THE LEVEL OF GREENWASHING AND COST OF EQUITY CAPITAL

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CERTIFICATE OF ORIGINALITY

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Abstract

Under increased pressure to report positive environmental performance, some firms engage in greenwashing to create an impression of accountability and transparency while hiding their true performance. This study aims to assess whether greenwashing is costly by examining the impact of greenwashing on the cost of equity capital. Using a sample of 5,617 U.S. firms, I find that firms engaging in greenwashing exhibit higher equity financing. After controlling for multiple risk factors in my main regression model and performing additional tests, which aim to control for correlated omitted variables and endogeneity concerns, the results still hold. My findings contribute to the debate on whether greenwashing is priced by showing that the market can capture greenwashing since it increases a firm's cost of equity capital. First, to the best of my knowledge, this is the first thesis examining the association between cost of capital and the extent of greenwashing. This examination is critical as it sheds light on how the market values greenwashing and furthermore, there is yet little consensus on how to measure and identify greenwashing. Second, limited and imperfect information about firms' environmental performance contributes to greenwashing, and therefore affects the cost of capital. Finally, seeing that prior research highlights the importance of social performance for firm valuation and access to external investment, my study suggests that greenwashing is also important to firms as it has power to explain a firm's cost of equity beyond other risk factors.

Key words: Greenwashing, Cost of Capital, selective Disclosure

Data availability: Data are publicly available from the sources identified in the study.

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1. INTRODUCTION

Greenwashing is the selective disclosure of positive information about a company's environmental or social performance, without full disclosure of negative information on these dimensions, so as to create an overly positive corporate image (Lyon and Maxwell, 2011). This study aims to assess whether greenwashing is costly by investigating the impact of greenwashing on the cost of equity capital.

The motivation of the research question is threefold. First, despite the fact that greenwashing is widespread, it is not without risk for companies. Yvon Shouinard, the founder and boss of Patagonia the clothing manufacturer for example, recently harshly criticized firms engaging in greenwashing. He argues that in the manufacturing industry greenwashing is widespread and he knows so many companies that have claimed, 'we are making our business green, actually it is almost always greenwashing'. The problem is that companies may face financial risks for engaging in misleading environmental communications.[1] It may throw an organization's activities open to suspicion and reduce its ability to obtain resources, legitimacy, or social support. On February 3rd, 2017, Walmart agreed to pay $1 million to settle greenwashing claims alleging that the nation's largest retailer sold plastic products that were misleadingly labeled "biodegradable" or "compostable" in violation of California law. Also, the U.S. SEC issued a concept release in April 2016 asking for new disclosure of environmental, social and governance matters to increase regulatory and stock exchange requirements. The European Commission estimates that Europe will need 180 billion euros ($207 billion) in additional investment every year in the next two decades if it wants to achieve its goal of curbing greenwashing. Finally, countries such as Australia, Canada,

[1] The Greenwashing Index (2017) claims that 'When properly trained, consumers see right through this "green screen". Then greenwashing backfires, damaging the company's reputation and, ultimately, their sales'.

France, Norway and the United Kingdom are also taking pro-active steps to tackle greenwashing claims through a variety of regulatory, legislative and enforcement efforts.

Second, previous empirical research on the relation between corporate social responsibility (CSR) and cost of equity finds that firms engaging in CSR exhibit low level of cost of equity capital and present cheaper equity financing. Using 2,809 unique U.S. firms between 1992 and 2007, El ghoul et al. (2011) examine the capital market participants' perceptions of CSR. They document a solid evidence of CSR impacts on the cost of capital and they show that the cost of capital is an important channel through which the market values corporate social responsibility. A major limitation of this stream of literature is that a high CSR rating might include firms that do actually engage in greenwashing. Firms may engage in environmentally friendly practices to hide their real intentions behind the quality of their environmental practices, which can cause the public to doubt whether the company wants to implement a sustainable corporate strategy or just simply establishes a green image for the sustainability of their earnings. Chatterji et al. (2008) examine whether Kinder, Lydenberg, Domini Research & Analytics (a rating organization) provides transparency to stakeholders about the past and future environmental performance. They find that the CSR concern score represents the past environmental performance and includes firms that are slightly, but statistically significantly, more polluting and exhibit lower environmental compliance in later years. However, KLD "strengths" ratings do not accurately foretell compliance violations or pollution levels, and the positive association between CSR and financial performance is overstated due to wrong CSR metrics, as well as because of the success in greenwashing campaigns.

Finally, greenwashing is also a matter of concern to policy makers. There is a need for mandatory environmental regulation to avoid misleading communications, reduce information uncertainty and improve firms' understanding about the harm of engaging in greenwashing.

To the best of my knowledge, few papers examine the economic consequence of greenwashing (e.g., Chen 2008a, b, 2010; Chen and Chang 2012; Chen et al. 2006; Parguel et al. 2011; Ramus

and Montiel, 2005; Du, 2015). These studies have provided little evidence to inform the public about how the market values greenwashing as a form of selective disclosure and how it impacts the cost of capital and therefore, the information asymmetry.

Prior analytical research on disclosure (Easley and O'hara, 2004; Lambert, Leuz, and Verrecchia, 2011, 2007) and empirical studies (Attig et al., 2012; El Ghoul et al., 2011; Bhat, Hope, and Kang, 2006; Bushee and Leuz, 2005; Graham, Campbell and Rajgopal, 2005; Richardson and Welker, 2001; Welker, 1995; Leuz and Verrecchia, 2000; Botosan, 1997) document that disclosure quality improves the precision and quality of information available to investors and consequently reduces the financing equity. Previous analytical and empirical studies on greenwashing (Marquis et al. 2016; Delmas and Burbano, 2011; Kim and Lyon, 2014; Lyon and Montgomery, 2015; Lyon and Montgomery, 2013; Lyon and Maxwell, 2011) classify greenwashing as a form of selective disclosure. They suggest that the probability of a firm engaging in greenwashing may decrease over time in response to stakeholder pressures. In addition, empirical evidence shows that greenwashing is significantly negatively related to cumulative abnormal returns around the exposure of greenwashing (Du, 2015). Yet empirical evidence on whether greenwashing has an impact on cost of equity is sorely lacking.

A key research design issue in this study is to develop a reliable proxy for greenwashing. I use the Trucost database, which is a company established in 2000, and it develops a more advanced approach to computing the environmental impact of company operations, supply chains, and investment portfolios. The database includes 4,787 firms over a period from 2005 to 2016. Greenwashing (GW) is measured by the selective disclosure magnitude, which exhibits the extent to which companies risk making a deceptive environmental impression of transparency and indebtedness by disclosing relatively favorable environmental metrics rather than overall environmental harm. (Lyon and Maxwell 2011; Bowen 2014; Marquis et al. 2016).

There are controversies about the measurement of cost of capital (Hope at al., 2009; Francis et al., 2004). I use four models: two implementations of the Ohlson (1995) residual income valuation model, the Ohlson and Juettner-Nauroth (2005) model, and the PEG model as implemented by Easton (2004).

In my second set of tests, I examine cross-sectional variation in the relation between greenwashing and cost of equity capital. In particular, I investigate how this relation varies with: (1) the media pressure, (2) market competition, and (3) CEO optimism bias. Such tests are helpful because, although our main tests document the relation between greenwashing and cost of equity capital, one might still harbor a concern that a correlated omitted variable might independently affect both for the level of greenwashing and cost of capital. Finding consistent evidence across multiple predictions makes it less likely that our collective results are attributable to alternative explanations or specific research design choices.

Using a large sample of U.S. firms from 2005 to 2015, I show that the market values greenwashing by offering a higher risk premium after controlling for other firm-specific determinants as well as industry and year fixed effects. I also find that firms related to ‘‘dirty’’ industries, namely transportation, oil and gas, and nuclear power, seem to exhibit higher cost of capital. My evidence is robust to several additional analyses, including alternative assumptions and model specifications, additional controls for corporate governance and financial constraints, noise in analyst forecasts and analyst following, and various approaches to addressing endogeneity. In brief, my findings provide add value in the literature that greenwashing as a form of selective disclosure destroys firm value.

My thesis contributes to the accounting and finance literature. First, to the best of my knowledge, this is the first empirical study examining the association between cost of capital and the extent of greenwashing. Dhaliwal et al. (2011) find that high CSR firms tend to disclose more information, as these firms want to project their positive image as a responsible corporate citizen to investors and other stakeholders. This paper complement Dhaliwal et al. (2011) findings by showing that

investors charge higher cost of equity for firms that engage in greenwashing. This examination is critical as it sheds light on how the market values greenwashing and furthermore, there is yet little consensus on how to measure and identify greenwashing.

Second, my study contributes to the literature examining the association between disclosure and the cost of equity. Although in theory firms with higher disclosure quality should enjoy a lower cost of equity capital, empirical research finds only limited support (Botosan 1997; Botosan and Plumlee 2002; Francis et al. 2008), partly because voluntary disclosure is driven by incentives other than reducing information asymmetry. Cao et al. (2015) find that companies with better reputations enjoy a lower cost of equity capital. They suggest that reputation may be important value relevant information to the capital markets, decreasing information asymmetry and hence the cost of capital.

I provide supporting evidence by showing that greenwashing is a piece of value relevant information to the capital market and that it also affects companies' financing costs. Finally, because this study shows an important aspect, which is the tendency for firms to engage in greenwashing while hiding the real environmental damage, it should interest shareholders and board members concerned in the effect of greenwashing on companies' reputations and financing costs.

The remainder of the thesis is organized as follows. Section 2 provides the background of research. Section 3 provides the development of hypotheses. Sections 4 and 5 describe the research design and present the main empirical results and cross-sectional analyses of the impact of greenwashing on the cost of equity. Finally, Section 6 concludes.

2. BACKGROUND AND DEVELOPMENT OF THE HYPOTHESES

2.1. Concept of Greenwashing

Greenwashing is born out of the need for brands to forge a certain image at a time when sustainable development becomes very important for economic activities. A brand image refers to "brand perceptions reflected by brand associations held in the consumer's memory" (Keller, 1993). Beyond the actual practices of companies, communication plays a preponderant role in the construction of this image. It should be noted that the consumer's knowledge of the brand is closely linked to its image (Park et al., 1994).

The term "Greenwashing" was coined in 1986 by a New York environmentalist, Jay Westerveld, to denounce certain hotels that placed green plaques in each room to promote the reuse of services and thus help safeguard the environment. However, over time, this concept has spread across all business sectors to become a management system for some businesses.

TerraChoice develops a grid of analysis of greenwashing in the marketing of environmental products; the phenomenon goes beyond manipulation: the practice is downright false, being defined as "all tactics that mislead consumers about a company's environmental practices or the environmental benefits of a product or service". In this sense, this definition aligns with that of Bodger and Monks (2009), who claim that greenwashing is "painting in ‘green’ products through vague, incomplete, non-substantial, inaccurate environmental declarations where the benefits are negligible" (p.285). Thus, even though 55% of citizens from 17 countries, including the UK, France, China and the United States, are very interested in environmental issues and are aware of the environmental impact of their purchases (Bodger and Monks, 2009), companies that rely on the discourse of sustainability in a non-genuine way are more likely to damage their reputation than to positively influence the consumer's attitude (Parguel et al., 2011).

According to Greenpeace, four criteria make it possible to detect greenwashing:

- The objective of the company: if the company's activities have a significant impact on pollution or destruction of the environment (for example: an oil company or other non-renewable resource company, a forestry company), there is a good chance that its green communication is greenwashing. Even if the company is launching "cleaner" initiatives (for example, an oil company is going into solar energy), it is also greenwashing because it does not recognize the fundamentally incompatible nature of its main activity with respect to the environment;

- Advertising practices: greenwashing is also defined as any company that uses the media to boast the ecological character of a few products or a single one, without changing its main harmful activity, or conversely to legitimize the continuation of this activity;

- Research and Development: if research and development budgets are mainly devoted to maintaining (or improving the margin of) old non-sustainable activities, rather than developing new and clean activities, then one might think that the green speech of that company is only greenwashing;

- The lobbying: the doublespeak, by which a company presents itself publicly as committed to the environment while leading (directly or through organizations) lobbying actions against the regulations aimed at precisely to limit damage to the environment, is also a characteristic of greenwashing.

According to TerraChoice's (2009) report, 98% of the 2,219 "green" products evaluated in Canada and the United States have misleading claims about their ecological properties. Since 2007, the number of so-called "green" products has increased by 79% in North American stores. TerraChoice identified the Seven Sins of Greenwashing:

(1) The Sin of the Hidden Trade-Off (70% of the products): the focus is on the ecological aspect of the product by ignoring the fact that some of its components are harmful to the environment or that its production process is polluting;

(2) The Sin of No Proof (60% of products): a product displays "green" claims without proof or validation by third-party certification;

(3) The Sin of Vagueness (51% of products): it occurs when an allegation is so vague and meaningless;

(4) The Sin of Worshiping False Labels (23% of the products): a logo is affixed which is strongly and/or roughly inspired by those issued by real certification organizations, which suggests that it has been approved by a third party;

(5) The Sin of Irrelevance (7% of products): it refers to the absence of a deleterious substance which the product has never contained or is not related to the product;

(6) The Sin of Lesser of Two Evils (5% of products): an allegation that makes a category of products "greener" that is itself lacking in environmental benefits;

(7) The Sin of Fibbing (1% of products): an ecological claim turns out to be false.

2.2. Literature review on Greenwashing

Studies on greenwashing can be categorized into two broad categories. The first category includes conceptual papers (theories, models, and frameworks) that explain the drivers and means of greenwashing (Delmas and Burbano, 2011; Lyon and Maxwell, 2011; Lyon and Montgomery, 2013; Bowen, 2014). The second category encompasses empirical work on greenwashing (Ramus and Montiel, 2005; Delmas and Montes-Sancho, 2010; Walker and Wan, 2012; Kim and Lyon, 2014; Marquis et al. 2016; Du, 2015; Du et al. 2016). Surprisingly, this latter category counts only few studies and a lot of work needs to be done in this area to explore the cost and benefits of greenwashing.

There is a large conceptual literature on organization theory, economics, and marketing discussing misleading communications. Organization theory refers to the idea that companies must conform to social norms to avoid critics from stakeholders and to maintain "legitimacy" (Meyer and Rowan, 1977). Meyer and Rowan (1977) warn that the conformity to social norms holding benefits for organizations may actually incite misbehavior, and that firms may manipulate outside impressions by "decoupling" their internal activities from the more public aspects of the organization. The authors posit that there is a disconnection between the structures and the activities of an organization.

