of enhancing financial performance by lowering their costs of capital through enhancing their ESG scores. However, this could be setting their shareholders and creditors up for large swings in the value of their holdings in the firms as seen in the case of Volkswagen's "Dieselgate" fiasco, which resulted in a major depreciation of Volkswagen stock price that lasted for several years. As Gregory (2023) demonstrates, such a heavy reliance on greenwashing as a strategy can lead to a large, difficult-to-detect source of idiosyncratic form of risk for shareholders and creditors. The greater likelihood that greenwashing is associated with the occurrence of future ESG-related controversies supports this hypothesis.

Comparing the results here with the results of Li et al. (2023) and Gregory (2022), Li et al. find that greenwashing efforts are associated with improved return on equity, an effect that is moderated when local environmental regulations are high. Here, I find that generally, greenwashing has no effect on return on equity, with a negative effect for firms with the highest greenwashing scores. Why the difference?

Li et al. (2023) restrict themselves to a sample of winsorized Chinese firms. In Table 13, I also find a positive, but insignificant, coefficient from the Greenwash score on roe. As Li et al. note, the effect of greenwashing on roe for their set of Chinese firms is moderated by the level of environmental regulation and the local social attitudes. This would be much wider in my sample, and thus may explain why I did not find the same results. Secondly, I made a much stronger and more robust correction for endogeneity than they did in estimation.

Gregory (2022) finds that ESG scores have a positive effect on free cash flow to the firm, particularly for developed markets, which is similar to the results reported in Table 12 above.

6. Conclusions

Using ESG scores from Refinitiv, I construct a greenwashing measure for 3973 companies from 70 countries from 2012 to 2022. Amongst the major findings of this work are the following.

Greenwashing firms tend to be larger firms, with higher institutional ownership and are typically headquartered in countries with less political instability. Greenwashing is

associated with a lower weighted average cost of capital for the firm, but it is not clear if this is from greenwashing or if greenwashing allows greenwashing firms to issue more low-cost debt by "fooling" the markets that they are less risky. However, greenwashing is associated with higher idiosyncratic risk. Moreover, greenwashing is associated with a greater likelihood of ESG-related controversies in the future. There is significant evidence of a complex relationship between greenwashing and ESG rating scores. There is no evidence found to support the idea that ESG reporting mandates inhibit greenwashing.

The limitations of this study are primarily the endogeneity of the greenwashing decision. I have tried to control for this using GMM estimation and lagged differenced instruments. The other major limitation is the bi-directional relationship between ESG scores and the Greenwash score. I have tried to control for that using GMM estimation and a series of dummy variables. It could be argued that the Greenwash score used does not capture greenwashing as per the definition. I have tried to use a very wide definition of greenwashing.

Another limitation is the use of a single greenwashing score. Expanding upon this study using additional greenwashing scores along the lines of Li et al. (2023) might be fruitful.

My suggestions for research are further studies on the measurement of greenwashing, the relationship between greenwashing and financial outcomes, and the determinants of greenwashing. Follow-up research on the hypothesis that greenwashing has a bi-directional relationship with ESG ratings with rating scores from other rating firms is called for.

In addition, the hypothesis that greenwashing may act as a means of risk reduction needs further investigation. Greenwashing introduces a new set of risks to a firm and presumably alters its risk exposure.

Further research should also be conducted on possible moderating influences on greenwashing, such as regulatory regimes, political risk, press freedom, etc.

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