

From Symbolic to Substantive Legitimacy: Investor Reactions to the Regulation of Greenwashing

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We examine investor perceptions on anti-greenwashing legislation. Drawing on legitimacy and resource dependence theory, we develop a conceptual framework that predicts both the direction of investor reactions to anti-greenwashing regulation and the boundary conditions shaping these effects. We test our predictions using abnormal stock returns around the announcement of the European Union's landmark Green Claims Directive (2023–2024), which aimed to curtail greenwashing, for a sample of 1,524 EU-listed firms. While average stock price reactions to the announcement are insignificant, cross-sectional analyses reveal substantial heterogeneity. Specifically, consistent with legitimacy theory and inconsistent with resource dependence theory, firms with larger environmental legitimacy deficits and higher environmental legitimacy materiality experience more favorable investor responses. Although the EU announced plans to withdraw the Directive in 2025, investor reactions to this policy reversal suggest that the legitimacy benefits of anti-greenwashing regulation are not undone by repeal. Overall, our findings indicate that anti-greenwashing reforms can transform symbolic legitimacy into “sticky” substantive legitimacy, creating tangible value for firms for which environmental legitimacy is strategically most consequential.

Keywords: greenwashing, regulation, legitimacy, decoupling, resource dependence, shareholder value

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1. Introduction

Greenwashing is a broad umbrella term encompassing a variety of forms of misleading environmental communication, ranging from “*a slight exaggeration to a full fabrication*” (Lyon & Montgomery, 2015). Recent high-profile greenwashing scandals underscore the salience of this phenomenon, with companies such as Shein, Unilever, and Deutsche Bank facing public criticism and media scrutiny (Kollewe, 2023; Armellini, 2025; Reuters, 2025). Against the backdrop of intensifying public concern over corporate sustainability claims, policymakers have advanced calls for the introduction of anti-greenwashing legislation (European Union, 2020). Yet, a notable omission in both public and academic discourse concerns the impact of such legislation on covered firms’ financial performance. This lack of evidence is not surprising given the very recent nature of anti-greenwashing regulatory efforts. Nevertheless, it represents an important oversight, because the long-term viability of environmental regulation will depend not only on its ecological effectiveness but also on its economic consequences (OECD, 2025).

Our study intends to address this gap. Drawing on legitimacy and resource dependence theory, we develop and test an exploratory framework on the impact of anti-greenwashing legislation on corporate financial performance, yielding conflicting predictions. On the one hand, a regulation that limits opportunities for greenwashing may enable firms to repair and strengthen their environmental legitimacy. This can, in turn, enhance firms’ financial performance by fostering trust and strengthening relationships with key stakeholders, including customers, suppliers, and employees (DiMaggio & Powell, 1983; Deephouse, 1999). On the other hand, anti-greenwashing regulation may adversely affect firms’ cash flows by requiring additional costly resources while constraining firms’ ability to secure legitimacy through low-cost, merely symbolic actions (Pfeffer & Salancik, 1978; Oliver, 1991; Hillman et al., 2009). Because it is unclear a priori whether the positive effects of enhanced legitimacy or the negative

effects of the constrained resources will dominate, the overall impact of anti-greenwashing legislation on firm performance is an empirical question.

Legitimacy and resource dependence theories also suggest moderators of the relationship between anti-greenwashing legislation and corporate financial performance. First, we predict that the impact of greenwashing bans will be moderated by firms' "*Environmental Legitimacy Deficit*" (*ELD*), defined as their pre-legislation shortfall in demonstrating environmental legitimacy. Legitimacy theory predicts a more positive investor response for firms with a larger *ELD*, as regulation allows these firms to credibly signal their commitment to environmental standards. In contrast, resource dependence theory predicts a less favorable response, since firms with larger deficits may face higher costs to comply and adapt to the new rules.

Second, we predict a moderating role for firms' "*Environmental Legitimacy Materiality*" (*ELM*), defined as the relevance of environmental legitimacy for corporate cash flows. Legitimacy theory anticipates stronger positive investor responses when environmental legitimacy is more strategically important to firm value, implying a positive effect of *ELM* proxies. In contrast, resource dependence theory suggests that high-*ELM* firms may face larger incremental resource constraints and therefore experience more adverse returns.

Third, we predict a more negative investor response for firms with higher "*Resource Constraints*", defined as their difficulty in coping with the additional compliance costs and potential fines associated with anti-greenwashing regulation. Consistent with resource dependence theory, we therefore expect resource constraints proxies to be associated with more negative investor responses.

Our empirical context for testing these predictions is the Green Claims Directive (GCD), a pioneering anti-greenwashing regulation announced by the European Union (EU) in 2023, with

subsequent amendments in 2024 and 2025.² The GCD is the first pan-European framework explicitly aimed at preventing false or misleading environmental claims from hindering the green transition, using a harmonized framework across all EU countries. Often referred to as the “greenwashing ban” (Lawler, 2024), it applies to explicit environmental claims about a company’s products or the company itself in business-to-consumer commercial practices. Examples include statements such as “Eco-friendly packaging”, “Carbon neutral”, “Green”, or “Better for the planet”. The GCD specifies how such claims must be substantiated and communicated, outlines requirements for the approval of environmental labels and third-party verification, and establishes penalties for noncompliance (European Commission, 2023a).

To capture the GCD’s impact on corporate financial performance, we examine investor reactions to the Directive’s announcement, as reflected in announcement-period abnormal daily stock returns. Under the assumption of semi-strong form market efficiency, stock prices respond immediately and unbiasedly to firm-specific and policy news, with the sign and magnitude of the reaction reflecting investors’ expectations of the news’ net effect on discounted cash flows (Eden et al., 2022; Brealey et al., 2023). Examining daily stock returns around the GCD announcement therefore allows us to infer the regulation’s anticipated cash-flow consequences without having to wait for these effects to materialize. The novelty of the GCD makes this feature especially valuable.

To measure stock price reactions to the GCD, we adopt a standard policy event study methodology (Zhang 2007, Armstrong et al. 2010; Grewal et al. 2019; Florackis et al., 2025). Our analysis uses a sample of 2,885 firms with complete stock price data and a subsample of 1,524 firms with complete data for all explanatory variables used in the baseline cross-sectional analysis. Following an extensive search in media sources and press releases using the Factiva

² In EU law, a directive is a binding legal act that sets out objectives that Member States must achieve but leaves it to national authorities to decide on the form and methods of implementation. It must be transposed into national law by a specified deadline before it takes effect domestically (European Union, n.d.a.).

database, we identify six dates associated with news increasing the likelihood of the adoption of the GCD, ranging from March 22, 2023 until June 17, 2024.

Our key findings are as follows. In univariate tests, we observe no significant average abnormal stock returns over any of the six event dates, nor over the event dates considered collectively. However, this overall nonsignificant effect masks substantial cross-sectional heterogeneity. Specifically, consistent with our prediction derived from legitimacy theory, regression results indicate that firms with higher values on proxy variables capturing *Environmental Legitimacy Deficit*, i.e., previous greenwashing offenders, firms domiciled in countries with a weaker regulatory environment, and firms with lower innovation capabilities, have more favorable stock price reactions. Also as hypothesized, firms with higher values on variables capturing *Environmental Legitimacy Materiality*, i.e., those relying on government contracts and those with substantial institutional ownership, have a more favorable stock price reaction. In contrast, evidence that investors are concerned about compliance costs is limited.

Our results are robust to a range of additional tests, including a two-step Heckman (1979) procedure accounting for potential self-selection in the subsample of greenwashing offenders. A placebo analysis in which we use simulated event dates suggests our cross-sectional inferences are unlikely to be spurious.

On June 20, 2025, after more than two years of negotiations and just prior to the final negotiation round, the European Commission announced its intention to withdraw the GCD, citing concerns about the regulation's administrative burden (Agence France Presse, 2025). In a follow-up test, we identify two news announcements in 2025 linked to this withdrawal and perform an event study analogous to that for the introduction of the GCD on these announcements. We find no significant stock price reactions to these two withdrawal events, either individually or combined. Cross-sectional regression analyses indicate that firms benefiting from a legitimacy boost from the GCD's introduction, such as those in government-contracting industries, show no reversal of previously more favorable stock price reactions.

However, high-leverage firms do exhibit a more favorable stock price reaction to the GCD's cancellation, consistent with investors expressing relief that these firms will likely not incur GCD-associated additional costs.