The economic theory proposes that it is difficult to deceive skeptical and sophisticated audiences. Theories of signaling, disclosure, and costly state falsification offer various explanations for greenwashing. From a signaling perspective, sophisticated investors are not fooled by firms' cheap talk of outstanding performance. Thus, firms engage in costly actions that they hope will "signal" their underlying type, such as being perceived as socially responsible (Spence, 1973). Crucially, such inferences are only informative if high-quality CSR firms find it sufficiently less costly to

send the signal than do low-quality CSR firms. Otherwise, a "pooling equilibrium" emerges in which low-quality CSR firms mimic the action of the high-quality CSR firm, and investors learn nothing from the action. In such an equilibrium, nobody is "fooled" into adopting false beliefs, but still investors are unable to distinguish the good from the bad, and hence are misled about the CSR quality of any particular firm, being forced to assume that all are average. Unlike signaling models, disclosure models involve firms' attempts to persuade investors of something by releasing "hard" or verifiable information that can be credibly communicated to others. Sophisticated investors with skeptical beliefs will assume the worst unless given hard evidence to refute their innate skepticism. Thus, a failure to disclose information is interpreted as an admission of poor performance (Milgrom, 1981) and strategic attempts to hide information will fail. However, when investors are uncertain as to whether the firm in fact possesses hard information on CSR, a failure to disclose may simply indicate that the firm itself is not fully informed (Krishna and Morgan, 2001). Under these circumstances, positive disclosures can lead investors to adopt overly favorable views of the firm's performance, that is, they can be misleading (Shin, 2003). Finally, the theory of costly state falsification argues that firms can also expend resources to distort what others observe about their CSR practices (Lacker and Weinberg, 1989) and even if investors are aware of the possibility of costly state falsification, there is often no way to completely undo its effects. Green claims have spurred many lawsuits and attracted the business press's attention.

Finally, the literature on marketing suggests that what matters as misleading behavior depends necessarily on how individuals interpret particular claims (Oswald, 2011). Deceptive advertising has identified many types of misleading cases (Darke and Ritchie, 2007). For example, incomplete comparisons suggesting that one product is better than another do not give any competitive advantage. Another way of deceptive marketing is the halo effect, which is a concept driven by brand equity. For instance, a consumer might think that a firm's products are not genetically

modified, and thus assumes that the firm is environmentally friendly (Lyon and Montgomery, 2015).

There are numerous drivers for a company to engage in environmentally friendly or green activities. Delmas and Burbano (2011) suggest that corporate actors are the primary authors of greenwashing. They offer a theoretical framework that investiagtes the external, organizational and individual drivers of greenwashing. External drivers of greenwashing include pressures from both market actors, such as consumers, investors, and competitors, and nonmarket actors, such as regulators and NGOs. The control of greenwashing is very limited, probably because the subject is not very circumscribed, but also because the means of control would be very expensive to implement. Most countries have since implemented the recommendations through the government regulation of local business practices. Thus, in the United States, the Federal Trade Commission (FTC) regularly publishes a "Green Guide" with relatively broad guidelines (eg, avoiding vague, unfounded, deceptive acts or practices), but does not have a control system. The FTC Act also fixes criminal liability or fines if the violation is committed with the intent to defraud or mislead. Given the limited history of FTC charges, companies accept the risk of being punished by the FTC for engaging in greenwashing behavior, as the current U.S. regulatory context does little to prohibit greenwashing.

In Europe, several countries have set up specific advertising advisory and control systems, such as the Advertising Regulatory Authority (ARA) in France or the Advertising Standards Authority in the United Kingdom. These associations represent multi-stakeholder interests, primarily those of professionals, but also those of civil society. The ARA proposes a recommendation of ‘Sustainable Development’, which is updated regularly, and advertisers can consult an annual report on the state of greenwashing. If there is a misleading act, the advertising ethics committee examines the case and may request withdrawal of the advertisement. The ARA cannot, however, denounce an advertiser and therefore does little to deter greenwashing. Finally, the U.S. government does not

currently mandate corporate disclosure of environmental practices, with a few exceptions such as toxic releases. Given the uncertainty about greenwashing enforcement in the U.S. and limited formal regulation of greenwashing, activist groups, NGOs and the media currently play a critical role as informal monitors of firm greenwashing.

Lyon and Maxwell (2011) present the first economic analysis of greenwashing. They posit that when the expected penalty for greenwash is zero, firms have more incentives to engage in greenwashing. However, when the expected penalty for greenwashing increases and any potential benefits of greenwashing are outweighed by the expected penalty, the firm will avoid greenwashing. The key implication of their model is that activists can audit and detect greenwashing and act accordingly on this information. In addition, they document that firms facing activists' pressure are more likely to risk public backlash by disclosing selective information to prevent a negative public image. For example, on August 4, 2017 PepsiCo faced activists' outrage following the beverage giant's release of its Palm Oil Action Plan Progress. From the discussion above, activists, NGOs, and the media provide a constraint of public exposure to firms' greenwashing behavior.

Turning to the market external drivers of greenwashing that include consumer-, investor- and competitor-induced incentives, Delmas and Burbano (2011) argue that firms face pressure from both consumers and investors to look environmentally friendly and are thus obliged to disclose only positive environmental information. The competitive part is an important driver for engaging in greenwashing. Firms may follow their rivals who have already begun to communicate positively their environmental performance and the adoption of green practices. This suggests that within an industry the green practices are commonly used to promote their products and gain investors' confidence.

Besides the market and non-market external-level drivers, there are organizational-level drivers including firm characteristics, incentive structure and ethical climate, effectiveness of intra-firm communication, and organizational inertia mediation. In fact, empirically, Ramus and Montiel (2005) examine what actually motivates a firm to implement environmental policies. They find that manufacturing companies are more likely to commit to specific policies of sustainable development comparing to other sectors. Moreover, Kim and Lyon (2014) find that growing firms, which are likely to face future regulatory interactions, are more likely to greenwash. Recently, Marquis et al. (2016) theorize conditions under which firms are less likely to engage in such selective disclosure, such as organizational and institutional factors that intensify scrutiny, legitimacy and expectations of disclosure. Using a set of 4,750 public companies headquartered in 45 countries across many industries, the authors show that environmentally damaging firms will be less likely to engage in selective disclosure, specifically those in countries where they are more exposed to activists, more connected to global norms and listed on foreign stock exchanges.

Finally, the individual-level psychological drivers play an important role in explaining firms' greenwashing behavior. Psychology literature documents that optimistic bias, narrow decision-framing and hyperbolic intertemporal discounting become more prominent and have a greater impact on individual decision-making under conditions of uncertainty and limited or imperfect information. Thus, managers are likely to exhibit these psychological tendencies and engage in greenwashing behavior (Delmas and Burbano, 2011).

Empirical work on decoupling and economic literature on information disclosure suggest that activists and external stakeholders have an important impact on greenwashing. Lyon and Montgomery (2013) document that social media will reduce the incidence of greenwashing. In fact, they argue that the use of social media by consumers and activists will make greenwashing less likely to occur, thereby increasing the scrutiny companies face. Delmas and Montes-Sancho (2010) find that greenwashing is more likely among firms that experience less political pressure at the state

level and are less dependent on local and federal regulatory agencies. Along the same lines, Kim and Lyon (2011) find that greenwashers are more likely to be threatened by increased regulation, but that pressure from environmental groups reduces the likelihood of greenwashing. A follow-up study by Kim and Lyon (2015) suggests that the presence of scrutiny may affect a manager's incentives to make environmental disclosures. Examining over 100 top-performing Canadian firms in visibly polluting industries, Walker and Wan (2012) find that greenwashing has a negative effect on financial performance.

In China, Du (2015) examines whether the market values greenwashing and whether corporate environmental performance plays an important role in explaining the market reaction around the exposure of greenwashing. Using a sample from the Chinese stock market during the period 2011–2012, he shows that greenwashing is significantly negatively associated with CAR around the exposure of environmental wrongdoings, suggesting that the market negatively values greenwashing. Moreover, corporate environmental performance is significantly positively related to the tendencies for CAR around the exposure of greenwashing, implying that corporate environmental performance plays an important role in explaining the market reaction to greenwashing. A follow-up study by Du et al. (2016) examine the interaction between corporate environmental performance and internal control (auditors issuing modified opinions) and they look at the moderation effect of greenwashing on the relation between environmental performance and modified audit opinions. Their results suggest that greenwashing exacerbates the negative effect of corporate environmental performance on modified audit opinions.

2.3. Literature review on the consequences of disclosure

Companies have faced increasing pressure over the past decade to disclose more information and presume that they are green to avoid paying fines and loss of reputation, consumer trust and corresponding market shares. However, is it true that the firm is environmentally friendly or is it managing audience impression? Previous studies suggest that firms are motivated to voluntarily disclose only information that bolsters their reputations.

Prior analytical and empirical research on selective disclosure (Easley et al., 2002; Easley and O'Hara, 2004; Barry and Brown, 1985) suggests that firms with higher disclosure quality should enjoy a lower cost of equity capital. Botosan (1997), Botosan and Plumlee (2002), and Francis et al. (2005) in the U.S. and Richardson and Welker (2001) in Canada document a negative association between voluntary disclosures and the cost of capital. Botosan (1997) finds a significant association between her self-constructed disclosure score and implied cost of equity capital only for firms with low analyst following; however, she finds no significant association for her full sample. Botosan (2006) and Hail and Leuz (2006) review all the theoretical and empirical studies that have studied the different associations between accounting information and the cost of capital. Theoretically, the link between the two concepts finds its argument along two lines of research. The first line states that a high level of disclosure reduces the cost of capital by decreasing the information asymmetry and/or transaction costs, whereas the second line suggests that a high level of disclosure reduces the cost of capital by reducing the probability of misstatement by investors. Indeed, in a context of information asymmetry, uninformed investors are afraid to negotiate in the presence of investors holding private information. The latter can sell or buy securities at their true value because they hold better information and therefore, they are able to change their portfolios at any time to improve their profitability. In contrast, the least informed investors do not know precisely the real value of the securities, and they will buy or sell and become more reluctant to acquire securities of

poor profitability. As a result, they lower (increase) the prices at which they are willing to buy (sell) to protect themselves from a potential loss when they trade in the presence of better-informed investors.

Also, Sengupta (1998) shows that comprehensive voluntary disclosure contributes to a low level of cost of capital. Francis, Nanda and Olsson (2005) investigate the relations among voluntary disclosure, information quality, and the cost of capital. They find that more voluntary disclosure is associated with lower costs of equity; however, taking into account the complementary association between disclosure and accruals quality, Francis, Nanda and Olsson (2005) find that voluntary disclosure has a substantially weaker, and in most cases, no incremental effect on the cost of equity after controlling for accruals quality. Richardson and Welker (2001) examine the relation between financial and social disclosure and the cost of capital in a Canadian setting. They find a significant association between the quantity and quality of financial disclosure and the cost of equity for firms with low analyst following.

Choi (1999) indicates that, in general, managers believe that the cost of voluntary disclosure is higher than its benefit. Therefore, there must be an important economic motive, such as a strong demand for capital, to get these conservative managers to change their behavior regarding disclosure. Healy and Palepu (1993) add that financial analysts rely more on financial information when companies disclose voluntary information. In addition, financial markets continue to require more information in order to make investment decisions.

Using a sample of 97 firms, Healy, Hutton, and Palepu (1999) show that an increased disclosure implies an average increase of 7 in share prices during the first year before reaching an average growth rate of between 12 and 24 percent over the subsequent three years.

Recently, Cao et al (2015) investigate whether companies with better reputations enjoy a lower cost of equity financing. They document that companies with higher reputation scores exhibit a lower cost of equity capital even after controlling for other factors that determine the cost of equity.

However, Johnstone (2016) provides a theoretical analysis of how information might increase uncertainty and a firm's cost of equity capital. They show that more information does not lead necessarily to more certainty, because of Bayesian logic which shows that the best available information can often leave decision-makers less certain about future events.

Amihud and Mendelson (1986) and Diamond and Verrecchia (1991) suggest that better disclosure may reduce information asymmetry, which in turn reduces the cost of capital of the company because of an increase in the liquidity of their stocks, and therefore its market value increases. Barry and Brown (1985) document that a high level of disclosure reduces the cost of equity because of a decrease in the estimated systematic risk, and therefore the stock's market value increases. Along the same lines, Merton (1987) develops a theoretical model in which investors have incomplete information and do not know all firms in the market. As a result, risk-sharing is not total and inefficient. On the other hand, when the unknown companies disclose their information, investors will broaden their investment base, which improves risk-sharing and therefore lowers their cost of capital.

The main purpose of voluntary disclosure of non-financial information appears to be a reduction in information asymmetry (Lang and Lundholm, 2000). Another benefit appears to be a lower cost of capital for firms (Welker, 1995). Previous studies show that the main incentive for a company to make voluntary disclosure is its competitive advantage. Grossman (1981) and Milgrom (1981) argue that there is no equilibrium when no manager would be interested in voluntary disclosure. Similarly, Verrecchia (1983) and Dye (1985) include in their models constraints that may prevent a company from making full disclosure, for example, when the information is costly, has a negative impact on the future firm value, or when the stakeholder is uncertain whether the firm possesses a given piece of information as shown by Shin (2003). These studies provide empirical support for disclosure theory, which argues that firms with better performance have more incentives to disclose in order to differentiate themselves from poorer performers. In the same vein, Clarkson et al. (2008)

predict that good environmental performers will provide more environmental information to the market in the form of voluntary environmental reports. They find a positive relationship between the level of environmental performance and the level of discretionary disclosure, and find that environmental disclosure is more driven by economic than by socio-political reasons

Cho and Patten (2007) construct four groups of 25 firms matched on 2002 revenue levels and composed of firms with good environmental performance and those with very poor environmental performance, in the objective of identifying significant differences in their policies on environmental disclosure. The results show that the use of monetary components makes all the difference: monetary information, especially about possible litigation, is less present among companies with the worst environmental performance. In general, the results provide further support for the argument that companies use voluntary disclosure of environmental information as a legitimizing tool.