To our knowledge, this paper is the first to examine the financial performance impact of anti-greenwashing regulation. A substantial body of prior work investigates drivers of corporate greenwashing behavior (Marquis et al., 2016; Testa et al., 2018a; Wu et al., 2020; Bothello et al., 2023; Cartellier et al., 2025; Huang et al., 2025; Kudlak, 2025; Long et al., 2025; Xiong et al., 2025). These studies tend to operate in contexts where corporate greenwashing was not covered by dedicated regulation (Cartellier et al., 2025).

By comparison, only few studies focus on the impact of corporate greenwashing on corporate (financial) performance, with mixed findings. Walker & Wan (2012), Testa et al. (2018b), and Li et al. (2023) conceptualize greenwashing as the discrepancy between a firm's environmental communication and its environmental performance (the "green talk" versus "green walk") and report negative, neutral, and positive associations with shareholder value, respectively. Du (2015), using an event study of Chinese firms exposed for greenwashing, finds a negative stock price reaction for the implicated firms, but Dorfleitner et al. (2025) record an insignificant overall stock price reaction for a sample of European greenwashing offenders. Kassinis et al. (2022) document that greenwashing negatively affects consumer purchase intentions. Empirical challenges in this line of research include measurement error (because, by definition, greenwashers seek to avoid detection), self-selection (because samples of greenwashing offenders may be biased, as media coverage tends to focus on larger, more visible firms), and reverse causality (because firm performance may both influence and be influenced by greenwashing behavior). Our study overcomes these challenges by exploiting a recent, pan-EU legislative intervention that constitutes an exogenous negative shock affecting all covered firms' ability to greenwash.

On a theoretical level, our study contributes to the scientific debate on organizational legitimacy, which has so far mostly focused on the legitimacy-boosting effect of voluntary corporate actions, including environmental disclosures (Patten, 1992; Deegan, 2002; Delmas & Montes-Sancho, 2010; Paulraj & De Jong, 2011; Acuti et al., 2024). We instead illustrate the legitimacy-repairing potential of mandatory anti-greenwashing regulation and uncover important boundary conditions for the impact of such regulation on firm financial performance.

Finally, our study bridges business ethics and finance by using investor responses to regulation as a measure of anticipated incremental legitimacy benefits (i.e., net of compliance costs), highlighting the tangible (cash flow) consequences of ethics-related regulation in capital markets. We also contribute to the policy event study literature by examining both the introduction and the abolishment of regulation within a single framework. Our abolishment event study results provide the novel insight that regulatory legitimacy, once established, persists over time, even when the underlying regulation is paused or reversed.

2. Theory and hypotheses

2.1. Investor response to anti-greenwashing regulation

Fama (1970) defines a semi-strong form efficient market as one in which stock prices immediately and accurately reflect all publicly available, cash flow-relevant information. While markets can never be perfectly efficient (Brealey et al., 2023), it is reasonable to assume that firms listed on stock exchanges in developed economies operate under conditions of semi-strong form efficiency. This implies that stock price reactions to the announcement of anti-greenwashing regulation will instantaneously and accurately reflect investors' expectations of any incremental changes in future cash flows resulting from the legislation. To consider the potential implications of anti-greenwashing legislation for corporate cash flows, we draw on legitimacy theory and resource dependence theory.

Anti-greenwashing legislation through a legitimacy lens

Paradoxically, legitimacy theory provides a framework for explaining both why firms engage in greenwashing and how anti-greenwashing regulation can create shareholder value. Broadly speaking, legitimacy refers to the degree to which an organization's actions are perceived as congruent with societal norms and values (Suchman, 1995). Firms depend on legitimacy to secure critical resources and, ultimately, to ensure their survival (Pfeffer & Salancik, 1978; Acuti et al., 2024). They can achieve legitimacy by aligning their practices with the expectations of their institutional environment (Meyer & Rowan, 1977; DiMaggio & Powell, 1983). Environmental legitimacy, a specific dimension of overall legitimacy, captures the extent to which a firm's environmental conduct is viewed as meeting societal expectations regarding its relationship with the natural environment (Bansal & Clelland, 2004; Berrone et al., 2017).

From a legitimacy perspective, greenwashing is commonly viewed as a decoupling strategy through which firms attempt to obtain a "shortcut" to legitimacy by engaging in symbolic rather than substantive actions (Delmas & Montes-Sancho, 2010; Bromley & Powell, 2012; Marquis et al., 2016; Bothello et al., 2023). Symbolic actions ceremonially conform to institutional rules and stakeholder expectations, whereas substantive actions entail measurable efforts and tangible resource commitments (Zott & Huy, 2007). Firms relying primarily on symbolism risk being perceived by stakeholders as untrustworthy and opportunistic (King & Lenox, 2000). Such perceptions may in turn prompt stakeholders to curtail their transactions with the firm until evidence of genuine commitment emerges (Lin-Hi & Müller, 2013).

In general terms, anti-greenwashing legislation seeks to ensure that firms substantiate environmental claims with credible evidence. From a legitimacy perspective, such legislation could therefore reassure stakeholders that a firm's environmental claims are grounded in substantive action. In turn, this may enhance firms' environmental legitimacy, thereby

improving their relations with key stakeholders such as customers, suppliers, and governments (DiMaggio & Powell, 1983; Deephouse, 1999), and ultimately yielding higher cash flows.

Anti-greenwashing legislation through a resource dependence lens

Resource dependence theory (RDT) posits that organizations are not self-contained but depend on external stakeholders, such as investors, customers, and regulators, for access to critical resources necessary for survival and success (Pfeffer & Salancik, 1978). Firms may attempt to influence or accommodate stakeholder demands through strategies such as forming alliances, signaling legitimacy, or complying with institutional expectations (Hillman et al., 2009). As such, the RDT is related to the legitimacy framework, as it perceives legitimacy as one of the critical resources that firms seek to control.

From an RDT perspective, greenwashing can be understood as a low-cost resource acquisition strategy. By projecting environmental responsibility without incurring the full costs of substantive environmental improvements, firms may attract resources from environmentally conscious stakeholders while preserving internal flexibility. Anti-greenwashing regulation disrupts this strategy by restricting firms' ability to rely on symbolic environmental claims as a means of managing resource dependencies. Compliance with such regulation may require costly investments in monitoring, verification, and substantive environmental performance, or may reduce firms' ability to attract resources altogether if they cannot credibly meet the new standards.

Consequently, anti-greenwashing regulation may negatively affect firm value by increasing the cost of acquiring external resources or by weakening firms' ability to secure these resources on favorable terms. From a resource dependence perspective, investors may therefore anticipate lower future cash flows following the introduction of anti-greenwashing regulation and react negatively to its announcement.

Hypotheses

Taken together, legitimacy theory and resource dependence theory offer competing directional predictions regarding the stock price reaction to anti-greenwashing regulation. From a legitimacy perspective, such regulation can enhance the credibility of firms' environmental claims and strengthen their relationships with key external stakeholders, thereby increasing expected future cash flows and eliciting a positive investor response. In contrast, resource dependence theory emphasizes that anti-greenwashing regulation constrains firms' ability to rely on symbolic environmental claims as a low-cost means of managing external dependencies, potentially increasing the cost of accessing critical resources and reducing expected future cash flows. Which effect dominates is ultimately an empirical question. Accordingly, we propose the following competing hypotheses:

H_{1a}: The investor response to anti-greenwashing regulation is positive.

H_{1b}: The investor response to anti-greenwashing regulation is negative.

2.2. *Moderators of the investor response to anti-greenwashing regulation*

While legitimacy theory and resource dependence theory yield opposing directional predictions for the average investor response to anti-greenwashing regulation, both perspectives also imply that investor reactions are contingent on firm-specific conditions. The first two contingencies we examine, environmental legitimacy deficits and the materiality of environmental legitimacy, are central to both legitimacy theory and resource dependence theory but give rise to opposing predictions regarding investor responses. In contrast, the third contingency, resource constraints, is uniquely rooted in a resource dependence perspective and is therefore expected to operate unidirectionally. We discuss each of these firm-level contingencies in turn and develop testable hypotheses regarding how they shape investors' valuation responses to anti-greenwashing regulation.

Moderating role of Environmental Legitimacy Deficit

We define the concept of "*Environmental Legitimacy Deficit*" (*ELD*) as the shortfall between a firm's existing environmental legitimacy and the level it could credibly attain if stakeholders

fully trusted its environmental claims. Under a legitimacy framework, we expect the legitimacy-generating or -restoring benefits of anti-greenwashing regulation to be incrementally stronger for firms with a higher *ELD*. Conversely, under an RDT perspective, we predict compliance with anti-greenwashing legislation to be more expensive for firms with a higher *ELD*, as these firms need to make larger leaps to move from symbolic actions to the substantive actions required by the legislation. We thus obtain the following dual hypothesis:

H_{2a}: *Environmental Legitimacy Deficit* positively affects the investor response to anti-greenwashing legislation.

H_{2b}: *Environmental Legitimacy Deficit* negatively affects the investor response to anti-greenwashing legislation.

Moderating role of Environmental Legitimacy Materiality

We conceptualize “*Environmental Legitimacy Materiality*” (*ELM*) as the degree to which environmental legitimacy is financially material to a firm’s value creation. This concept is based on the more general notion of materiality in the accounting literature (Khan et al., 2016, Grewal et al., 2021). It recognizes that for some firms, environmental legitimacy matters more for future cash flows than for others.

Under a legitimacy framework, we predict a positive impact of *ELM* on investor responses, because the legitimacy benefits of anti-greenwashing regulation will have stronger positive cash flow impact for firms with a higher cash flow relevance of environmental legitimacy. Conversely, under the RDT we predict the opposite effect, as a high *ELM* will make it more pressing for firms to make the (potentially costly) switch from symbolic to substantive environmental actions. Accordingly, we obtain the following dual hypothesis:

H_{3a}: *Environmental Legitimacy Materiality* positively affects the investor response to anti-greenwashing legislation.

H_{3b}: *Environmental Legitimacy Materiality* negatively affects the investor response to anti-greenwashing legislation.

Moderating role of Resource Constraints

A final contingency we examine, *Resource Constraints*, is directly derived from the RDT. Specifically, it is reasonable to assume that firms with greater resource constraints face greater challenges in meeting the additional demands imposed on them by anti-greenwashing regulation. Their limited resource base limits their capacity to absorb compliance costs or invest in substantive sustainability initiatives, while their dependence on external financiers and stakeholders heightens the risks associated with failing to maintain environmental legitimacy. Consequently, from a resource dependence perspective, these firms are likely to experience more negative investor reactions to anti-greenwashing legislation, as the regulation intensifies their existing vulnerabilities and strains their limited adaptive capacity. Accordingly, we obtain the following hypothesis:

H₄: *Resource Constraints* negatively affect the investor response to anti-greenwashing legislation.

In sum, these moderators delineate the conditions under which anti-greenwashing regulation enhances or erodes shareholder value. Figure 1 represents our conceptual framework on the investor response to anti-greenwashing regulation and the moderating variables affecting this response.

<< Please insert Figure 1 here >>

3. The European Green Claims Directive

3.1. Background and key aims

Until the formal adoption of the European Green Claims Directive (GCD), EU firms' environmental claims fall under the general provisions of Directive 2005/29 on Unfair Business-to-Consumer Practices and Directive 2006/114 on Comparative Advertising. Although the European Commission and Member States have issued guidance on how these directives should be interpreted in the context of environmental claims, substantial variation

persists across Member States in both the requirements for such claims and their enforcement (Molyneux et al., 2023).

The proposed GCD emerged against a backdrop of intensifying scrutiny of corporate environmental marketing. The European Commission justified the initiative with empirical evidence drawn from an Impact Assessment finalised in 2020 (European Union, 2020). The study revealed that 53% of corporate environmental claims were vague, unsubstantiated, or outright misleading, highlighting widespread greenwashing and its detrimental effects on consumer trust and market integrity. The assessment also identified approximately 230 sustainability labels and 100 green energy labels in the EU, characterised by highly uneven levels of transparency.

The GCD was conceived as a regulatory response to these deficiencies. Its primary objective is to ensure that environmental claims are credible, comparable, and verifiable, thereby enabling a shift from “green claims” to “green facts” (Chowdhury, 2023). By establishing uniform standards for substantiation, verification, and disclosure, the Directive seeks to harmonise national rules, reduce information asymmetries, and encourage firms to pursue genuinely sustainable practices (European Commission, 2023b).

3.2. Main provisions

The GCD applies to explicit environmental claims addressed directly to consumers. Environmental claims are defined very broadly as *“any message or representation which is not mandatory under Union or national law, in any form, including text, pictorial, graphic or symbolic representation, such as labels, brand names, company names or product names,...and which states or implies that a product, product category, brand or trader has a positive or zero impact on the environment or is less damaging to the environment than other products”* (Igiehon, 2024). Such a broad definition will inevitably capture most green marketing claims a firm intends to make. However, it also extends to environmental labelling schemes applied in business-to-consumer (B2C) commercial practices.

Under the GCD, firms making environmental claims will be required to support these claims through scientific, life-cycle-based assessment evidence and must ensure the claims are clear as to their scope (e.g., whether they pertain to the whole product or a part thereof) and the environmental characteristic concerned (e.g., durability, recyclability, or biodiversity impact). Crucially, the Directive outlines that firms cannot just focus on the positive elements of their environmental impact. For example, a bank with one percent of its energy portfolio in renewables should not mention this without also outlining its support for fossil fuels. Similarly, if a business has made a move to reduce carbon emissions but which will drive up its plastic pollution, or vice-versa, customers should be informed of the full impact of this change (George, 2023). Moreover, the GCD requires verification of any claim by independent, accredited conformity-assessment bodies, before the claim is released to the public. Finally, environmental labels (whether public or private) will have to meet EU-level criteria for independence, transparency and methodological soundness, and private labelling schemes will be discouraged or subject to authorisation.

The GCD only provides for a minimum regime on environmental claims and labels. This means that there will be 27 different applications of the GCD over the EU Member States, with it being possible for the latter to adopt higher standards than the ones provided under the GCD (Igiehon, 2024). Whilst EU Member States can decide on the specific enforcement, the GCD mandates that penalties must be “*effective, proportionate and dissuasive*”. Moreover, it explicitly provides that Member States set rules under which fines may amount to at least four percent of the firm’s annual turnover in the State(s) concerned. For widespread or cross-border infringements, other measures such as confiscation of revenues derived from the offending transaction and temporary exclusion from public procurement processes are also envisaged. Micro-enterprises, defined as those with fewer than 10 employees and with annual turnover not exceeding €2 million, are proposed to be exempted from the GCD’s environmental verification obligations.

Appendix A.1 provides a more detailed overview of the GCD's coverage, key provisions, and enforcement mechanisms (European Commission, 2023b). Appendix A.2 outlines how the GCD relates to previous environmental regulation in the EU and United States (US).

4. Empirical design

In this section, we outline the identification of GCD adoption dates, the sample selection, the event study methodology, the explanatory variables, and the cross-sectional regression methodology used in our study.

4.1. Identification of GCD adoption event dates

A critical element in any study of investor responses to new policy is the accurate identification of event dates. Consistent with Cousins et al. (2020), we identify a relevant event date as a day on which credible relevant incremental information related to the adoption of the GCD was publicly revealed. In line with Hendricks et al. (2015), we use time stamp information on the press releases associated with the announcements to convert calendar dates into event dates. If the announcement occurs before the stock market closes on a trading day, we use that calendar day as the announcement date. If the announcement is made after the stock market closes on a trading day, or at any time on a nontrading day, we use the next trading day as the relevant event date. Using Factiva, a business information and research database owned by Dow Jones & Company including newspapers, magazines, and newswires, we identify six relevant dates associated with credible new information increasing the likelihood of the adoption of the GCD.

The EU's legislative process typically begins with a proposal from the European Commission, which sets out the objectives and main provisions of the law. The proposal is then reviewed by advisory bodies, such as the European Economic and Social Committee (EESC), and discussed by the European Parliament and the Council of the EU.³ The Parliament and

³ EESC opinions capture civil-society and social-partner views on proposed legislation. Obtaining this opinion is a mandatory step of the EU's legislative procedure.

Council may propose amendments, negotiate compromises, and eventually adopt the legislation. Once formally adopted, Member States must transpose the directive into national law within a set timeframe, after which it becomes applicable (European Union, n.d.b.).

The adoption of the Green Claims Directive (GCD) largely mirrored this process, moving from a Commission proposal through advisory reviews and interinstitutional negotiations. Our Factiva search identifies six key dates associated with the GCD's adoption, on which investors likely updated their priors regarding its likelihood of being eventually implemented. We briefly outline these event dates below and summarize them in Table 1.