In contrast to Shin (2003), firms do not always pursue the partial disclosure strategy. Indeed, Lyon and Maxwel (2011) show that greenwashing behavior changes when a firm's strategy changes. For instance, an increase in activists' pressure leads to a reduction in greenwashing and an increase in the expected penalty for selective disclosure makes the manager more willing to fully disclose. Recently, Marquis et al. (2016) show that under an increased pressure to disclose a positive environmental image, firms selectively disclose positive information about a company's environmental or social performance while masking their true performance. However, Delmas and Blass (2010) evaluate the performance of 15 firms in the chemical sector, and their results show that firms having the most advanced reporting and environmental management practices tend to have higher levels of toxic releases and lower environmental compliance. El Ghoul et al. (2011) examine capital market participants' perceptions of CSR. They find that firms with better CSR scores exhibit cheaper equity financing. However, 'sin' industries, namely tobacco and nuclear

power, increase firms' cost of equity. These results suggest that firms with socially responsible practices have higher valuation and lower risk.

Also, using 51 Australian firms from the mining or manufacturing sectors, Clarkson et al. (2011) find that firms with a higher pollution propensity make more environmental disclosures. Plumlee et al. (2015) investigate the association between voluntary environmental disclosure quality and both firm value and cost of capital. Using a self-constructed disclosure index based on the GRI's disclosure framework over the period 2000–2005, they find that disclosure quality is positively associated with firm value. With regard to the cost of capital, they find that the relation between disclosure quality and the cost of capital depends on the type and nature of such disclosure. In contrast, Clarkson et al. (2013) examine whether environmental disclosure provides informative information. They show that voluntary environmental disclosures have an incremental informative power for firm valuation. However, there is no incremental explanatory power of such disclosures for the cost of capital even after they control for disclosures disaggregated by categories. The mixed evidence is due to the sample selection and methodology.

In an international setting covering 31 countries, Dhaliwal et al. (2011) highlight the roles of stakeholder orientation and financial transparency in the association between corporate social responsibility disclosure and the cost of equity capital. They find that in countries that are more stakeholder-oriented or in firms with higher levels of financial opaqueness, environmental disclosure is negatively associated with the cost of equity capital. In addition, they show that financial and CSR disclosures act as substitutes for each other in reducing the cost of equity capital.

From the discussion above, I will extend the literature on disclosure by examining the association between greenwashing as a form of selective disclosure and cost of equity capital.

2.4. Measures of Cost of Equity Capital

Previous literature suggests several measures of cost of capital. However, there is still debate on the best commonly used proxy. I describe below the 11 measures identified by Botosan et al. (2011) in addition to the CAPM model.

2.4.1. CAPM

The CAPM model, originally introduced by Lintner (1965) and Sharpe (1964), estimates the cost of equity (r) and is based on the following equation:

$$r = r_f + \beta\left(E_t[r_m - r_f]\right),$$

where r_f is the risk-free rate, r_m the market return, and β_i the systematic risk of company i. The CAPM model determines the cost of a company's equity as the sum of the risk-free rate and the market risk premium (r_m - r_f) multiplied by the systematic risk of the company (β_i).

According to this modeling, the CAPM model does not estimate the cost of equity based on firm-specific characteristics, but rather gives a discounted estimate of the current value of the cost of equity caused by co-movements of the stock price with prices on the market. Indeed, the determination of the cost of equity (r) is based primarily on the systematic risk calculation β_i, which expresses the response of the security's returns to changes in market returns.

β_i is determined by regressing the past returns of the security based on market returns. The quality of β_i estimates, as a measure of risk, strongly depends on the assumption that all market information is absorbed by the price of the security.

The CAPM model is the subject of several criticisms that have their origins in its conditions of application. For example, Fama and French (2004) state that the CAMP model is based on simplified and unrealistic assumptions. One hypothesis, for example, is that investors must have consistent expectations of their utility function and that their investment funds are expected to

borrow or lend at a fixed interest rate. Sharp (1964) states that this assumption is too restrictive and unrealistic.

On the other hand, Arnold (2008) argues that the CAPM model has other theoretical limitations, such as the fact that the CAPM model is a simple one-period model and that investments are made over several periods. However, Dempsey (2013) states that the most problematic point with the CAPM model is not the theoretical underpinning of the model, but rather its practical aspect. For example, as discussed earlier, the estimate of the cost of equity is based on the determination of the systematic risk obtained as the simple linear regression coefficient relating the returns of the security to market returns.

In this context, a practical problem arises concerning the frequency of observation of yields, should daily, weekly or monthly data be used which systematically give different results as to the value of the risk. In addition, market returns, used in the regression to estimate β, include only the values of the securities traded on the market while other assets must be included as durable goods or real estate.

In addition, the CAPM model is a forward-looking model that is predictive based on expected returns, whereas in reality it is estimated on the basis of historical values since future values of returns are not available (Arnold, 2008). In the same vein, Watson and Head (2010) show that if the risk β is estimated on the basis of historical data, the efficiency of the CAPM model will depend on the stability of β over time. If the systematic risk changes dramatically over time, then it cannot be considered as an estimate of the forecast risk.

2.4.2. Target price method: r_{DIV}

The target price method is proposed by Botosan and Plumlee (2002). It is based on the relationship between the current price of the security and the forecasts of dividend values made by financial

analysts over a short period of time. Technically, this method allows an estimate of the cost of equity value to be calculated using the current price of the financial asset (P_0) as the data and the analysts' forecasts of dividend values over a 5-year period (E (Dt)) while including a (forecast) target price at the end of the eighth year (E (P5)). The formula is as follows:

$$P_0 = \sum_{t=1}^{5} (1 + r_{DIV})^{-t} E(D_t) + (1 + r_{DIV})^{-5} E(P_5)$$

2.4.3. Price-earnings-growth ratio: PEG:r_{PEG}

Easton (2004) proposes an alternative approach to estimating the cost of equity based on the dividend valuation model. He assumes that the market predicts no growth of abnormal earnings during the forecast period. Moreover, he adds the assumption that the expected value of dividends for period t+1 is also zero. These assumptions then enable Easton (2004) to arrive at a more simplified form of the dividend valuation model, which is used to estimate the cost of equity as follows:

$$r_{PEG} = \sqrt{(E(eps_5) - E(eps_4))/P_0},$$

where E(eps_t) represents the expected value of earnings per share for period t. Easton (2004) presents another version of this ratio, using expected earnings per share values for one- and two-year forecast horizons (E (eps_1) and (E (eps_2)).

Botosan et al. (2011) suggest that it will be better to use longer forecast horizons.

2.4.4. Modified Price-earnings-growth ratio r_{MPEG}

Easton (2004) proposes an alternative approach to estimating the cost of equity based on the dividend valuation model. He assumes that the market predicts no growth of abnormal earnings during the forecast period. Moreover, he adds the assumption that the expected value of dividends

for period t+1 is also zero. These assumptions then enable Easton (2004) to arrive at a more simplified form of the dividend valuation model, which is used to estimate the cost of equity as follows:

$$r_{MPEG} = A\sqrt{A^2 + (E(eps_2) - E(eps_1))/P_0} \quad \text{whether} \quad A = E(dps_1)/2P_0,$$

where E (dps1) represents the expected value of dividend per share. It should be noted that this model is based on earnings per share forecasts for periods t+1 and t+2.

2.4.5. **Ohlson and Juettner-Nauroth (2005)** Model r_{OJN}

Ohlson and Juettner-Nauroth (2005) propose another model for assessing the level of the cost of equity. The proposed measure is based on the accounting-based valuation model, while imposing a series of assumptions that focus primarily on the value of profits expected by the market in the short term, on the value of abnormal profits, and on the short-term and long-term growth rates of abnormal profits. The resulting model is written as follows:

$$r_{OJN} = A + \sqrt{A^2 + (E(eps_1)/P_0) * \left\{\left[\frac{E(eps_3)-E(eps_2)}{E(eps_2)} + \frac{E(eps_5)-E(eps_4)}{E(eps_4)}\right]/2 - (\gamma - 1)\right\}},$$

where A = ((γ-1) + E (dps_1) / P_0) / 2 and γ is the growth rate of abnormal profits. In practical terms γ is equal to the risk-free rate of less than 3%, where 3% represents the growth rate of the economy.

2.4.6. **Gode and Mohanram (2003) model** r_{GM}

Gode and Mohanram (2003) use the same principle as Ohlson and Juettner-Nauroth (2005) to determine a measure of the cost of equity. Indeed, the only difference lies in the fact that they only incorporate the expected benefits in the short term. The model is as follows:

$$r_{GM} = A + \sqrt{A^2 + (E(eps_1)/P_0) * \left\{\left[\frac{E(eps_2) - E(eps_1)}{E(eps_1)}\right] - (\gamma - 1)\right\}}$$

2.4.7. Gordon and Gordon (1997) Model

Gordon and Gordon (1997) develop a measure based on the accounting valuation model by imposing a restriction that the market, after the forecast horizon, expects the ROE ratio of each firm to return to its expected average value. The equation used to derive the cost of equity value is as follows:

$$P_0 = \sum_{t=1}^{4}(1 + r_{GOR})^{-t}E(dps_t) + ((r_{GOR}(1 + r_{GOR})^4)^{-1}E(eps_5)$$

2.4.8. Claus and Thomas Model

Claus and Thomas (2001) use the residual income model of Ohlson (1995) to provide an estimate of the cost of equity. To construct their model, Claus and Thomas (2001) assume that after the forecast horizon, abnormal profits will grow at a constant rate equal to inflation rates for empirical reasons. Their model is as follows:

$$P_0 = BV_0 + \sum_{t=1}^{5}(1 + r_{CT})^{-t}((E(ROE_t) - r_{CT})E(BV_{t-1})) + (1 + r_{CT})^{-5}(r_{CT} - g)^{-1}E(ROE_5) - r_{CT})\,E(BV_4)(1 + g))$$

2.4.9. Gebhardt, Lee and Swaminathan (2001) Model

The Gebhardt et al. (2001) model is also based on Ohlson's residual income model (1995). It is similar to that of Claus and Thomas (2001); however, it is different in terms of implementation. Specifically, they use a 12-year forecast horizon. The model is as follows:

$$P_0 = BV_0 + \sum_{t=1}^{11}(1 + r_{GLS})^{-t}((E(ROE_t) - r_{GLS})E(BV_{t-1})) + (1 + r_{GLS})^{-11}E(ROE_{11}) - r_{GLS})\,E(BV_{11}))$$

2.4.10. Fama and French four factors (1998) Model

On the basis of the hypothesis that the four factors identified by Fama and French (1998) give a complete picture of the risk factors, Barth et al (2008) and Kothari et al. (2009) develop an estimate of the expected return as follows:

$$r_{FF} = r_f + \beta_1(RM - r_f) + \beta_2 SMB_t + \beta_3 HLM_t + \beta_4 MOM_t,$$

where $(RM - r_f)$, SMB, HLM, and MOM represent the market risk, the size, the book-to-market ratio and the momentum price, respectively.

2.4.11. Implied cost of capital Hail and Leuz (2006)

Hail and Leuz (2006) propose a measure obtained as the average value of the measures r_{CT}, r_{GLS}, r_{MPEG} and r_{OJN}.

$$r_{HL} = \left(\frac{r_{CT} + r_{GLD} + r_{MPEG} + r_{OJN}}{4}\right)$$

2.4.12. Mean-adjusted implied cost of capital r_{DKL}

Dhaliwal et al. (2006) propose another measure of the cost of equity as an adjusted average of measures r_{CT}, r_{GLS} and r_{GM}. The adjustment is made by winsorizing these values to the maximum value of 0.5.

2.5. Determinant of Cost of equity capital

The cost of equity can be influenced by a number of factors, which can work at the firm level as well as at a more global level. In general, the more these variables amplify the perceived uncertainty of future returns, the more shareholders will have high profitability requirements and the higher the cost of equity of the company is.

Size: There is less uncertainty about the future performance of the company. Therefore, there is an inverse relationship between the size of the firm and the cost of equity capital.

Leverage: Given that the payments to creditors take precedence, increasing debt (or financial leverage) and fixed interest charges will make shareholders' gains more sensitive to changes in earnings (more uncertain). Therefore, more leverage will be associated with higher cost of equity.

Corporate tax: Corporate income taxes have an indirect effect on the cost of equity in that it reduces the impact of leverage. Since payment interests on debt are deductibles, corporate income taxes lower the effective cost of borrowed capital. Therefore, where corporations are subject to income tax, indebtedness provides a risk-free tax benefit, so the overall risk to the business is lower, with equal leverage. It would be expected, therefore, that there is an inverse relationship between tax and the cost of equity.

Liquidity: Investors charge additional income to cover the costs associated with buying and selling securities. However, these transaction costs are generally lower for securities that are more frequently traded or liquid. The return required from companies whose stocks have greater liquidity should therefore be lower, just like the cost of their equity.

Forecast dispersion: Investors' uncertainty about future returns could increase if the dispersion of analysts' forecasts of corporate profits increases and their accuracy decreases. As a result, there are reasons to believe that the more dissimilar the forecasts, the higher the cost of equity will be.

In addition to these firm-specific characteristics, some other general factors can also influence the cost of equity.

Industry characteristic: Some determinants of the cost of capital are common to companies in the same sector. For example, a high proportion of fixed costs characterizes the mining industry.

Operating leverage is higher; the benefits are much more sensitive to a change in income, which increases the uncertainty of shareholder returns of companies and the cost of capital in this sector.

Economic Conditions: previous studies show that the expected returns generally exhibit counter-cyclical behavior. They are relatively low in times of strong economic conditions and relatively high when the situation is bad.

3. DEVELOPMENT OF THE HYPOTHESES

Easley and O'Hara (2004) suggest a multi-asset rational expectations model to investigate the economic consequences of information on the cost of capital. They propose a scenario where some investors receive both public and private information (informed investors), but others receive only public information (uninformed investors). Easley and O'Hara (2004) show that the cost of capital (1) increases in the fraction of private information in the information set (that is, information asymmetry among investors or α_k in Easley and O'Hara notation), because an increase in the fraction of private information decreases the weighted average precision and (2) decreases in the quantity (I_k in Easley and O'Hara notation) and quality (γ_k) of both public and private information, because increases in the quantity and quality of either public or private information increase the weighted average precision. The weight of evidence from many studies examining the determinants and economic consequence of greenwashing is that if a company is exposed as using greenwashing, investors would adhere more firmly to their initial impression that the company is environmentally unfriendly, and that it makes dishonest green claims. As a result, investors negatively value the company. To the extent that these findings are true for a large cross-section of firms, I expect, based on Easley and O'Hara (2004), that the cost of capital is higher for firms engaging in greenwashing on average for the full sample. I formally state my first hypothesis as follows:

H1: Greenwashing is positively associated with the cost of capital, ceteris paribus.