<< Please insert Table 1 here >>

On March 22, 2023 (Event 1), the European Commission formally adopted and published the proposal for the GCD (European Commission, 2023b). On June 14, 2023 (Event 2), the European Economic and Social Committee (EESC) adopted its opinion on the GCD proposal. The EESC's opinion on the GCD was overall supportive, thereby increasing the likelihood of this regulation being adopted (EESC, 2023). On September 19, 2023 (Event 3), the Council of the EU and European Parliament reached a provisional agreement on the Empco Directive, which complements the GCD by focusing on consumer protection measures such as mechanisms against early obsolescence (Council of the EU, 2023; please see Appendix A.2 for a more elaborate description). While not pertaining to the GCD itself, this event likely served as an important signal for investors that there was a strong political will within the EU to regulate green claims for consumer protection purposes. On November 28, 2023 (Event 4), the European Parliament's Committee on the Internal Market and Consumer Protection took important procedural steps that moved the GCD from a European Commission proposal toward a joint committee consideration, which is a necessary stage before interinstitutional talks with the Council of the EU (European Parliament, 2023). On March 12, 2024 (Event 5), the GCD was adopted by the European Parliament at first reading, with 467 votes in favour, 65 against and 74 abstentions (European Parliament, 2024). The Parliament's amendments mainly

enhanced and operationalized the rules rather than altering the fundamental approach. The main changes with respect to the original GCD proposal included delayed application and exemptions for smaller businesses, strengthened requirements for the independent verification of environmental claims and labelling schemes, and stricter rules for climate-related claims (including the use of carbon credits). Importantly, however, the core elements of the original Commission proposal from March 22, 2023 remained unchanged. Finally, on June 17, 2024 (Event 6), the Council of the EU adopted its general approach on the GCD, implying that it had achieved a unified negotiating position on the proposed legislation (Council of the EU, 2024). Whilst keeping the key elements of the GCD intact, the Council's position introduced some amendments compared to the original European Commission proposal. Notably, it allowed exemptions for certain claims or eco-labelling schemes from third-party verification, introduced a simplified procedure for some environmental claims under defined conditions, and provided greater flexibility regarding climate-related claims involving carbon credits.

Even though media articles mention some pushback from agricultural and wool firms against the GCD (Textiletechnology.net, 2024; Nugent, 2024), the Directive's adoption was considered extremely likely from its first announcement, with the perceived likelihood of adoption increasing after each event date. Following Event 6 and the closed-door trilogue negotiations between the European Commission, the European Parliament, and the Council of the EU—whose content was not reported in the media and therefore could not reasonably have been known to investors—the Directive was clearly on course to enter into force in summer 2025. As with any EU Directive, Member States would then have 18 months to transpose it into national law, followed by a further six months before its provisions would apply. The European Commission expected the GCD to be fully applicable within two years of entry into force (Igiehon, 2024).

Following Akyol et al. (2012), we conduct a systematic search of Factiva to identify major macroeconomic announcements that could plausibly affect stock price reactions on the six

event dates. We find no evidence of such events. As in any event-study setting, firm-specific news with cash-flow implications may coincide with the announcement dates (McWilliams & Siegel, 1997). Such overlap would, if anything, introduce measurement noise rather than a systematic directional bias in the investor responses. To minimize this concern, we employ an event window that is as narrow as possible, focusing on the announcement dates only in our main analyses.

4.1 Sample

In a first step of the sample collection process, we download all listed firms headquartered in the EU 27 countries from the Orbis Global database established by Bureau Van Dijk with stock price info surrounding our events, resulting in 4,258 observations. Second, we remove all micro-enterprises from our dataset, as some of the GCD's provisions do not apply to them.⁴ This leaves us with 2,885 firms. This sample further reduces to 1,524 firms in our multivariate analysis due to availability requirements for the variables used in the baseline cross-sectional tests of stock price reactions. Figure 2 reports the geographical distribution of the latter sample. In total, 20 EU countries are represented in our dataset, with Germany, Finland, France, Italy and Sweden accounting for 66.54% of the observations.

<< Please insert Figure 2 here. >>

Appendix A.3 presents the sample's industry composition, illustrating that the manufacturing industry accounts for more than one-third (38.25%) of observations.

4.2 Event study methodology

We build on Schipper and Thompson's (1983) event study methodology for the univariate analysis of stock price responses where event dates are the same for all firms (Knittel & Stango, 2014; Cousins et al 2020). We focus on the combined stock price response across all six events

⁴ We define micro-enterprises as firms with less than ten employees and less than two million euros in annual revenues, consistent with the GCD's definition (Igiehon, 2024). Firms with missing sales or employment data are removed to avoid misclassification.

associated with the adoption of the GCD, consistent with other previous policy event studies (e.g., Zhang 2007, Armstrong et al. 2010; Grewal et al. 2019; Florackis et al., 2025). We estimate equation (1) over a window from 200 trading days prior to the first GCD adoption event on March 22, 2023 to twenty trading days after the final GCD adoption event on June 17, 2024.

$$R_{p,t} = \alpha_p + \beta_p \times R_{m,t} + \gamma_p \times D_t + \varepsilon_{i,t} \quad (1)$$

The dependent variable $R_{p,t}$ captures the value-weighted return on the portfolio of sample firms, with as weights their market capitalizations as of December 31, 2022. $R_{m,t}$ is the return on the market index, for which we use the MSCI World ex-Europe index. The Pearson correlation between the value-weighted returns on the portfolio of sample firms and the return on this market index over the estimation period (excluding the event dates) equals 0.689, confirming its suitability to capture “counterfactual” returns for the sample firms had the events not taken place. D_t is an indicator variable that equals one in one of the six GCD adoption event windows (i.e., either the announcement date or a three-day window centered around the announcement date) and zero on all other days in the estimation window. As such, its coefficient γ_p captures the average abnormal return per event, estimated across the six events combined (Lewis & Verwijmeren, 2014). In addition to examining the stock price reaction over the six events combined, we also use the following regression equation to verify the abnormal returns associated with each individual GCD adoption event through six separate dummy variables:

$$R_{p,t} = \alpha_p + \beta_p \times R_{m,t} + \sum_{k=1}^6 \gamma_{p,k} \times D_{t,k} + \varepsilon_{i,t} \quad (2)$$

All regression parameters are defined as in equation (1), with the exception of the $D_{t,k}$ dummy variables and their coefficients $\gamma_{p,k}$. $D_{t,k}$ now equals one on the announcement date of the respective GCD adoption event and zero otherwise, while $\gamma_{p,k}$ captures the average abnormal stock return for event k for the sample firms.

4.3. Explanatory variables

We use the following variables to test our hypotheses regarding the moderating role of *Environmental Legitimacy Deficit (ELD)*, *Environmental Legitimacy Materiality (ELM)*, and *Resource Constraints* on the relationship between anti-greenwashing regulation and shareholder value. Appendix A.4 provides a detailed description of all variables and their sources.

We identify three factors that may contribute to a firm having a higher *ELD*. First, a firm may have a history of greenwashing incidents. We capture this using a *Greenwashing* dummy based on the RepRisk database, which records ESG-related incidents reported in media, government, and other public sources. The indicator is set to one if a firm experienced at least one RepRisk flag in 2022 (the year preceding the first GCD adoption event) that involved both an environmental issue and either misleading communication or fraud. This definition is broadly consistent with RepRisk's characterization of greenwashing as the co-occurrence of an ESG incident and corporate misrepresentation (RepRisk, 2024).

We also construct separate *Greenmisleading* and *Greenfraud* dummies. *Greenmisleading* equals one for firms involved in environmental incidents with misleading communication, while *Greenfraud* equals one for environmental incidents with fraudulent reporting. For instance, German car manufacturer BMW is coded *Greenmisleading* = 1, following allegations from the Danish Parliamentary Ombudsman in 2022 that its marketing portraying it as a “sustainable car producer” could mislead consumers (Foget, 2023). Spanish energy company Repsol, in turn, is coded *Greenfraud* = 1 after a major oil spill at its La Pampilla refinery in Peru in 2022, where authorities sanctioned the firm for materially understating the spill's size and impact (Infobae, 2024). These examples illustrate the distinction: *Greenmisleading* captures misleading claims in the absence of a major environmental incident, whereas *Greenfraud* involves misrepresentation about an actual environmental event, e.g. an oil spill. We treat both as forms of greenwashing to reflect investors' comprehensive assessment of a

firm's *ELD*, although *Greenmisleading* is arguably more directly aligned with the type of greenwashing addressed by the GCD.

Second, according to Delmas & Burbano (2011), a weak regulatory environment is a key driver of greenwashing. We therefore expect firms domiciled in EU countries with less effective corporate regulatory frameworks to have a higher *ELD*, as stakeholders may have a lower trust in the firms' environmental claims. Our country-specific *Regulatory quality* measure is based on the World Governance Indicators from the World Bank.

Third, building on Cohen & Levinthal (1990), Research and Development (*R&D*) investment is central to a firm's ability to develop and implement genuine innovations. Firms with low *R&D* intensity therefore lack a credible foundation for firm-specific technological or process improvements, which may ultimately undermine their environmental legitimacy, as claims about the greenness of products or processes are more likely to be interpreted as symbolic rather than reflecting verifiable, innovation-driven performance. We thus expect firms *R&D* intensity to have lower perceived environmental legitimacy and a higher *ELD*.

To capture *ELM*, we also use three variables. First, given that the GCD explicitly states that non-complying firms may be excluded from government procurement, we expect *ELM* to be higher for firms in industries heavily dependent on government contracts. We construct a *Government contracts* dummy equal to one for firms in the defence or construction industries, which are particularly reliant on government procurement. Second, *ELM* is expected to be higher for firms in consumer-facing industries, since the GCD primarily concerns business-to-consumer (rather than business-to-business) environmental communications. Accordingly, we construct a *Consumerfacing* dummy equal to one for firms in transportation, retail, hospitality, personal services, and leisure/recreation, consistent with Lee et al.'s (2021) identification of consumer-facing sectors. Third, we argue that *ELM* is higher for firms with greater *Institutional ownership*, as large investors often have mandates to allocate capital to sustainable firms, making environmental legitimacy more cash-flow critical (Florackis et al., 2025).

We capture firms' *Resource Constraints* using cash holdings (*Cash*), return on assets (*ROA*), and long-term debt (*LTD*). Firms with lower cash levels, lower profitability, or higher debt are likely to be more constrained in meeting the additional resource demands imposed by the GCD.

Finally, we include several control variables. *Analysts* (the number of analysts following a firm) is commonly used as a proxy for the degree of information asymmetry between firm insiders and outsiders (Lang & Lundholm, 1996; Healy & Palepu, 2001). Because the GCD may force firms to disclose previously private information to substantiate environmental claims, it can impose proprietary costs by revealing competitively sensitive information (Dye, 1986). These costs are likely more pronounced for firms with higher ex ante information asymmetry, leading us to predict a positive association between analyst coverage and stock price reactions to the GCD (Ellis et al., 2012). We also control for the firm's investment policy (*Capex*) and total assets (*Size*), without specific predictions regarding the direction of their effects. We include *Intangibles*, capturing the firm's reported intangible assets, as an additional measure of information asymmetry, with the same predicted effect as *Analysts*. Prior research shows that firms relying more on intangible assets face higher information asymmetry because such assets are difficult to value and disclose credibly to external investors (Gu & Wang, 2005; Wu & Lai, 2020). All continuous variables are winsorized at the 2.5% and 97.5% levels to reduce the influence of outliers. To avoid a simultaneity bias, we use the most recent value of the explanatory variables prior to the first event.

Table 2 reports the summary statistics of the explanatory variables. Approximately eight percent of our sample firms have been caught up in *Greenwashing* incidents. Our sample firms have a large *Size* (average total assets of 8.42 billion euros), are profitable (average *ROA* of 2.4%) and have considerable leverage (average *LTD* of 20.5%), consistent with European firms being typically in a quite mature stage before they become stock-listed, and with the fact that we removed micro-enterprises from the sample.

< Please insert Table 2 here >

Appendix A.5 presents the Pearson correlation matrix for the independent variables. *Greenwashing* and *Greenmisleading*, as well as *EPI* and *Trust* (defined in a subsequent robustness test), exhibit correlations exceeding 0.8. However, because these variable pairs are never included jointly in the same specification, these correlations do not pose concerns regarding multicollinearity. The maximum Variance Inflation Factor (VIF) in our main cross-sectional regression is 2.71, which is well-below the commonly used threshold of five.

4.4. Cross-sectional regression methodology

We use the announcement-date (day 0) firm-specific cumulative abnormal return (*CAR*) as our dependent variable for the cross-sectional regression analysis. We focus exclusively on day 0-returns because we are confident in the accuracy of our identified announcement dates (as only six dates required verification) and because this approach helps minimize noise from confounding events (Larcker et al., 2011).

To obtain the *CAR*, we first run the following model for each of the 1,524 firms in our multivariate baseline sample over a window from 200 trading days prior to the first event on March 22, 2023 to twenty trading days after the event on June 17, 2024.

$$R_{i,t} = \alpha_i + \beta_i \times R_{m,t} + \gamma_i \times D_t + \varepsilon_{i,t} \quad (3)$$

All regression parameters follow the definitions in equation (1), with the sole modification that individual stock returns $R_{i,t}$ replace sample-portfolio returns as the dependent variable. As such, the coefficient γ_i reflects the average abnormal stock price effect across the six event dates. We then calculate the total (cumulative) abnormal returns (CAR_i) by multiplying the estimated coefficient γ_i by the number of event dates (six). We use the following regression specification as our baseline model.

$$\begin{aligned} CAR_i = & \beta_0 + \beta_1 \times \text{Greenwashing} + \beta_2 \times \text{Regulatory quality} + \beta_3 \times \text{R\&D} \\ & + \beta_4 \times \text{Government contracting} + \beta_5 \times \text{Consumerfacing} + \beta_6 \times \text{Institutional ownership} \\ & + \beta_7 \times \text{Cash} + \beta_8 \times \text{ROA} + \beta_9 \times \text{LTD} + \beta_{10} \times \text{Analyst} + \beta_{11} \times \text{Size} + \beta_{12} \times \text{Capex} \\ & + \beta_{13} \times \text{Intangibles} \end{aligned} \quad (4)$$

5. Shareholder value impact of greenwashing regulation: Baseline test results

5.1. Univariate results

Panel A of Table 3 reports the average and cumulative stock price reaction across all six events combined. We estimate equation (1) to obtain the coefficient capturing the average abnormal return per event and multiply this coefficient by six to compute the total stock price reaction. Row (1) focuses on the announcement dates only, while row (2) considers a wider three-day window centered on the announcement dates. Across both specifications, we find no statistically significant abnormal returns. Panel B corroborates this conclusion by estimating abnormal returns separately for each event date using the date-specific dummy variables defined in equation (2). None of the individual events is associated with a significant stock price reaction. Taken together, these results indicate that the adoption of the GCD does not generate a statistically significant average market reaction for covered EU firms.

Importantly, an insignificant average effect does not preclude economically meaningful heterogeneity in firm-level responses. Figure 3 shows substantial dispersion in abnormal returns across firms, suggesting that market reactions to GCD announcements vary systematically with firm characteristics. Consistent with this interpretation, unreported tests reveal similarly pronounced dispersion when using the full sample of 2,885 firms. This heterogeneity motivates our subsequent analysis of the drivers of cross-sectional variation in stock price reactions.

<< Please insert Figure 3 here >>

5.2. Cross-sectional results

Table 4, column (1) presents the baseline cross-sectional results. The R^2 is below ten percent, which is consistent with other policy event study results and can be explained by the high noise-to-signal ratio of information embedded in daily stock returns (Liberti & Petersen, 2019).

<< Please insert Table 4 here >>

For the *ELD* proxy variables, we find a significantly positive effect of *Greenwashing* and significantly negative effects of *Regulatory quality* and *R&D*, consistent with H_{2a} , which

predicts that anti-greenwashing legislation is more valuable for firms with a higher environmental legitimacy deficit. For the *ELM* proxy variables, *Government contracts* and *Institutional ownership* have significantly positive coefficients, suggesting that the legislation is more valuable for firms for which environmental legitimacy is more material, as H_{3a} predicts. In contrast, the *Consumerfacing* dummy is not statistically significant. One possible explanation is that, although some provisions of the GCD primarily affect business-to-consumer firms, other GCD elements such as eco-labelling requirements apply more broadly, including to business-to-business firms. As a result, investors may not perceive the consequences of the legislation to be materially weaker for non-consumer-facing firms.