3.1. Social Media Pressure

By bringing investors' attention to incidents of greenwashing, social media, activists and NGOs work towards holding companies engaging in greenwashing accountable. For instance, Greenpeace's "stop greenwash" site includes articles about greenwashing firms and Source Watch's site provides a list of firms engaging in greenwashing. Furthermore, activist- and NGO-led campaigns against greenwashing firms can have a much wider reach than informational websites.

Finally, the Coastal Alliance for Aquaculture Reform of Vancouver, British Columbia, used a campaign strategy successfully to reduce ocean pollution from salmon farms that used floating nets.

Activists and the media issue threats to publicly expose greenwashing, which likely deters some firms from positively communicating their environmental performance. As consumers, the public, and investors become more interested in environmental issues, environmental activist groups become more powerful and can exert more influence and pressure on companies. Members of the media are also more likely to report on issues of greenwashing as these stories become more likely to capture readers' interest.

The increased interest in environmental issues has thus strengthened the role that activist groups and the media can play in punishing firms for greenwashing or in deterring firms from greenwashing in the first place. However, given the limited formal regulation and enforcement of greenwashing, NGOs and the media can only bring about reputational damage to greenwashing firms. The threat of exposure would have much more of a deterrent impact on greenwashing if there were legal ramifications for being "caught" and exposed. This would require more stringent and enforceable formal regulation of greenwashing. In addition, previous empirical work in this area suggests that social media diminish the incidence of corporate greenwashing (Bowen, 2014; Lee et al., 2013; Lyon and Montgomery, 2013). Putting these arguments together leads me to the following hypothesis.

H2: The association between greenwashing and cost of capital is less pronounced for firms that are more publicly visible.

3.2. Pressure from market external factors

In addition to social media pressure, investor demand and competition are an important source of pressure for firms choosing to engage in greenwashing. Firms may face pressure from investors to appear to be environmentally friendly and thus may choose to selectively communicate their

environmental performance in the capital market. Consequently, the higher the pressure for environmentally responsible firms from investors, the more likely firms are to engage in greenwashing.

Competition in the product market has an impact on firms' decision on whether to communicate positively its environmental performance and product market competition is an important determinant of corporate decisions. Firms are more likely to communicate their commitments to green practices to avoid being perceived as falling behind their competitors. For instance, companies adopted a more progressive policy on climate change after an internal report was compiled demonstrating that the company lagged its competitors in publicly committing to help mitigate global warming. Li (2010) investigates how companies' voluntary disclosures are affected by the product market competition. The results suggest that competition improves the disclosure quality by correcting potential biases in disclosures, such as over-reporting of profits. Thus, as the overall industry pressure to communicate green practices gets higher, firms are more likely to selectively communicate its environmental practices.

Following the preceding discussions, I present my third hypothesis formally as follows.

H3: The positive association between *g*reenwashing and cost of capital is stronger for firms that are more subject to pressure from external market forces, ceteris paribus.

3.3. CEO Optimism Bias

Optimistic bias is the "*the tendency for individuals to over-estimate the likelihood of positive events and under-estimate the likelihood of negative events*", and it can increase the likelihood of firms engaging in greenwashing (Delmas and Burbano, 2011). Optimistic bias takes place as managers' forecasts of future cash flow are leaned more towards success rather than failure. Managers tend to overvalue the benefits of greenwashing, such as the market perception of being environmentally friendly and access to green financing, and undervalue the cost resulting from greenwashing such

as litigation risks, negative media coverage or activists' campaigns. CEO optimism bias increases the likelihood that a firm engages in greenwashing. This line of reasoning leads me to my fourth hypothesis.

H4: The positive association between *g*reenwashing and cost of capital is stronger for firms with optimistic CEOs, ceteris paribus.

The basic structure can be represented by a conceptual model, where the relations are represented by path arrows:

Figure 1: Conceptual model: The impact of greenwashing on cost of equity capital

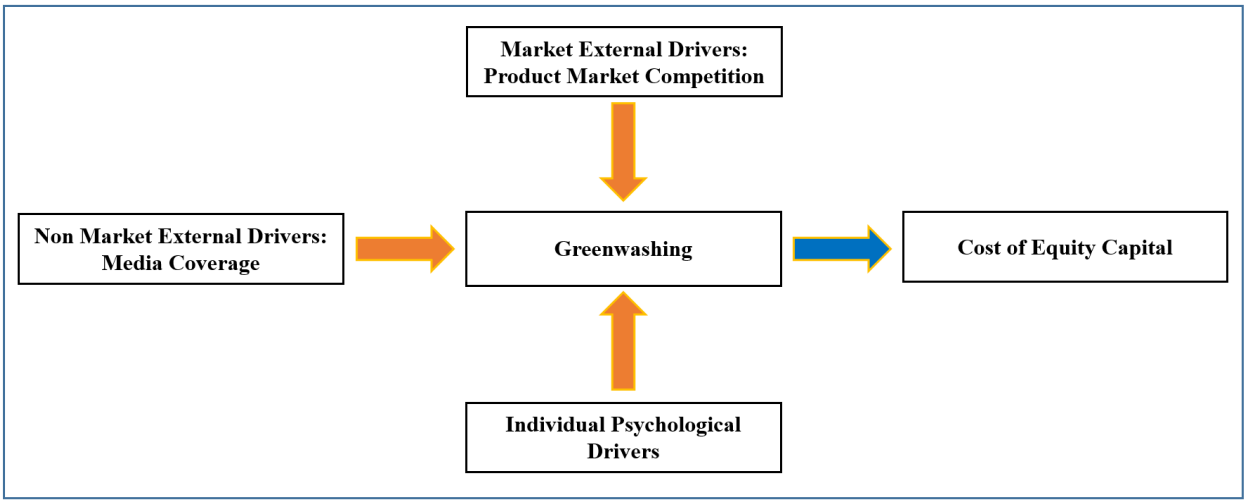

Figure 1 represents the drivers of greenwashing as reported by Delmas and Burbano (2011). They offer a theoretical framework that examines the external, organizational and individual drivers of greenwashing. External drivers of greenwashing include pressures from both market actors, such as consumers, investors, and competitors, and nonmarket actors, such as regulators, NGOs and the media. The individual psychological driver documents that optimistic bias, narrow decision-framing and hyperbolic intertemporal discounting become more prominent and have a greater impact on individual decision-making under conditions of uncertainty and limited or imperfect information. Thus, it would be interesting to investigate how these drivers affect greenwashing and therefore how the market values this behavior.

4. RESEARCH DESIGN

4.1 Sample Construction

To examine the relation between greenwashing and the level of cost of equity, I begin by merging four databases: Compustat North America, which provides financial data; Thomson Institutional Brokers Earnings Services (I/B/E/S), which provides analyst forecast data; Trucost (created and maintained by Trucost Plc., an organization established in 2000), which provides environmental impacts of company operations, supply chains, and investment portfolios, and CRSP monthly return files, which provide information on stock returns. A key research design issue in this thesis is to develop a reliable proxy for greenwashing. Greenwashing (GW) will be measured by the selective disclosure magnitude, which represents the extent to which companies risk creating a misleading impression of transparency and accountability by disclosing relatively benign environmental metrics rather than those more representative of their overall environmental harm. This is a form of greenwashing because it involves a company conveying accurate but selective environmental information that creates a misleading impression of its overall environmental performance (Lyon and Maxwell 2011; Bowen 2014). I follow Gebhardt et al. (2001) and Dhaliwal et al. (2006) and compute the cost of equity in June of each year. To do so, I extract from the I/B/E/S summary file forecast data recorded in June for all firms that have positive 1- and 2-year-ahead consensus earnings forecasts and a positive long-term growth forecast. For further specification, I require that Compustat reports a positive book value per share, that I/B/E/S provides a share price as of June, and that the firm belongs to one of the Fama and French (1997) 48 industries. I then follow Hail and Leuz (2006) and Dhaliwal et al. (2006) and estimate the cost of equity capital using four models. These models are discussed below and summarized in Appendix A.

[Insert Table 1 here]

4.2 Regression variables

4.2.1 Independent Variable

Greenwashing is a form of selective disclosure measured by the difference between two ratios, that is, the absolute disclosure ratio (Symbolic transparency) and weighted disclosure ratio (substantive transparency). The absolute disclosure ratio measures the proportion of relevant environmental indicators which a company publicly discloses in a given year (how many did a company disclose?). The denominator of this ratio is the number of environmental indicators relevant to a particular company. These indicators include consumption of natural resources (such as natural gas, oil and water) and emissions of various pollutants to land, air, and water. Using annual reports, corporate social responsibility reports, and websites, Trucost defines that the number of these indicators publicly disclosed by the company constitutes the numerator. The weighted disclosure ratio includes the extent of environmental impact or harm associated with each environmental indicator. In other words, this ratio will emphasize how much of the most important information was disclosed. For example, for every dollar of economic output, Trucost estimates the natural resources consumed and the emission released for each environmental indicator on the basis of transfer registries and several pollution releases.

The extent of greenwashing approaches its maximum value of 1 when a company discloses few of its more harmful indicators and many of its less harmful indicators. This type of companies engage in environmental misleading action and provide an impression of transparency, but in the real world they hide quite a lot. However, when a company discloses only the few relevant indicators that really matter in terms of its environmental damage, it will have a selective disclosure magnitude tending toward the minimum value of .1.

For example, suppose that a company has only two relevant environmental indicators: greenhouse gas emissions and mined materials. Further suppose that the company that year publicly discloses its tons of greenhouse gas emissions but does not disclose anything related to mined materials.

1) *Absolute disclosure ratio*: The company has two relevant environmental indicators; thus the denominator of *absolute disclosure ratio* would be 2. The numerator would be 1 because it disclosed one of those two indicators. Thus, *absolute disclosure ratio* for that company-year would be ½=0.5, indicating that the company disclosed 50 percent of its relevant environmental indicators.

2) *Weighted disclosure ratio*: Suppose Trucost estimated the total environmental damage cost for that company to be around $1 million, the sum of $600,000 from releases of mined materials and $400,000 from greenhouse gas emissions. The weighted disclosure ratio would be 0.4 (calculated as $400,000 ÷ $1,000,000), indicating that its disclosures accounted for 40 percent of its environmental damage cost that year. If the company disclosed its mined materials but not its greenhouse gas release, its absolute disclosure ratio would still be 0.5 (one of the two indicators disclosed) but its weighted disclosure ratio would be 0.6.

3) *Selective disclosure magnitude*: This equals the difference between *absolute disclosure ratio* and *weighted disclosure ratio.* If the company disclosed its greenhouse gas emissions but not its mined materials, *selective disclosure magnitude* would equal 0.1, computed as 0.5 minus 0.4. If the company disclosed its mined materials but not its greenhouse gas emissions, *selective disclosure magnitude* would equal -0.1, calculated as 0.5 minus 0.7. The negative number indicates that the company engages less in selective disclosure; that is, the company disclosed the more important one rather than the less important one while hiding another indicator.

Dependent Variable

I will use four models: two implementations of the Ohlson (1995) residual income valuation model, the abnormal earnings growth model of Ohlson and Juettner-Nauroth (2005), and the PEG model as implemented by Easton (2004). Each measure identifies the internal rate of return that equates expected future earnings and the current stock price using a different expectation model. I also use

an aggregate measure, which takes the averages of these four individual measures according to Hail and Leuz (2006).

Claus and Thomas (2001) and Gebhardt et al. (2001) derive the implied cost of equity capital from the residual income valuation model. This measure is a function of several exogenous variables such as the industry characteristics, the book to market ratio, the expected long-term interest rate, and analyst forecast dispersion of the firm's future cash flow. Most of these measures are stable over the long term and can be valued ex ante, so they can provide a good estimate of the perceived business risk for investors. Claus and Thomas (2001), Gebhardt, Lee, Swaminathan (2001) and Easton, Taylor, Shroff and Sougiannis (2002) use a model of corporate valuation to generate a market implied cost of equity capital for a particular firm and they do not rely on historically realized returns.

In Ohlson and Juettner-Nauroth model, the implied cost of equity capital is based on abnormal earnings growth. The model is a generalization of the Gordon constant growth model with two growth rates (the 5-year EPS growth rate and 1+terminal growth rate). As an extension of Ohlson and Juettner-Nauroth model, Easton (2004) generates the Price Earnings Growth (PEG) model. The author estimates the implied cost of equity premium from the abnormal earnings growth model using only current prices, expected dividends (div_{t+1}), and earnings estimates. Appendix A provides details on the implementation of the four models.

In this thesis, I use the average value of the measures r_{CT}, r_{GLS}, r_{MPEG} and r_{OJN} following Hail and Leuz (2006).

$$r_{HL} = \left(\frac{r_{CT} + r_{GLD} + r_{MPEG} + r_{OJN}}{4}\right)$$

4.2.2 Control Variables

Previous studies show that the implied cost of capital is correlated with a bunch of variables that might affect the cost of equity capital (such as Gebhardt et al. 2001; Gode and Mohanram 2003; Easton 2004; Botosan and Plumlee 2005; Dhaliwal et al. 2005; Botosan et al. 2004; Easton and Monahan 2005; Hail and Leuz 2006). These controls include: beta (BETA), by regressing 60 monthly excess stock returns ending in June of year t on the corresponding monthly CRSP value-weighted index excess returns; leverage (Lev), estimated as the ratio of total debt to the market value of equity; size (Size) computed as the natural logarithm of market value; book-to-market ratio (BTM); and return on assets (ROA), measured as income before extraordinary items in year t scaled by total assets at the end of year t–1.

I use the number of analysts following a firm and forecast dispersion (FD), measured as the standard deviation of analysts' 1-year-ahead earnings per share (EPS) forecasts, as proxies for the information environment and long term growth (LTG), respectively, hypothesizing that the association between risk premium and greenwashing is lower for firms with more analysts following. This association is also positive for growth companies because they face more uncertainty and hence are risky.

I perform regression analyses to test the association between the level of greenwashing and cost of equity capital. The model used in our regression analyses is as follows:

$$COC_{it} = \alpha_0 + Greenwash_{it}\alpha_1 + Beta_{it}\alpha_3 + Leverage_{it}\alpha_4 + LTG_{it}\alpha_5 + BTM_{it}\alpha_6 + ROA_{it}\alpha_7 + Size_{it}\alpha_8 + FD_{it}\alpha_9 + \sum_j \alpha_j \times Industry\ fixed\ effects_j + \sum_l \alpha_l \times Year\ fixed\ effects_l + \varepsilon_{it}$$

I conduct pooled multivariate regression tests and control for heteroscedasticity and within company serial correlation using Roger's standard errors, clustered by company (Petersen 2009). I expect the coefficient on Greenwashing to be positive if companies engaging in selective disclosure suffer higher cost of equity.