Turning to *Resource Constraints* proxies, only *LTD* is statistically significant, with the predicted negative sign. The lack of broader support for hypothesis H₄ may reflect the composition of our sample: as shown in the descriptive statistics in Table 2, the firms in our sample are generally large and profitable, and thus likely able to absorb the compliance costs associated with the GCD. None of the control variables are statistically significant.

In column (2), we replace *Greenwashing* with *Greenmisleading* and *Greenfraud*. We find that only *Greenfraud* has a significant positive effect on stock price reactions, whereas *Greenmisleading* is not significant. This result is somewhat unexpected, as *Greenmisleading* more closely aligns with the type of conduct explicitly targeted by the GCD. One possible explanation is that *Greenfraud* captures more severe incidents in which firms both experience an environmental incident and engage in fraudulent communication about it. Investors may view such incidents as a stronger signal of a high environmental legitimacy deficit than “mere” misleading environmental claims, as captured by *Greenmisleading*.

6. Shareholder value impact of greenwashing regulation: Additional test results

6.1. Heckman test controlling for self-selection in greenwashing detection

Unobservable firm characteristics may jointly influence the likelihood that a firm engages in greenwashing and the stock price reaction to the GCD. To address this concern, we re-estimate the announcement return regression using a two-step Heckman (1979) selection model, following Li and Prabhala (2007). Table 5 reports the results.

The first stage consists of a probit analysis of the determinants of *Greenwashing*. The explanatory variables are the same as those included in the announcement return regression, as the costs and benefits of engaging in greenwashing should fundamentally align with (but mirror) those associated with those of greenwashing legislation. For identification purposes, we additionally include a *Hightech* dummy variable capturing high-technology firms. We expect *Hightech* to positively affect *Greenwashing*. High-technology firms typically rely more heavily on intangible assets and operate more opaque production processes (Dutordoir et al., 2025). As a result, their environmental claims may be subject to weaker external verification, increasing the scope for selective disclosure and greenwashing (Marquis et al., 2016; Wu et al., 2020).

The results reported in column (1) indicate that *Consumerfacing* firms are more likely to engage in greenwashing. The benefits of doing so could be larger when dealing with consumer clients, who may be more responsive to symbolic signals of environmental performance than business clients. We also document a negative effect of *LTD* and positive effects of *Analysts* and *Size*. To the extent that the latter variables capture firms' visibility to stakeholders, these findings are consistent with higher stakeholder scrutiny increasing firms' incentives to engage in greenwashing. In addition, we find a positive impact of *Capex* and negative impacts of *Intangibles* and *Hightech*. The latter two results suggest that firms with harder-to-value, more opaque assets exhibit a lower propensity to greenwash, contrary to our prior expectation.

The second stage of the Heckman (1979) procedure involves estimating the same announcement return regression as in the baseline specification (Table 4), augmented by the *Inverse Mills Ratio (IMR)* obtained from the first stage (computed as described in Appendix A.4). *Greenwashing* retains a positive and statistically significant effect. The *IMR* itself is not

statistically significant, and none of the other coefficients change materially. Overall, these findings indicate that our baseline results are unlikely to be driven by self-selection in the identification of greenwashing firms.

<< Please insert Table 5 here >>

6.2. *Alternative specifications of the baseline regression*

We next assess the robustness of the baseline regression to the inclusion of alternative or additional proxy variables. Table 6 reports the results, and all additional variables are defined in Appendix A.4. In column (1), we replace *Regulatory quality* with *Trust*, a country-level measure capturing respondents' agreement with the statement that "most people can be trusted." We expect firms domiciled in lower-trust countries to exhibit a higher *ELD*, as both firms' environmental credentials and government enforcement efforts are likely perceived as less credible by stakeholders, including investors. Consistent with this prediction, we find a negative effect of *Trust* on stock price reactions.

In column (2), we substitute *Regulatory quality* with a country-level *Environmental Performance Index (EPI)*. We again expect a negative effect, as firms headquartered in countries with weaker environmental performance are likely to face higher *ELD*. Our results align with this expectation.

Firms with highly valuable brands may be subject to greater stakeholder scrutiny regarding *Greenwashing* and therefore experience both the potential benefits (enhanced legitimacy) and costs (expensive transitions from symbolic to substantive environmental performance) of anti-greenwashing regulation more strongly. To examine the moderating role of brand value, column (3) includes a dummy variable equal to one for firms listed in Interbrand's *Best Global Brands* ranking as of 2022. Only a small fraction of sample firms is covered, which is unsurprising given that the ranking includes only the 100 best global brands. We find a negative effect of the *Interbrand* dummy, suggesting that firms with the most valuable brands are more adversely affected by anti-greenwashing legislation.

In column (4), we control for firms' environmental performance using Refinitiv Eikon's environmental score (*E-score*), reflecting the idea that investors may rely on such scores to further assess firms' *ELD*. Unlike *Greenwashing*, however, the *E-score* does not significantly affect shareholder value reactions to the GCD. One possible explanation is the substantial uncertainty surrounding environmental performance scores (Berg et al., 2022), leading investors to place greater weight on observable environmental incidents rather than on scores derived largely from self-reported information.

Finally, column (5) introduces a *Carbon offsets* dummy equal to one for firms reporting the use of carbon offsets. The GCD highlights that claims such as "carbon neutral" or "CO₂ compensated" are particularly prone to being unclear or misleading (European Commission, 2023b). It therefore requires offsets to be reported separately from emission reductions and to be accompanied by transparent disclosure of methodologies and coverage (European Commission, 2023b). This skepticism could imply a higher *ELD* for firms relying on *Carbon offsets*, predicting a positive (negative) effect under H_{2a} (H_{2b}). However, we find no significant impact of this variable. One potential explanation is that, over the GCD-adoption event dates considered, the GCD's treatment of carbon offsets became less clearly defined, as successive amendments introduced ambiguity regarding the permissibility of offset-based claims. This uncertainty may have weakened carbon offsetting as a clear signal of environmental legitimacy, consistent with the nonsignificant effect observed.

<< Please insert Table 6 here >>

6.3. Analyzing additional event dates

The six GCD event dates underpinning our baseline tests capture official announcements that, in the eyes of investors, materially increased the likelihood of the legislation's adoption. In addition to these dates, our media search identified two rumor-based disclosures related to the GCD's progression. First, on January 20, 2023, approximately two months prior to the official announcement, the Euractiv website published an article titled "*Leak: EU to slap*

penalties on companies making false green claims.” Although the article did not provide substantive details on the GCD, it signaled that anti-greenwashing legislation was imminent (Simon, 2023). Second, a leaked draft compromise update dated May 22, 2024, obtained by Euronews, indicated modest relaxations of the carbon-offsetting provisions embedded in the GCD draft, while maintaining the overall structure of the proposal (Euronews, 2024). Appendix A.6 presents a univariate analysis of stock price reactions to these two leaks, using an event study methodology analogous to that employed in our baseline tests. Consistent with their limited informational precision, we find no significant investor response to either leak. To avoid introducing unnecessary noise, we therefore exclude these two dates from our main analysis.

While the timeline covered in the baseline analysis reflects a period during which GCD adoption appeared highly likely, the momentum shifted in January 2025. On January 27, 2025, an online article suggested that, although trilogue negotiations were forthcoming, the legislation faced mounting challenges from co-legislators in both the Parliament and the Council, who sought to narrow its scope (Machado, 2025). The article further reported that several Member States favored a weaker verification regime for environmental claims, despite verification having been a central “unique selling point” of the GCD proposal. It also noted that the Council intended to permit green claims based on offsetting environmental impacts—an approach widely criticized for enabling further greenwashing. Based on our comprehensive media search, this article constitutes the first public indication of a substantive change in the political momentum surrounding the GCD’s adoption and content. It likely prompted investors to reassess the probability that the EU would ultimately enact legislation capable of meaningfully constraining greenwashing.

The shift culminated on June 20, 2025, when the European Commission formally announced its intention to withdraw the GCD following last-minute opposition from the centre-right European People’s Party. The associated reporting framed the withdrawal as part of a broader political movement toward regulatory simplification in the wake of the EU Parliament’s

rightward shift (Agence France Presse, 2025). The announcement was met with substantial pushback from companies and non-governmental organizations advocating for the legislation's adoption without dilution (Carbon Market Watch, 2025). As of the time of writing of this paper, the GCD remains abolished, with uncertainty surrounding its future.