Table 2 reports descriptive statistics for the dependent variable and the other explanatory variables and table 3 summarizes the sample composition by Fama and French (1997) 48 industry groups (Panel B) and by year (Panel A). The banking, business services, retails, and utilities industries dominate the sample, with each accounting for more than 5% of the observations. Sample companies are large and profitable with strong growth potential; their mean (median) market capitalization is 1.98 (7.07) and the mean (median) of ROA is 0.062 (0.055). The mean (median) greenwashing is close to -0.1 (-0.01). The mean (median) BTM is 0.45 (0.38), and LTG is between 12 and 13%. Sample companies have a BETA equal to 1 and a mean (median) LEVERAGE of 0.23 (0.21).

[Insert Table 2 here]

[Insert Table 3 here]

Table 4 provides the pair-wise correlations between the cost of equity estimates and the regression variables. I find that greenwashing is associated with a higher equity risk premium, consistent with the notion that low selective disclosure companies enjoy a lower cost of equity. Additionally, all of the explanatory variables show the expected relations with the dependent variable, r_{AVG}. Finally, I do not find high correlations between the explanatory variables, which suggest that multicollinearity is not a serious problem in my regressions.

[Insert Table 4 here]

5. EMPIRICAL RESULTS

As discussed in the introduction, the purpose of my thesis is to address empirically the relation between firms' greenwashing and their cost of equity capital. I proceed as follows. In Section 5.1, I implement univariate tests that compare the cost of capital of firms with higher level of greenwashing against the cost of capital of firms with lower level of greenwashing. Next, in Section 5.2 I perform a pooled multivariate regression analysis where I regress firms' cost of equity on greenwashing and control variables. In Section 5.3, I pesent results of the cross-sectional analysis.

5.1. Univariate analysis

I employ the t-test to compare the mean (Table 5) cost of equity premiums (rAVG) of firms with low and high greenwashing based on the median greenwashing value. Medians are used because they are less likely influenced by extreme observations. The mean of equity financing for firms with a high greenwashing score is 0.096, and 0.098 for firms with a low greenwashing score. These differences in the mean are statistically significant at the 1% level. In addition, I find similar evidence when I examine differences in means using the four individual estimates of cost of capital except K_{OJN}.

[Insert Table 5 here]

5.2. Multivariate regression analysis

To investigate the association between cost of capital and greenwashing as a form of selective disclosure, I regress the cost of equity premium r_{avg} and various individual cost of equity estimates on greenwashing and control variables using multivariate regressions with robust standard errors clustered at the firm level. Table 6 provides my main empirical results. In model 1, I document a strong evidence of greenwashing effect on the cost of equity without including any control

variables. After controlling for year and industry fixed effects, I notice that the coefficient on greenwashing is positive and statistically significant at the 1% level, suggesting that firms selectively disclosing environmental information exhibit significantly higher cost of equity capital. This positive and significant relation remains when I further include in Model 2 the additional firm-specific controls discussed above (BETA, SIZE, BTM, LEV, ROA, LTG, and DISP). In addition, this positive relation remains when I include the different individual estimates of cost of equity capital. Economically, the estimated coefficient in Model 2 Table 6 implies that a one-standard deviation increase in Greenwashing leads firms' equity premium to increase, on average, by 10 basis points. This result confirms Du's (2015) findings that greenwashing is significantly negatively associated with cumulative abnormal returns and that the market negatively values greenwashing.

[Insert Table 6 here]

Next, in table 7, I investigate whether the time affects the documented relation between greenwashing and the cost of capital. Accordingly, I partition the full sample period into three sub-periods: 2005–2008 (Model 3), 2009–2012 (Model 4) and 2013–2015 (Model 5). In Models 1, 2 and 3, I find evidence that the coefficient on greenwashing is positive and statistically significant. These sub-period results show that in recent years there is an increase in investors' attention and awareness about reputation losses.

Furthermore, previous studies show that companies in environmental dirty industries, such as oil and gas, transportation, and chemicals, face severe risks of being classified as greenwashers (Reid and Toffel, 2009; Lyon and Montgomery, 2013). Accordingly, in Table 7 I examine the impact of operating in three dirty industries, namely transportation, oil and gas, and nuclear power. I construct a dichotomous variable for each industry, which I separately include in Models 4 to 7. In Model 1, I include the dummy variable Gw_dirty to detect firms implicated in any of the three

industries. The results indicate a positive and significant relation between gw_dirty and cost of capital at the 1% level, suggesting that, consistent with Lyon and Montgomery, firms implicated in ‘‘dirty’’ industries are more likely to engage in greenwashing. In Models 5 to 7, I further find that the coefficients on all dummy variables are positive, although the statistical significance varies across the different industries. These results suggest that these industries are perceived as affecting a firm’s risk profile. Overall, two main results appear from the analyses in Tables 6 and 7. First, greenwashing is priced and is related with higher cost of equity. Second, firms in environmentally sensitive industries are more likely to engage in greenwashing and exhibit significantly higher cost of equity.

[Insert Table 7 here]

Finally, Table 8 reports the results of the models that split the impacts of greenwashing as a form of selective disclosure. I find a positive and significant coefficient on weighted disclosure ratio. In contrast, the absolute disclosure ratio exhibits little or no significant impact on firms’ cost of equity.

Model 1 indicates that higher cost of equity is related with a large increase in weighted disclosure ratio (substantive disclosure) than in symbolic disclosure (absolute disclosure ratio). After replacing the dependent variable r_{AVG} with the individual risk premiums k_{gls} k_{ct} k_{ojn} and k_{mpeg}, In model 1, table 8, I replicate my baseline model. I show that the estimated coefficient on weighted disclosure is positive and statistically significant. In contrast, except k_{ct}, the coefficient on absolute disclosure is positive and statistically insignificant. This indicates that the positive association between selective disclosure and cost of equity might be driven by the weighted disclosure ratio, and that the market values the most important information disclosed and does not take into account the cheap talk (symbolic disclosure).

[Insert Table 8 here]

5.3. Cross-sectional analysis

5.3.1 Social media pressure and greenwashing

To examine the role of media in the association between greenwashing and cost of capital, I include in my main model an interaction term between media coverage and greenwashing (Table 9). I find a positive and significant coefficient on greenwashing and media. In contrast, the coefficient on the interaction term is negative and statistically significant. My result confirms Lyon and Montgomery's (2013) findings that social media reduces the incidence of corporate greenwashing because these firms face severe risks if they disclose only positive environmental information to the media; they must anticipate the risk of attack for greenwashing. This suggests that the media might play a moderator and a monitoring role between greenwashing and cost of capital.

[Insert Table 9 here]

5.3.2 Cost of equity capital and competitive pressure

To understand whether competitive pressure as a market external driver is an incentive for firms to greenwash and to communicate positively their environmental performance while hiding the reality (Delmas and Burbano, 2011), I include in my main regression the Herfindahl-Hirschman (HH) index. I find a negative and significant coefficient on (HH) index. This suggest that product market competition affects the cost of equity capital and firms in more competitive industries enjoy lower cost of equity (Ashbaugh-Skaife et al. 2009; Chen et al., 2009). In addition, the positive association between greenwashing and cost of capital remains. However, the coefficient on the interaction term is negative and statistically significant. These results confirm Li's (2010) findings which suggest that competition improves the disclosure quality by correcting potential biases in disclosures, for example over-reporting of profits. In summary, one might think that in a competitive market, firms are willing to gain market shares from rivals, and this drives managers to greenwash and look good comparing to their rivals. However, shareholders are more informed about managers' intentions

and thus allow them to play a monitoring role and prevent managers from greenwashing because they might face litigation risks.

[Insert Table 10 here]

5.3.3 CEO optimism bias

To investigate whether managers tend to overvalue the benefits of greenwashing, such as the market perception of being environmentally friendly and access to green financing, and undervalue the cost resulting from greenwashing such as litigation risks, I add in my model optimism bias. I find a positive and significant relation between GW*Optimism and cost of capital, suggesting that optimistic bias becomes more noticeable and has a considerable impact on CEO decisions and under-estimation of the risk attached to greenwashing; therefore, the company suffers higher risk premium. Furthermore, the results indicate a positive and significant relation between greenwashing and cost of equity. Taken together, these results confirm that managers' individual characteristics lead the organization towards an unethical direction such as greenwashing (Delmas and Burbano, 2011).

[Insert Table 11 here]

5.4 Robustness checks

In this section, I run a bunch of sensitivity tests to document whether my main result reported in Table 6 (Model 2) that greenwashing increases the cost of equity is solid to other assumptions and model specifications, poor proxies for the market's expectations, and endogeneity, among other sensitivity checks. Overall, the results of these different sensitivity tests reported in Tables 12 to 17 are similar to those of the primary empirical analysis.

5.4.1 Alternative measure of the cost of equity

My primary measures of implied cost of equity are based on accounting valuation models. In table 12, I use alternative measures of the cost of equity to mitigate the fact that these models are driving

my results. I re-estimate my baseline model after replacing r_{AVG} with other cost of equity estimates. In column 1, I follow Gordon and Gordon (1997) to estimate the equity premium based on the finite horizon expected return model. In columns 2 and 3, I include the price-earnings growth ratio using short-term earnings forecasts and the forward earnings-price ratio using long-term forecasts, respectively. The results indicate that the coefficient on greenwashing remains significantly positive at the 1% level. I interpret this result as evidence that the cost of capital is an important channel through which the market prices companies engaging in selective disclosure behavior.

[Insert Table 12 here]

5.4.2 Noise in analyst forecasts

Previous studies have criticized the fact that analyst forecasts are overoptimistic and argue that these forecasts are imperfect proxies for the market's expectations of future earnings, which can result in biased estimates of the cost of capital (Hail and Leuz, 2006; Kothari, 2001). To mitigate this concern, I address this concern in two ways. First, I control for forecast optimism bias, defined as the difference between the one-year-ahead consensus earnings forecast and realized earnings deflated by beginning of period assets per share. Table 13 (model 1) reports the results. I show that the coefficient on greenwashing is positive and significant at the 1% level and the coefficient on forecast optimism bias is also positively related with the cost of equity. Second, I exclude the top 5%, 10%, and 25% of firm-year observations in the forecast optimism bias distribution and the results strongly support my earlier conclusions.

[Insert Table 13 here]

5.4.3 Endogeneity

Greenwashing is endogenous—it is a firm's strategic selective disclosure behavior dependent on the firm's environmental damage extent. In addition, my finding related to the fact that the market values greenwashing may be driven by omitted variables that are correlated with both

greenwashing and the cost of capital. Hence, without correcting for potential endogeneity, my results could be biased. For example, previous studies suggest that financial constraints, analyst following, and corporate governance are correlated with both disclosure and the cost of capital (Brown et al., 2006; Chen et al., 2009; Barnea and Rubin, 2010). Additionally, one might think that the cost of equity in the previous period impacts present greenwashing. Finally, the tragic explosion and oil spill revealed a corporate failure at BP that had consistently ignored environmental standards and worker safety. This crisis caused growing calls for a boycott of its products and a considerable financial issue and reputation losses.

In Table 14, I present the results of alternative tests that take into consideration these potential problems. I begin by including to my main regression (Table 6, Model 2) the logarithm of one plus the number of analysts following the firm. The results indicate that the coefficient on greenwashing remains positive and statistically significant at the 1% level. I then partition the full sample into strong governance/low governance, and constrained/unconstrained firms. Table 14 (models 2-5) suggests that the results still hold. Finally, I re-estimate panel-data regressions reported above employing the instrumental variable approach. I use the industry average greenwashing score and a dichotomous variable for whether the previous year's earnings are negative (model 6). Second, to alleviate the problem of reverse causality, I include the lagged cost of equity to control for any time invariance (model 7). The results indicate that greenwashing is negative and significantly significant at the 1% level. Overall, results in table 14 provide strong evidence that endogeneity concerns are not likely to be driving my main results.

[Insert Table 14 here]

The tragic explosion and oil spill revealed a corporate failure at BP that had consistently ignored environmental standards and worker safety. This crisis caused growing calls for a boycott of its products and a considerable financial issue and reputation losses.

Table 15 exploits an exogenous greenwashing shock created by the BP scandal in 2010 and analyze firms' disclosure responses to this shock. The results show that the interaction between greenwashing shocks and the BP event period is negative and significant. This finding is consistent with the idea that firms respond to transparency concerns and cost of capital shocks with less selective disclosures. Furthermore, the crisis might play an inhibitory role for companies to engage in greenwashing.

This result confirms Leuz and Schrand's (2009) findings that companies respond to the Enron Shocks by increasing disclosure specially if they are most affected by the shock.

[Insert Table 15 here]

5.4.4 Other sensitivity results

In this section, I further implement additional robustness checks. First, I investigate the robustness of my results to alternative methodologies to control for cross-sectional and serial dependence including industry fixed effect, Newey-West, Prais-Winsten, and Fama-MacBeth methodologies. In all these different specifications, greenwashing is positively related to cost of capital.

[Insert Table 16 here]

Second, I check whether my results still hold after excluding firms related to ''dirty'' industries. Corroborating my earlier evidence in Table 6, I find that the coefficient on greenwashing is positively and significantly (at the 1% level) associated with the cost of equity capital. Finally, prior research suggests that firm-level cost of equity is positively associated to industry-level cost of equity (Gebhardt et al., 2001). Thus, I control for the median industry risk premium and find that greenwashing is still positive and significant. Furthermore, In model 3 I checked whether my results hold after removing financial industries and I find a supportive evidence that greenwashing is positively associated with cost of equity, concluding that selective environmental disclosure is negatively priced by the market.

The above supplementary evidence provides additional confidence that my empirical results are capturing the fact that firms selectively disclosing environmental information exhibit higher equity risk premium.

[Insert Table 17 here]

6. SUMMARY AND CONCLUSIONS

This thesis examines the relationship between greenwashing and cost of equity capital. I hypothesize that ceteris paribus, firms engaging in greenwashing and selectively disclosing the positive environmental information without revealing negative messages in order to generate a green image should have higher cost of equity capital because these firms are perceived to be risky. Using a sample of 5,617 US firm-year observations from 2005 to 2017 and after controlling for other firm-specific determinants as well as industry and year fixed effects, I find that greenwashing is positively and significantly associated with cost of equity capital. The empirical results are consistent with my conjecture. Although I control for multiple risk factors in my main regression model and perform additional tests, which aim to control for correlated omitted variables and endogeneity concerns, the results still hold.