Table 7 presents univariate event-study results for the two “withdrawal” event dates. Consistent with the insignificant reactions observed for the adoption-related events, we find no significant stock price responses to the withdrawal announcements.

<< Please insert Table 7 here >>

Table 8 replicates the baseline cross-sectional regression using the *CAR* over the two withdrawal events as the dependent variable. If investors interpreted the withdrawal announcements as reversing the expected benefits and costs associated with anti-greenwashing legislation, we would expect the signs of the significant coefficients in Table 4 to invert in Table 8. However, we find no systematic evidence of such reversals. The only exception is *LTD*, which exhibits a positive coefficient that is opposite in sign to its negative effect in Table 4. A plausible interpretation is that investors in highly levered firms experienced relief upon learning of the withdrawal, reflecting concerns that such firms may face resource constraints in complying with stringent anti-greenwashing requirements.

We also observe positive coefficients on *Analysts* and *Size*, which were both insignificant in the baseline regression. This pattern suggests that investors in firms with greater stakeholder visibility may have welcomed the GCD withdrawal.

<< Please insert Table 8 here >>

Nevertheless, the overall pattern of largely nonsignificant results in Table 8 indicates that investors view the anticipated benefits and costs of anti-greenwashing legislation as relatively sticky and not easily undone by withdrawal announcements. One interpretation is that investors perceive the withdrawal as a temporary pause rather than a definitive abandonment of regulatory efforts. Another is that they expect firms to internalize the reputational and

operational implications of anti-greenwashing standards irrespective of formal legislative adoption.

6.4. Capturing environmental claims

The GCD, in essence, regulates firms' environmental claims. Consequently, if a firm refrains from making such claims, the regulation could be less relevant to that firm.⁵ To distinguish empirically between firms that do and do not make environmental claims, we prompted Copilot, an Artificial Intelligence assistant embedded in Microsoft 365, to identify environmental claims made during 2022 by 60 randomly selected firms from the sample used in our cross-sectional analysis. Appendix A.7 provides the prompt we used. The search results indicate that all 60 firms made at least one environmental claim. We consider this finding representative of our broader sample and conclude that the GCD is relevant for all firms in our dataset.

A plausible interpretation for this universal presence of environmental claims is that the large, publicly listed European firms in our dataset operate under substantial institutional, regulatory, and stakeholder pressure to communicate their environmental performance. These firms are subject to extensive sustainability reporting requirements, and heightened scrutiny from several stakeholders. In such an environment, making environmental claims, whether through sustainability reports, corporate websites, or marketing materials, has become a de facto component of corporate communication (Cho et al., 2015).

6.5. Placebo analysis of stock price reactions

In a final robustness test, we conduct a placebo analysis consistent with Cousins et al. (2020) and Dutordoir et al. (2024), to assess whether the estimated determinants of greenwashing could arise from random variation in event timing. Over 2,000 iterations, we draw 500 firms and each time assign six randomly selected pseudo-event dates. We re-estimate the baseline specification

⁵ One could still argue, though, that a non-claiming firm may intend to make environmental claims in the future, or that the GCD could nonetheless strengthen the firm's competitive position by constraining competitors' ability to make misleading claims.

for each iteration and compare the actual coefficients of the variables found to be significant in Table 4 to the resulting placebo distribution. Appendix A.8 visualizes the results. Overall, the placebo test supports the notion that the main significant results are not spurious, as the associated variables do not affect stock price reactions on randomly-generated event dates. Only *R&D Intensity* falls near the center of the placebo distribution, indicating a weaker and potentially less robust association.

7. Conclusions

7.1. Summary of key findings

This study examines how investors respond to the introduction of anti-greenwashing regulation, using the European Union's Green Claims Directive (GCD) as an empirical setting. Drawing on legitimacy theory and resource dependence theory, we develop competing predictions regarding the direction of the stock market response and identify and test three contingencies shaping this relationship. Our empirical analyses reveal that, although the average stock price reaction to the GCD's announcement is statistically insignificant, this aggregate effect masks substantial cross-sectional heterogeneity that is highly consistent with a legitimacy viewpoint on anti-greenwashing legislation, rather than with a resource dependence viewpoint.

Specifically, we find strong support for H_{2a} , which predicts that firms with a higher *Environmental Legitimacy Deficit (ELD)* experience more favorable investor reactions. Firms previously implicated in greenwashing, domiciled in countries with weaker regulatory environments, or exhibiting lower innovation capabilities all benefit disproportionately from the GCD's introduction. This suggests that investors view the Directive as a mechanism that helps legitimacy-deficient firms credibly signal substantive environmental commitment, thereby reducing the risks associated with symbolic decoupling. We find no evidence supporting H_{2b} , indicating that concerns about higher required resources for these low-*ELD* firms do not dominate investors' assessments.

Similarly, our results provide support for H_{3a}, which posits that firms with higher *Environmental Legitimacy Materiality (ELM)* respond more positively to anti-greenwashing regulation. Firms reliant on government contracts and those with substantial institutional ownership (i.e., contexts in which environmental legitimacy is financially consequential) experience more favorable stock price reactions. These findings reinforce the idea that the GCD enhances the credibility of environmental claims precisely where such credibility matters most for future cash flows. We find no support for H_{3b}, suggesting that investors do not perceive the GCD as imposing disproportionate resource burdens on firms for whom environmental legitimacy is especially cash-flow-relevant.

Evidence for H₄, which predicts more negative investor responses for resource-constrained firms, is limited. Together, our cross-sectional results suggest that investors primarily interpret anti-greenwashing regulation through a legitimacy-enhancing lens rather than a cost-imposing one.

Our follow-up analysis of investor reactions to the EU's 2025 announcement of its intention to withdraw the GCD further strengthens this interpretation. We find no reversal of the legitimacy-related gains observed for firms with high *ELD* or high *ELM*, suggesting that the legitimacy benefits conferred by the GCD are “sticky”. Even when the immediate likelihood of anti-greenwashing regulation recedes, investors appear to believe that firms will internalize the expectations set by the Directive or that similar regulatory efforts will re-emerge.

7.2. *Theoretical and methodological contributions*

This study advances theory on organizational legitimacy by demonstrating that regulatory interventions can convert symbolic legitimacy into substantive legitimacy, particularly for firms with high legitimacy deficits or high legitimacy materiality. Prior research has largely focused on voluntary legitimacy-enhancing or -reducing actions, while our findings show that regulation can also play a pivotal role in reshaping legitimacy dynamics and in reducing the scope for symbolic decoupling.

Our methodological contribution lies in using investor reactions to ethics-related regulation as a forward-looking measure of the net cash-flow consequences of legitimacy shifts. This approach complements traditional survey- or disclosure-based measures and offers a powerful tool for assessing the economic implications of ethical regulation in capital markets. We also contribute to the policy event study literature by examining both the introduction and the abolishment of regulation within a single event-study framework. Our findings show that the legitimacy-enhancing benefits of regulation, as perceived by investors, are not undone when the regulation is later abolished. This asymmetry highlights the durability of legitimacy once established through regulatory intervention. In an era of heightened regulatory uncertainty—for instance, the recent revocation of the EU AI Liability Directive (European Parliament, 2025)—these insights also inform broader theory-building on the shareholder value implications of regulation.

7.3. Policy implications

Our findings carry important implications for policymakers. The absence of a negative average stock market reaction suggests that anti-greenwashing regulation does not impose undue financial burdens on firms overall. Instead, the regulation appears to generate legitimacy benefits for firms most in need of them, without triggering widespread investor concern about compliance costs. This should reassure policymakers that well-designed anti-greenwashing legislation can enhance market integrity without undermining firm value.

Moreover, our results indicate that regulatory initiatives can shape market expectations in durable ways, even in the face of political uncertainty. Finally, the heterogeneity in investor responses underscores the importance of tailoring regulatory design to the legitimacy profiles of different firms, ensuring that regulation effectively targets misleading practices without imposing disproportionate burdens.

Taken together, our findings reveal that anti-greenwashing regulation can meaningfully reshape the legitimacy landscape in capital markets. By enhancing the credibility of

environmental claims and reducing the scope for symbolic decoupling, such regulation can create tangible value for firms for whom environmental legitimacy is strategically salient. In doing so, it offers a pathway for transforming symbolic legitimacy into substantive legitimacy—an outcome that is both ethically desirable and economically consequential.