My findings contribute to the debate on whether greenwashing is priced by showing that the market can capture greenwashing by reducing the firm's cost of equity capital. First, to the best of my knowledge, this is the first thesis examining the association between cost of capital and the extent of greenwashing. This examination is critical as it sheds light on how the market values greenwashing and furthermore, there is yet little consensus on how to measure and identify greenwashing. Second, limited and imperfect information about firms' environmental performance contributes to greenwashing, and therefore affects the cost of capital. Finally, while prior research highlights the importance of social performance for firm valuation and access to external investment, my research suggests that greenwashing is also important to firms as it has power to explain a firm's cost of equity beyond other risk factors.

The findings in this thesis also have several practical implications. First, greenwashing is beneficial to firms and costly to society but the market may penalize these types of firms.

Second, greenwashing is also a concern to policy makers. There is a need for mandatory environmental regulation and enforcement of law to avoid misleading communications, reduce information uncertainty and improve firms' understanding about the harm of engaging in greenwashing.

While I provide the most comprehensive evidence on the effect of greenwashing on cost of equity capital, several topics are badly needed in future research. For example, this thesis can be extended internationally by using a global sample. Using an international sample across many industries that are headquartered in 45 countries, Marquis et al. (2016) find that environmentally damaging firms are less likely to engage in selective disclosure, particularly those in countries where they are more exposed to scrutiny and global norms. Thus, it would be interesting if one investigates cross-country and cross-culture variations in the relationship between greenwashing and cost of equity.

Appendices

APPENDIX A: MODELS OF COST OF EQUITY CAPITAL

In this appendix, I describe the cost of equity models used in this paper. I start by defining variables and specifying assumptions common to all models. I then successively cover each model and its assumptions.

A.1. Common variables and assumptions

P_t = stock price in June of year *t*,

DPS_0 = actual dividend per share in year *t* - 1,

EPS_0 = actual earnings per share in year *t* - 1,

LTG = long-term growth forecast in June of year *t*,

$FEPS_{t+s}$ = forecasted earnings per share for year t + τ recorded in June of year *t*,

B_t = book value per share at the beginning of year *t*,

r_f = yield on a 10-year Treasury note in June of year *t*.

I require firms to have positive 1-year-ahead ($FEPS_{t+1}$) and 2-year-ahead ($FEPS_{t+2}$) earnings forecasts as well as a long-term growth forecast (*LTG*). However, two models call for the use of earnings forecasts beyond year two. If a forecast is not available in I/B/E/S, we impute it from the previous year's forecast and the long-term growth forecast as $FEPS_{t+s} = FEPS_{t+s}$ (1+ *LTG*)

A.2. Model 1: Claus and Thomas (2001)

This model assumes clean surplus accounting (Ohlson, 1995), allowing share price to be expressed in terms of forecasted residual earnings and book values. The explicit forecast horizon is set to 5 years, beyond which forecasted residual earnings grow at the expected inflation rate, and dividend payout is assumed constant at 50%. The valuation equation is given by:

$$P_t = B_t + \sum_{\tau=1}^{5} \frac{ae_{t+\tau}}{(1+k_{ct})^{\tau}} + \frac{ae_{t+5}(1+g)}{(k_{ct}-g)(1+k_{ct})^{5}} \quad \text{(A.1)}$$

Where:

- $ae_{t+\tau} = FEPS_{t+\tau} - k_{ct}B_{t+\tau-1}$
- $B_{t+\tau} = B_{t+\tau-1} + FEPS_{t+\tau}(1 - DPR_{t+\tau})$
- $DPR_{t+\tau} = 0.5$
- $g = r_f - 0.03$

A.3. Model. 2 : Gebhardt et al. (2001)

This model also assumes clean surplus accounting, allowing share price to be expressed in terms of forecasted returns on equity (ROE) and book values. The explicit forecast horizon is set to 3 years, beyond which forecasted ROE decays to the median industry ROE by the 12th year, and remains constant thereafter. Dividend payout is again assumed to be constant. The valuation equation is given by:

$$P_t = B_t + \sum_{\tau=1}^{11} \frac{FROE_{\tau+t}-k_{GLS}}{(1+k_{GLS})^{\tau}} B_{t+\tau-1} + \frac{FORE_{t+12}-k_{GLS}}{k_{GLS}(1+k_{GLS})^{11}} B_{t+11} \quad \text{(A.2)}$$

Where:

- $FORE_{t+\tau}$ = forecasted return on equity for year $t + \tau$,
- $B_{t+\tau} = B_{t+\tau-1}(1 - DPR_{t+\tau})$, and
- $DPR_{t+\tau}$ = expected dividend payout ratio in year $t + \tau$.

For the first 3 years, $FORE_{t+\tau}$ is set equal to $FEPS_{t+\tau}/B_{t+\tau-1}$. Beyond the third year, *FORE* fades linearly to the industry median *ROE* by the 12th year. Industries are defined according to the Fama and French (1997) classification and the median industry *ROE* is calculated over the past 10 years excluding loss firms.

The expected dividend payout ratio $DPR_{t+\tau}$ is set equal to DPS_0/EPS_0. If EPS_0 is negative, it is replaced by the value implied by a 6% return on assets (the long-run return on assets in the US). I winsorize payout ratios at zero and one.

A.4. Model 3: Ohlson and Juettner-Nauroth (2005)

The model is a generalization of the Gordon constant growth model. It allows share price to be expressed in terms of the 1-year-ahead earnings forecast, the near-term and perpetual growth forecasts. The explicit forecast horizon is set to 1 year, after which forecasted earnings grow at a near-term rate that decays to a perpetual rate. I follow Gode and Mohanram's (2003) implementation of the model. The near-term earnings growth rate is the average of: (i) the percentage difference between 2-year-ahead and 1-year-ahead earnings forecasts, and (ii) the I/B/E/S long-term growth forecast. The perpetual growth rate is the expected inflation rate. Dividend per share is assumed to be constant. The model requires positive 1-year-ahead and 2-year-ahead earnings forecasts.

The valuation equation is given by:

$$K_{oJ} = A + \sqrt{A^2 + \frac{FEPS_{t+1}}{P_t}(g_2 - (\gamma - 1))} \qquad \text{(A.3)}$$

Where:

- $A = \frac{1}{2}((\gamma - 1) + \frac{DPS_{t+1}}{P_t O})$
- $DPS_{t+1} = DPS_0$
- $g_2 = \frac{STG+LTG}{2}$
- $STG = \frac{FEPS_{t+2} - FEPS_{t+1}}{FEPS_{t+1}}$
- $(\gamma - 1) = r_f - 0.03$

A.5. Model 4: Easton (2004)

This model is a generalization of the Price–Earnings–Growth (PEG) model and is based on Ohlson and Juettner-Nauroth (2005). It allows share price to be expressed in terms of 1-yearahead expected dividend per share, plus 1-year-ahead and 2-year-ahead earnings forecasts. The explicit forecast horizon is set to 2 years, after which forecasted abnormal earnings grow in perpetuity at a constant rate. The model requires positive 1-year-ahead and 2-year-ahead earnings forecasts as well as positive change in earnings forecast. The valuation equation is given by:

$$P_t = \frac{FEPS_{t+2} + k_{ES} DPS_{t+1} - FEPS_{t+1}}{k_{ES}^2} \quad \text{(A.4)}$$

Where:

-$DPS_{t+1} = DPS_0$

A.6. Alternative models

I also consider alternative models of the cost of equity. These are used in Table 11.

Gordon finite horizon model

This model assumes that dividends grow over an explicit forecasting horizon set to 4 years, beyond which the firm's return on equity reverts to the expected cost of equity capital. The valuation equation is given by:

$$P_t = \sum_{\tau=1}^{4} \frac{DPS_{t+\tau}}{(1+k_{FHG})^{\tau}} + \frac{NEPS_{t+1}(1+LTG)^4}{k_{FHG}(1+k_{FHG})^4} \quad \text{(A.5)}$$

Where:

- $DPSt+\tau = DPS0\ (1 + LTG)\tau$
- $NEPSt+1 = \frac{FEPS_{t+3}}{(1+LTG)^2}$

Price–Earnings–Growth (PEG) ratio

This is a special case of the Easton (2004) model assuming no dividend payments. There are two versions of the model. One is based on short-term earnings forecasts and the other on long-term earnings forecasts. The valuation equations are given by:

$$P_t = \frac{FEPS_{t+2} - FEPS_{t+1}}{k_{PEG2}^2} \quad \text{(A.6)}$$

$$P_t = \frac{FEPS_{t+5} - FEPS_{t+4}}{k_{PEG5}^2} \quad \text{(A.7)}$$

APPENDIX B: VARIABLE DEFINITIONS

Variable Name	Definition
Greenwash	Equals *absolute disclosure ratio* minus *weighted disclosure ratio*.
absolute disclosure ratio	The *absolute disclosure ratio* is the number of disclosed environmental indicators divided by the number of environmental indicators relevant to the firm's operations
weighted disclosure ratio	The *weighted disclosure ratio* is calculated as the proportion of the firm's *environmental damage cost* for which the company disclosed quantitative global figures
Dependent Variables	
K_{GLS}	Implied cost of equity capital estimated from the Gebhardt, Lee, and Swaminathan (2001) model ten months after the fiscal year-end.
K_{CT}	Implied cost of equity capital estimated from the Claus and Thomas (2001) model ten months after the fiscal year-end.
K_{OJN}	Implied equity premium capital estimated from the Ohlson and Juttner-Nauroth (2005) model ten months after the fiscal year-end.
K_{MPEG}	Implied cost of equity capital estimated from the Easton (2004) model ten months after the fiscal year-end.
R_{AVG}	Average of KGLS, KCT, KOJN and KMPEG.
Control Variables	
BETA	Beta estimated using an international version of the market model with stock returns over the previous twelve months.
LEV	Leverage ratio defined as the ratio of long-term debt to total assets.

DISP	Dispersion of analyst forecasts defined as the coefficient of variation of one-year-ahead analyst forecasts of earnings per share.
BTM	Ratio of the book value to the market value of equity.
LTG	Forecasted long-term earnings growth.
Size	Natural logarithm of Market value

Variables for robustness tests

Kfeyd	Forward Earnings-Price ratio which is defined as $FEPS_{t+1}$ divided by P_t.
Kpeg	Implied cost of equity capital from Price-Earnings-Growth (PEG) model which assumes no dividend payments to estimate the equity premium using short-term earnings forecasts and longer-term forecasts.
Kgg	I estimate the cost of equity from the finite horizon Gordon and Gordon (1997) model estimated in June of each year minus the rate on a 10-year Treasury note
Media	Media is defined as the natural logarithm of one plus the number of news articles for a given firm-year.
HH_index	Herfindahl-Hirschman Index, measured as the sum of squared market shares of all firms in the industry.
CEO optimism	Optimistic CEO is a dummy variable equals to 1 when the CEO holds an average percentage of exercised option moneyness of more than 67%, otherwise zero (Campbell et al. (2011)).
ANA_COV	Analyst coverage measured as the number of analysts providing one-year-ahead earnings forecasts.
FBIAS	Forecast bias equal to actual earnings per share minus forecasted earnings per share

Eindex	The entrenchment index (Eindex), based on six provisions: staggered board, limitation on amending bylaws, limitation on amending the charter, supermajority to approve a merger, golden parachute, poison pill.
Financial constrain	Kaplan and Zingales' (1997) index of financial constraints as implemented by Lamont et al. (2001)
BP	BP is a dummy variable equals to 1 if fiscal year is superior to 2010 otherwise, 0

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TABLE 1
Sample Selection (2005-2015; N = 5,617)

Sample selection procedure	Firm-years
Total number of firm-year observations from **2005–2015** with Trucost Database	9,625
Total number of firm-year observations with Compustat CRSP and IBES databases	45,823
Final sample	**5,617**

TABLE 1: SAMPLE SELECTION

TABLE 2: DESCRIPTIVE STATISTICS

Variable description	Mean	SD	P50	p75	Min	Max
Greenwash	-0.096	0.315	-0.010	-0.010	-0.940	0.960
K_{GLS}	0.090	0.028	0.087	0.104	0.015	0.323
K_{CT}	0.092	0.029	0.089	0.103	0.018	0.610
K_{OJN}	0.103	0.032	0.098	0.114	0.004	0.627
K_{MPEG}	0.108	0.043	0.099	0.122	0.003	0.799
r_{AVG}	0.098	0.028	0.093	0.108	0.031	0.572
Market capitalization	1.98	4.08	7.07	1.77	2.56	6.92
Beta	1.014	0.777	0.949	1.431	-0.922	4.067
Leverage	0.232	0.165	0.219	0.338	0	0.829
BTM	0.457	0.318	0.380	0.597	0.001	2.037
ROA	0.062	0.064	0.055	0.095	-0.281	0.267
Size	22.67	1.22	22.680	23.598	19.553	25.982
Disp	0.047	0.116	0.020	0.040	0	1.271
LTG	12.882	6.972	12	15.140	-6.920	45.460
N. Obs	5,617	5,617	5,617	5,617	5,617	5,617

This table presents descriptive statistics for the regression variables for the 5,617 firm-year sample observations between 2005 and 2015. This table provides the mean, minimum, first quartile, median, third quartile, maximum, and standard deviation of the control variables. rAVG is the average implied cost of equity premium obtained from four models developed by Claus and Thomas (2001), Gebhardt et al. (2001), Ohlson and Juettner-Nauroth (2005), and Easton (2004). Appendix A provides details on the implementation of the four models. Appendix B outlines definitions and data sources for the regression variables.

TABLE 3: SAMPLE BREAKDOWN BY INDUSTRY AND YEAR

Panel A*:Time Distribution*

Year	**N**	**%**
2005	582	9.40
2006	544	9.68
2007	496	8.83
2008	491	8.74
2009	533	9.49
2010	567	10.09
2011	564	10.04
2012	571	10.17
2013	637	11.34
2014	590	10.50
2015	96	1.71
Total	5,617	100

Panel B*: Industry distribution*

Industry	**N**	**%**
Agriculture	11	0.20
Food	118	2.10
Soda	27	0.48
Beer and liquor	36	0.64
Tobacco products	14	0.25
Recreation	19	0.34
Entertainment	60	1.07
Printing & publishing	17	0.30
Consumer goods	113	2.01
Apparel	70	1.25
Health care	77	1.37
Medical equipment	117	2.08
Pharmaceuticals Pdct	157	2.80
Chemicals	135	2.40
Rubber & plastic	10	0.18
Textiles	24	0.43
Construction materials	112	1.99
Construction	79	1.41
Steel works	52	0.93
Fabricated products	2	0.04
Machinery	238	4.24
Electrical equipment	55	0.98
Automobile &trucks	87	1.55
Aircraft	66	1.18
Shipbuilding	15	0.27
Defense	10	0.18
Metals	9	0.16
Mining	39	0.69
Coal	17	0.30

Petroleum & Gaz	229	4.08
Utilities	399	7.10
Communication	120	2.14
Personal Service	64	1.14
Business services	523	9.31
Computers	148	2.63
Electronic equipment	234	4.17
Measuring and control Equi	129	2.30
Business supplies	70	1.25
Shipping containers	57	1.01
Transportation	157	2.80
Wholesalers	175	3.12
Retail	405	7.21
Restaurants & hotels	86	1.53
Banking	324	5.77
Insurance	245	4.36
Real Estate	34	0.61
Trading	372	6.62
Others	60	1.07
Total	5,617	100

This table presents the industry (according to the 48 industry group affiliations in Fama and French (1997)) and calendar year distributions for the 5,617 firm-year observations comprising the sample between 2005 and 2015.

TABLE 4: PEARSON CORRELATION

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Greenwash	1												
2. KGLS	**0.071**	1											
3. KCT	**0.05**	**0.62**	1										
4. KOJN	-0.00	**0.50**	**0.60**	1									
5. KMPEG	**0.08**	**0.45**	**0.53**	**0.87**	1								
6. COE	**0.05**	**0.73**	**0.79**	**0.91**	**0.89**	1							
7. BETA	-0.00	**0.19**	**0.18**	**0.25**	**0.21**	**0.25**	1						
8. Leverage	**0.12**	-0.01	0.01	-0.00	**0.04**	0.01	0.00	1					
9. BTM	0.01	**0.34**	**0.10**	**0.19**	**0.23**	**0.25**	**0.05**	**-0.07**	1				
10. ROA	**-0.03**	**-0.11**	**-0.04**	**-0.13**	**-0.18**	**-0.14**	**-0.07**	**-0.27**	**-0.44**	1			
11. Size	**0.33**	**-0.18**	**-0.06**	**-0.20**	**-0.14**	**-0.17**	**-0.13**	**-0.05**	**-0.15**	**0.16**	1		
12. Disp	0.00	**0.07**	**0.00**	**0.29**	**0.34**	**0.23**	**0.13**	**0.08**	**0.17**	**-0.20**	**-0.15**	1	
13. LTG	**-0.12**	**-0.03**	**0.05**	**0.33**	**0.08**	**0.13**	**0.15**	**-0.09**	**-0.18**	0.03	**-0.05**	**0.05**	1

Notes: The table presents the matrix of Pearson correlations. Sample period encompasses the 2005 to 2015-time horizon. All variables are defined in appendix B.

Correlation coefficients in boldface are significant at the 1% level.

TABLE 5: UNIVARIATE TEST

	N	r_{Avg}	K_{GLS}	K_{CT}	K_{OJN}	K_{MPEG}
Means						
Greenwash<median	2,399	0.098	0.089	0.103	0.105	0.088
Greenwash≥ median	3,218	0.096	0.093	0.101	0.111	0.092
Difference		-0.002	-0.004	0.001	-0.005	-0.003
t-stat	5,617	-3.78***	-5.20***	2.061***	-4.58***	-4.99

This table presents mean comparison test for individual and average cost of equity premium estimates across subsamples of high (above median) and low (below median) greenwash. The total sample includes 5,617 firm-years between 2005 and 2015. rAVG is the average implied cost of equity premium obtained from four models developed by Claus and Thomas (2001), Gebhardt et al. (2001), Ohlson and Juettner-Nauroth (2005), and Easton (2004), which I denote kCT, kGLS, kOJN, and kmpeg, respectively. Appendix A provides details on the implementation of the four models.
*** Statistical significance at the 1% level.

TABLE 6: GREENWASHING AND COST OF EQUITY CAPITAL

	r_{Avg}	r_{Avg}	K_{GLS}	K_{CT}	K_{OJN}	K_{MPEG}
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Greenwash	0.007***	0.011***	0.012***	0.008***	0.010***	0.015***
	(2.90)	(4.24)	(4.40)	(2.96)	(3.69)	(4.08)
Beta		0.006***	0.005***	0.006***	0.006***	0.008***
		(9.51)	(8.42)	(9.44)	(8.27)	(7.73)
Leverage		0.004	0.001	0.008*	0.004	0.007
		(1.14)	(0.15)	(1.65)	(1.01)	(1.14)
LTG		0.000***	-0.000	0.000	0.002***	0.000**
		(4.79)	(-0.06)	(1.27)	(12.04)	(3.30)
BTM		0.022***	0.034***	0.012***	0.020***	0.023***
		(8.63)	(16.20)	(4.71)	(6.67)	(5.21)
ROA		0.007	0.027**	0.007	0.012	-0.015
		(0.90)	(2.70)	(0.73)	(1.27)	(-1.14)
Size		-0.002***	-0.003***	0.000	-0.003***	-0.002***
		(-3.66)	(-4.56)	(0.10)	(-5.15)	(-3.12)
Fd		0.034***	-0.005	-0.013**	0.054***	0.100***
		(5.51)	(-0.98)	(-2.79)	(6.79)	(9.42)
Constant	0.084***	0.104***	0.122***	0.065***	0.118***	0.117***
	(32.23)	(8.89)	(9.13)	(5.08)	(9.49)	(7.08)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes
adj. R^2		0.276	0.295	0.194	0.319	0.222
N		5,617	5,617	5,617	5,617	5,617

This table reports results from regressing the cost of equity premium (rAVG) on Greenwash and controls over the period 2005–2015. rAVG is the average implied cost of equity premium obtained from four models developed by Gebhardt et al. (2001), Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005), and Easton (2004). Appendix A provides details on the implementation of the four models. Greenwash equals absolute disclosure ratio minus weighted disclosure ratio. Models 2–5 presents the results from regressing individual cost of equity premium estimates. Appendix B outlines definitions and data sources for the regression variables. Robust t-statistics adjusted for clustering by firm are reported inside the parentheses.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.

TABLE 7: SUB- SAMPLE ANALYSIS & DIRTY INDUSTRIES

	2005-2008	2009-2012	2013-2015	Gw_dirty	Gw-Tran	Gw_oil	Gw_chem
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Greenwash	0.022***	0.011***	0.006**	0.758***	0.308**	0.285**	0.165***
	(3.89)	(3.31)	(2.21)	(3.87)	(1.98)	(2.71)	(2.43)
Beta	0.004***	0.010***	0.007***	0.009***	-0.007***	0.010***	0.006***
	(4.73)	(9.09)	(7.32)	(2.20)	(-2.23)	(4.06)	(2.54)
Leverage	0.004	0.001	0.012**	0.007	0.010	-0.015	0.012
	(0.51)	(0.27)	(2.60)	(0.38)	(0.94)	(-1.28)	(1.28)
LTG	0.001**	0.000***	0.001***	-0.001	0.001	0.000	-0.001**
	(2.12)	(3.66)	(5.52)	(-0.16)	(1.56)	(0.38)	(-3.09)
BTM	0.013***	0.021***	0.031***	-0.010	-0.007	0.010	-0.013***
	(3.66)	(6.59)	(7.97)	(-0.67)	(-0.64)	(1.24)	(-2.35)
ROA	-0.007	0.008	0.037**	-0.050	-0.008	-0.014	-0.028
	(-0.60)	(0.66)	(2.47)	(-1.00)	(-0.34)	(-0.37)	(-1.23)
Size	-0.003***	-0.002***	-0.003***	0.020***	0.006***	0.012***	0.002
	(-3.58)	(-3.45)	(-4.38)	(4.34)	(2.24)	(3.54)	(1.26)
Fd	0.041***	0.037***	0.022*	0.025	-0.011	0.055***	-0.018***
	(4.12)	(4.10)	(1.85)	(1.04)	(-1.37)	(2.46)	(-2.35)
Constant	0.140***	0.122***	0.120***	-0.557***	-0.189**	-0.310***	-0.022
	(8.38)	(8.14)	(7.94)	(-4.48)	(-2.63)	(-3.76)	(-0.51)
Year effect	No	No	No	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.124	0.252	0.258	0.044	0.023	0.038	0.036
N	2059	2235	1323	5,617	5,617	5,617	5,617

This table reports results from regressing the cost of equity premium (rAVG) on greenwash and controls over the period 2005–2015. rAVG is the average implied cost of equity premium obtained from four models developed by Gebhardt et al. (2001), Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005), and Easton (2004). Models 1–3 replicate table 5 Model 2 after dividing the total sample period into three sub-periods. Models 4- 7 reports the results from regressing the cost of equity premium (rAVG) on indicators for dirty industries. Appendix A provides details on the implementation of the four models. Appendix B outlines definitions and data sources for the regression variables. Robust t-statistics adjusted for clustering by firm are reported inside the parentheses.

* Statistical significance at the 10% level. ** Statistical significance at the 5% level. *** Statistical significance at the 1% level

TABLE 8: COMPONENT OF SELECTIVE DISCLOSURE AND COST OF EQUITY CAPITAL

	r_{Avg}	K_{GLS}	K_{CT}	K_{OJN}	K_{MPEG}
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Weighted_ratio	0.005***	0.006***	0.004**	0.004**	0.007***
	(2.58)	(2.79)	(1.77)	(1.86)	(2.55)
Absolute_ratio	0.003	-0.001	0.006***	0.002	0.003
	(1.05)	(-0.21)	(2.38)	(0.80)	(0.81)
Beta	0.006***	0.005***	0.006***	0.006***	0.008***
	(9.71)	(8.32)	(9.63)	(8.50)	(7.95)
Leverage	0.007	0.005	0.008*	0.005	0.009
	(1.55)	(1.20)	(1.65)	(1.18)	(1.46)
LTG	0.001***	-0.000	0.000	0.002***	0.001***
	(4.74)	(-0.14)	(1.39)	(11.84)	(3.31)
BTM	0.022***	0.033***	0.012***	0.020***	0.022***
	(8.51)	(14.98)	(4.58)	(6.66)	(5.14)
ROA	0.010	0.036***	0.007	0.012	-0.013
	(1.18)	(3.39)	(0.74)	(1.23)	(-0.98)
Size	-0.002***	-0.002***	-0.000	-0.003***	-0.002**
	(-3.51)	(-3.86)	(-0.42)	(-4.84)	(-2.92)
Fd	0.035***	-0.004	-0.013***	0.055***	0.100***
	(5.56)	(-0.69)	(-2.71)	(6.81)	(9.46)
Constant	0.101***	0.105***	0.071***	0.114***	0.112***
	(8.63)	(7.60)	(5.69)	(9.25)	(6.79)
Year effect	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes
R^2	0.273	0.28	0.19	0.316	0.219
N	5,617	5,617	5,617	5,617	5,617

This table reports results from regressing the cost of equity premium (rAVG) on greenwashing and controls over the period 2005–2015. rAVG is the average implied cost of equity premium obtained from four models developed by Gebhardt et al. (2001), Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005), and Easton (2004). Greenwash equals absolute disclosure ratio minus weighted disclosure ratio. The absolute disclosure ratio is the number of disclosed environmental indicators divided by the number of environmental indicators relevant to the firm's operations. The weighted disclosure ratio is calculated as the proportion of the firm's environmental damage cost for which the company disclosed quantitative global figures. Appendix A provides details on the implementation of the four models. Appendix B outlines definitions and data sources for the regression variables. Robust t-statistics adjusted for clustering by firm are reported inside the parentheses.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.

TABLE 9: THE EFFECT OF MEDIA PRESSURE ON THE ASSOCIATION BETWEEN GREENWASHING AND COST OF EQUITY CAPITAL

Greenwash	0.025***
	(3.85)
Media	0.001**
	(2.26)
*GW*Media*	-0.003***
	(-3.01)
Beta	0.006***
	(9.56)
Leverage	0.005
	(1.26)
LTG	0.001***
	(4.80)
BTM	0.022***
	(8.35)
ROA	0.008
	(0.87)
Size	-0.002***
	(-3.57)
Fd	0.035***
	(5.57)
Constant	(0.001)
	0.108***
Year effect	Yes
Industry effect	Yes
R^2	0.284
N	5,586

This table reports results from regressing the cost of equity premium (rAVG) on greenwashing and controls over the period 2005–2015. rAVG is the average implied cost of equity premium obtained from four models developed by Gebhardt et al. (2001), Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005), and Easton (2004). Greenwash equals absolute disclosure ratio minus weighted disclosure ratio. Media is defined as the natural logarithm of one plus the number of news articles for a given firm-year. GW *Media is the interaction between media and greenwash. Appendix A provides details on the implementation of the four models. Appendix B outlines definitions and data sources for the regression variables. Robust t-statistics adjusted for clustering by firm are reported inside the parentheses.

* Statistical significance at the 10% level. ** Statistical significance at the 5% level. *** Statistical significance at the 1% level.

TABLE 10: THE EFFECT OF PRODUCT MARKET COMPETITION ON THE ASSOCIATION BETWEEN GREENWASHING AND COST OF EQUITY CAPITAL

Greenwash	0.010***
	(3.57)
HH_index	-0.012*
	(-1.62)
*GW*HH_Index*	-0.006**
	(-1.88)
Beta	0.006***
	(8.48)
Leverage	0.009**
	(2.10)
LTG	0.000***
	(4.21)
BTM	0.020***
	(7.82)
ROA	-0.000
	(-0.05)
Size	-0.001**
	(-2.60)
Fd	0.033***
	(4.80)
Constant	0.092***
	(7.87)
Year effect	Yes
Industry effect	Yes
adj. R^2	0.272
N	4,786

This table reports results from regressing the cost of equity premium (rAVG) on greenwashing and controls over the period 2005–2015. rAVG is the average implied cost of equity premium obtained from four models developed by Gebhardt et al. (2001), Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005), and Easton (2004). Greenwash equals absolute disclosure ratio minus weighted disclosure ratio. Appendix A provides details on the implementation of the four models. Herfindahl-Hirschman (HH) index calculated based on firms' annual sales (O.Erhemjamts et al.,2013). GW*HH_index is the interaction between greenwash and HH index. Appendix B outlines definitions and data sources for the regression variables. Robust t-statistics adjusted for clustering by firm are reported inside the parentheses.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level

*** Statistical significance at the 1% level.

TABLE 11: THE EFFECT OF CEO OPTIMISM THE ASSOCIATION BETWEEN GREENWASHING AND COST OF EQUITY CAPITAL

Greenwash	0.009***
	(3.96)
Optimism	-0.003**
	(-2.89)
*GW*Optimism*	0.045***
	(2.79)
Beta	0.006***
	(8.44)
Leverage	0.004
	(1.02)
LTG	0.001***
	(4.23)
BTM	0.025***
	(8.22)
ROA	0.008
	(0.76)
Size	-0.002**
	(-3.18)
Fd	0.038***
	(4.62)
Constant	0.098***
	(8.68)
Year effect	Yes
Industry effect	Yes
adj. R^2	0.309
N	3,960

This table reports results from regressing the cost of equity premium (rAVG) on greenwashing and controls over the period 2005–2015. rAVG is the average implied cost of equity premium obtained from four models developed by Gebhardt et al. (2001), Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005), and Easton (2004). Greenwash equals absolute disclosure ratio minus weighted disclosure ratio. Optimistic CEO is a dummy variable equals to 1 when the CEO holds an average percentage of exercised option moneyness of more than 67%, otherwise zero. Data for measuring optimism are from the ExecuComp and Compustat databases. Appendix A provides details on the implementation of the four models. Appendix B outlines definitions and data sources for the regression variables. Robust t-statistics adjusted for clustering by firm are reported inside the parentheses.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level

TABLE 12: RESULTS USING ALTERNATIVE MEASURES OF COST OF EQUITY CAPITAL

	K_{gg}	K_{peg}	K_{feyd}
Greenwash	0.013***	0.008***	0.007**
	(4.60)	(2.75)	(3.27)
Beta	0.004***	0.008***	0.005***
	(5.71)	(9.20)	(8.23)
Leverage	0.022***	0.003	0.007*
	(3.72)	(0.58)	(1.69)
LTG	0.002***	0.001***	-0.001***
	(10.54)	(6.61)	(-9.86)
BTM	0.027***	0.019***	0.023***
	(7.80)	(4.92)	(9.78)
ROA	0.030***	-0.010	0.023***
	(2.50)	(-0.85)	(2.57)
Size	-0.000	-0.003***	0.000
	(-0.74)	(-4.74)	(0.35)
Fd	0.003	0.096***	-0.073***
	(0.18)	(10.48)	(-18.83)
Constant	0.047***	0.119***	0.044***
	(3.17)	(8.19)	(3.79)
Year effect	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes
Avg. R^2	0.252	0.257	0.303
N	5,611	5,582	5,617

This table presents alternative cost of equity premium estimates on the greenwash and controls over the period 2005–2015. In model 1, I estimate the cost of equity from the finite horizon Gordon and Gordon (1997) model estimated in June of each year minus the rate on a 10-year Treasury note. In model 2, I estimate the Implied cost of equity capital from Price-Earnings-Growth (PEG) model which assumes no dividend payments to estimate the equity premium using short-term earnings forecasts and longer-term forecasts. In model 3, I estimate the Implied cost of equity capital using Forward Earnings- Price ratio which is defined as FEPS $_{t+1}$ divided by P_t. Greenwash equals absolute disclosure ratio minus weighted disclosure ratio. Appendix A provides details on the implementation of the two models. Appendix B outlines definitions and data sources for the regression variables. Robust t-statistics adjusted for clustering by firm are reported inside the parentheses.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.

TABLE 13: GREENWASHING AND COST OF EQUITY: RESULTS CONTROLLING FOR ANALYST FORECAST OPTIMISM

	Forecast optimism bias less than jth percentile				
		j = 95%	j = 90%	j = 75%	j = 50%
	(1)	(2)	(3)	(4)	(5)
Greenwash	0.011***	0.011***	0.012**	0.026***	0.027***
	(4.23)	(3.21)	(2.26)	(2.73)	(2.98)
Beta	0.006***	0.007***	0.008***	0.009***	0.008**
	(9.51)	(7.05)	(5.69)	(3.98)	(3.12)
Leverage	0.005	0.007	0.005	-0.004	-0.001
	(1.04)	(1.28)	(0.58)	(-0.30)	(-0.05)
LTG	0.001***	0.001***	0.001***	0.001**	0.000*
	(4.76)	(4.10)	(2.88)	(2.15)	(1.82)
BTM	0.022***	0.025***	0.025***	0.023***	0.022***
	(8.56)	(7.63)	(6.72)	(4.20)	(2.87)
ROA	0.007	0.009	0.012	0.028	0.038
	(0.85)	(0.77)	(0.70)	(1.08)	(1.16)
Size	-0.002***	-0.003***	-0.003***	-0.005***	-0.005***
	(-3.71)	(-4.00)	(-3.31)	(-3.38)	(-3.14)
Fd	0.033***	0.029***	0.024**	0.020*	0.026***
	(5.31)	(3.64)	(2.76)	(1.95)	(2.54)
FBIAS	0.001***				
	(2.82)				
Constant	0.105***	0.132***	0.154***	0.203***	0.190***
	(8.81)	(8.02)	(6.57)	(6.28)	(4.69)
adj. R^2	0.280	0.302	0.293	0.295	0.384
N	5,546	2,784	1,375	634	351

This table examines the robustness of the results in Table 6, Model 2 to analyst forecast optimism. The dependent variable rAVG is the average implied cost of equity premium obtained from four models developed by Gebhardt et al. (2001), Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005), and Easton (2004). Appendix A provides details on the implementation of the four models. Model 1 controls for forecast optimism bias (FBIAS). Models 2–5 exclude observations in the top 5%, 10%, 25%, and 50% of the FBIAS distribution, respectively. Appendix B outlines definitions and data sources for the regression variables. Unreported industry controls are based on the Fama and French (1997) industry classification. Robust t-statistics adjusted for clustering by firm are reported inside the parentheses.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.

TABLE 14: GREENWASHING AND COST OF EQUITY: CONTROLLING FOR THE ENDOGENEITY PROBLEM

	ANA_Cov	Strong_Gov	Low_Gov	Constrained	Unconstrained	IV	Reverse Causality
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Greenwash	0.011***	0.012***	0.006**	0.009***	0.009***	0.006***	0.782***
	(4.18)	(3.39)	(2.13)	(0.002)	(0.002)	(4.40)	(4.19)
Beta	0.006***	0.005***	0.008***	0.003***	0.003***	0.006***	0.014**
	(9.25)	(4.14)	(8.57)	(0.001)	(0.001)	(15.11)	(2.37)
Leverage	0.007*	-0.003	0.002	0.015***	0.015***	0.006**	0.162***
	(1.74)	(-0.59)	(0.39)	(0.004)	(0.004)	(2.68)	(3.89)
LTG	0.000***	0.001***	0.001***	0.000+	0.000+	0.001***	-0.004***
	(4.27)	(3.38)	(3.86)	(0.000)	(0.000)	(10.87)	(-4.13)
BTM	0.023***	0.032***	0.021***	0.022***	0.022***	0.022***	0.008
	(8.79)	(5.83)	(-0.49)	(0.003)	(0.003)	(18.60)	(0.33)
ROA	0.007	0.015	-0.007	-0.003	-0.003	0.006	-0.186*
	(0.85)	(1.09)	(-2.60)	(0.011)	(0.011)	(1.03)	(-2.20)
Size	-0.003***	-0.001*	-0.002**	-0.000	-0.000	-0.002***	0.080***
	(-5.35)	(-1.75)	(3.67)	(0.000)	(0.000)	(-5.12)	(12.33)
Fd	0.034***	0.056***	0.048***	0.045***	0.045***	0.035***	0.057
	(5.33)	(5.23)	(0.013)	(0.010)	(0.010)	(11.97)	(1.34)
ANA_COV	0.005***						
	(3.88)						
Constant	0.126***	0.086***	0.128***	0.072***	0.173***	0.099***	-1.621***
	(10.51)	(5.57)	(6.48)	(0.011)	(0.017)	(13.59)	(-10.16)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind_effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
adj. R^2	0.284	0.352	0.339	0.350	0.267	0.277	0.195
N	5,586	1,501	2,168	2,383	3,203	5,586	5,329

This table examines the robustness of the results in Table 6, Model 2 to omitted variables and reverse causality bias. The dependent variable rAVG is the average implied cost of equity premium obtained from four models developed by Gebhardt et al. (2001), Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005), and Easton (2004). Appendix A provides details on the implementation of the four models. Models 1–5 include the logarithm of one plus the number of analysts following the firm (ANA), strong or low governance Bebchuk et al.'s (2009) antitakeover provisions index (EI), and constrained or unconstrained firms following Kaplan and Zingales' (1997) index of financial constraints (KZ), respectively. Model 6 uses the instrumental estimation approach. Model 7, which includes the lagged risk premium (Lag(rAVG)) as an explanatory variable. Appendix B outlines definitions and data sources for the regression variables. Robust t-statistics adjusted for clustering by firm are reported inside the parentheses.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.

TABLE 15: BP SPILL CRISIS AS AN EXTERNAL SHOCK FOR THE RELATION BETWEEN GREENWASHING AND COST OF EQUITY

Greenwash	0.017***
	(4.56)
BP	-0.030***
	(-13.23)
*GW*BP*	-0.010**
	(-2.79)
Beta	0.005
	(1.11)
Leverage	0.001***
	(5.52)
LTG	0.023***
	(8.51)
BTM	0.005
	(0.61)
ROA	-0.002***
	(-4.31)
Size	0.038***
	(6.08)
Fd	0.152***
	(12.24)
Constant	0.017***
	(4.56)
Year effect	Yes
Industry effect	Yes
adj. R^2	0.267
N	4,786

This table reports results from regressing the cost of equity premium (rAVG) on different component of greenwashing (weighted disclosure and absolute disclosure ratios) and controls over the period 2005–2015. rAVG is the average implied cost of equity premium obtained from four models developed by Gebhardt et al. (2001), Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005), and Easton (2004). Greenwash equals absolute disclosure ratio minus weighted disclosure ratio. BP is a dummy variable equals to 1 if fiscal year is superior to 2010 otherwise, 0. Appendix B outlines definitions and data sources for the regression variables. Robust t-statistics adjusted for clustering by firm are reported inside the parentheses.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level

TABLE 16: RESULTS USING ALTERNATIVE ESTIMATIONS PROCEDURES

	rAvg *(Industry fixed effect)*	***rAvg*** *(Newey-West Estimation)*	***rAvg*** *(Prais-Winsten Estimation)*	***rAvg*** *(Fama Macbeth Estimation)*
Greenwash	0.008***	0.011***	0.010***	0.011***
	(2.43)	(5.31)	(5.40)	(4.08)
Beta	0.005***	0.006***	0.002***	0.007***
	(4.39)	(11.33)	(5.35)	(3.73)
Leverage	0.015**	0.005	-0.001	0.008**
	(1.90)	(1.46)	(-0.28)	(2.40)
LTG	0.001***	0.001***	0.001***	0.000***
	(4.21)	(5.45)	(5.47)	(3.39)
BTM	0.023***	0.022***	0.011***	0.025***
	(13.29)	(11.11)	(5.50)	(9.14)
ROA	0.009	0.008	0.007	0.017**
	(0.95)	(1.05)	(1.08)	(1.99)
Size	-0.003***	-0.002***	-0.005***	-0.001**
	(-4.33)	(-4.95)	(-10.40)	(-2.96)
Fd	0.029***	0.034***	0.032***	0.029***
	(3.45)	(5.84)	(5.97)	(4.96)
Constant	0.129***	0.106***	0.184***	0.097***
	(9.33)	(12.13)	(16.81)	(10.91)
Year effect	Yes	Yes	Yes	Yes
Industry effect		Yes	Yes	Yes
R^2	0.179	-	0.508	0.261
N	5,617	5,617	5,617	5,617

This table reports results from regressing the cost of equity premium (rAVG) on greenwash and controls over the period 2005–2015 using alternative estimations procedures. rAVG is the average implied cost of equity premium obtained from four models developed by Gebhardt et al. (2001), Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005), and Easton (2004). Greenwash equals absolute disclosure ratio minus weighted disclosure ratio. Appendix A provides details on the implementation of the four models. Appendix B outlines definitions and data sources for the regression variables. Robust t-statistics adjusted for clustering by firm are reported inside the parentheses.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.

TABLE 17: OTHER SENSITIVITY TEST

	Drop dirty industries (1)	*Control for the median industry risk premium (2)*	*Drop Financial Industries (3)*
Greenwash	0.008***	0.006***	0.013***
	(2.82)	(3.22)	(4.29)
Beta	0.006***	0.004***	0.005***
	(9.25)	(6.86)	(7.20)
Leverage	0.004	0.012***	0.026***
	(0.96)	(3.31)	(5.23)
LTG	0.000***	0.000***	0.000**
	(3.67)	(4.81)	(2.97)
BTM	0.022***	0.022***	0.023***
	(8.22)	(9.33)	(7.48)
ROA	0.005	0.006	0.015
	(0.60)	(0.80)	(1.48)
Size	-0.002***	-0.001*	-0.003***
	(-3.32)	(-2.32)	(-4.93)
Fd	0.033***	0.026***	0.037***
	(5.35)	(5.34)	(4.71)
Median_ravg		0.880***	
		(13.71)	
Constant	0.105***	0.012	0.154***
	(8.73)	(1.04)	(11.13)
Year effect	Yes	Yes	
Industry effect	Yes	Yes	
adj. R^2	0.278	0.467	0.307
N	5,096	5,617	3,906

This table reports results from regressing the cost of equity premium (rAVG) on greenwash and controls over the period 2005–2015. rAVG is the average implied cost of equity premium obtained from four models developed by Gebhardt et al. (2001), Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005), and Easton (2004). Greenwash equals absolute disclosure ratio minus weighted disclosure ratio. Appendix A provides details on the implementation of the four models. In model (1) and (2), I drop 'dirty' industries and I control for the median industry risk premium, respectively. In Model (3), I report the results after deleting financial industries. Appendix B outlines definitions and data sources for the regression variables. Robust t-statistics adjusted for clustering by firm are reported inside the parentheses.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.