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Table 1. Defining events in the adoption of the Green Claims Directive

This table provides the exact date and description of six key events associated with the adoption of the Green Claims Directive. Source: our own compilation, based on sources obtained from Factiva and the internet.

Date	Description
March 22, 2023	European Commission formally adopts and publishes the proposal for the GCD
June 14, 2023	European Economic and Social Committee (EESC) adopts its opinion on the GCD
September 19, 2023	Council of the EU and European Parliament reached a provisional agreement on the Empco Directive, which complements the GCD
November 28, 2023	GCD is moved toward a joint committee consideration
March 12, 2024	European Parliament adopts the GCD at first reading
June 17, 2024	Council of the EU achieves a unified position on the GCD

Table 2. Descriptive statistics for explanatory variables

This table shows descriptive statistics for the independent variables used in the cross-sectional analysis for our sample of 1,524 European listed firms. Variables are winsorized at the 2.5% and 97.5% percentile. Appendix A.4. provides detailed variable definitions and sources. St.Dev. denotes the standard deviation. Q1 and Q3 denote the first and third quartile of the variable's distribution. While the natural logarithm of total assets is used in the regression models, we report monetary values for full transparency here.ⁱ

	<i>N</i>	Mean	St. Dev.	Min.	Q1	Median	Q3	Max.
Baseline variables								
Greenwashing	1,524	0.083	0.276	0.000	0.000	0.000	0.000	1.000
Greenmisleading	1,524	0.073	0.261	0.000	0.000	0.000	0.000	1.000
Greenfraud	1,524	0.033	0.180	0.000	0.000	0.000	0.000	1.000
Regulatory quality	1,524	1.291	0.509	0.300	1.180	1.530	1.690	1.960
R&D	1,524	0.034	0.098	0.000	0.000	0.000	0.012	0.518
Government contracts	1,524	0.060	0.238	0.000	0.000	0.000	0.000	1.000
Consumerfacing	1,524	0.085	0.279	0.000	0.000	0.000	0.000	1.000
Institutional ownership	1,524	0.668	0.471	0.000	0.000	1.000	1.000	1.000
Cash	1,524	0.136	0.134	0.005	0.047	0.093	0.174	0.620
ROA	1,524	0.024	0.115	-0.417	0.008	0.040	0.077	0.226
LTD	1,524	0.205	0.147	0.002	0.081	0.186	0.301	0.565
Analysts	1,524	4.164	3.846	1.000	1.000	3.000	6.000	15.000
Size ⁱ	1,524	8.415	2.270	0.022	0.187	0.957	4.966	149.950
Capex	1,524	0.031	0.034	0.000	0.008	0.020	0.042	0.149
Intangibles	1,524	0.230	0.213	0.000	0.041	0.167	0.381	0.748
Additional variables								
Hightech	1,524	0.549	0.498	0.000	0.000	1.000	1.000	1.000
Trust	1,524	0.420	0.163	0.169	0.263	0.410	0.570	0.739
EPI	1,524	0.638	0.073	0.506	0.577	0.625	0.727	0.779
Interbrand	1,524	0.010	0.099	0.000	0.000	0.000	0.000	1.000
E-score	1,024	0.555	0.238	0.052	0.368	0.581	0.749	0.951
Carbon offsets	1,524	0.068	0.252	0.000	0.000	0.000	0.000	1.000

Table 3. Stock price reactions to the adoption of the Green Claims Directive

This table provides the results of an event study analysis of stock price reactions of European listed firms to events associated with the adoption of the Green Claims Directive. In Panel A, we consider average and total abnormal stock returns over the six adoption events combined. We estimate the following regression equation over a window from 200 trading days prior to the first event on March 22, 2023 to twenty trading days after the final event on June 17, 2024: $R_{p,t} = \alpha_p + \beta_p \times R_{m,t} + \gamma_p \times D_t + \varepsilon_{i,t}$. $R_{p,t}$ is the value-weighted return on the portfolio of sample firms with market capitalizations as of December 31, 2022 as weights. $R_{m,t}$ is the return on the MSCI World ex-Europe index. γ_p captures the average abnormal return per event (column (1)). We then define the total abnormal return as the coefficient γ_p multiplied by six (column (2)). D_t is a dummy variable that equals one on the announcement dates of GCD adoption events in row (1) and on the three trading days surrounding the actual event dates in row (2). In Panel B, we report abnormal stock returns over individual event dates, obtained through the following regression specification: $R_{p,t} = \alpha_p + \beta_p \times R_{m,t} + \sum_{k=1}^6 \gamma_{p,k} \times D_{t,k} + \varepsilon_{i,t}$. $\gamma_{p,k}$ captures the average abnormal return for event k for the sample firms. $D_{t,k}$ equals one on the announcement date of the respective GCD adoption event and zero otherwise. Our analysis uses a sample of 2,885 firms with complete stock price data and a subsample of 1,524 firms with complete data on all explanatory variables used in the baseline cross-sectional analysis. None of the abnormal stock returns are statistically significant.

Panel A: Cumulative abnormal return over six events combined
2,885 firms

Event window	Average abnormal return (γ_p)	Total abnormal return ($6\gamma_p$)
	(1)	(2)
(1) Day 0	0.135%	0.810%
	(0.56)	
(2) Day (-1,+1)	0.032%	0.192%
	(0.22)	

Event window	Average abnormal return (γ_p)	Total abnormal return ($6\gamma_p$)
	(1)	(2)
(1) Day 0	0.085%	0.510%
	(0.35)	
(2) Day (-1,+1)	0.022%	0.132%
	(0.16)	

Panel B: Abnormal return per event
2,885 firms

Event	$\gamma_{p,k}$
March 22, 2023	0.540%
	(0.91)
June 14, 2023	0.264%
	(0.44)
September 19, 2023	0.016%
	(0.03)
November 28, 2023	-0.380%
	(-0.64)
March 12, 2024	0.351%
	(0.59)
June 17, 2024	0.021%
	(0.04)

1,524 firms

Event	$\gamma_{p,k}$
March 22, 2023	0.614% (1.04)
June 14, 2023	0.179% (0.30)
September 19, 2023	-0.059% (-0.10)
November 28, 2023	-0.441% (-0.75)
March 12, 2024	0.251% (0.42)
June 17, 2024	-0.035% (-0.06)

Table 4. Baseline regression analysis of stock price reactions to the adoption of the Green Claims Directive

This table presents the results of our baseline OLS regressions analyzing the determinants of stock price reactions to the Green Claims Directive. The baseline sample consists of 1,524 European listed firms. The dependent variable in each regression, CAR , is the firm-specific abnormal stock return (AR) cumulated over six GCD adoption events. For each firm, we estimate the following regression over a window from 200 trading days prior to the first event on March 22, 2023 to twenty trading days after the final event on June 17, 2024: $R_{i,t} = \alpha_i + \beta_i \times R_{m,t} + \gamma_i \times D_t + \varepsilon_{i,t}$. $R_{i,t}$ is the return on firm i 's stock. $R_{m,t}$ is the return on the MSCI World ex-Europe index. D_t is a dummy variable that equals one on the announcement dates of GCD adoption events. γ_i captures the average abnormal return per event for firm i . We then define the CAR for each firm as γ_i multiplied by six. Standard errors are clustered at the country level. Appendix A.4 provides detailed variable definitions and sources. We report t -statistics between parentheses. *, ** and *** represent significance at the 10%, 5% and 1% level, respectively.

Variables	Parameter estimate (t -statistic)	
	(1)	(2)
Intercept	0.013 (0.55)	0.013 (0.55)
Greenwashing	0.007* (2.00)	
Greenmisleading		-0.001 (-0.17)
Greenfraud		0.019*** (4.09)
Regulatory quality	-0.014*** (-3.98)	-0.014*** (-3.93)
R&D	-0.042* (-1.90)	-0.043* (-1.96)
Government contracts	0.009** (2.17)	0.008* (1.91)
Consumerfacing	0.004 (0.80)	0.004 (0.79)
Institutional ownership	0.006** (2.40)	0.006** (2.46)
Cash	-0.025 (-1.51)	-0.025 (-1.50)
ROA	-0.002 (-0.17)	-0.002 (-0.21)
LTD	-0.041*** (-5.63)	-0.041*** (-5.43)
Analysts	0.001 (1.59)	0.001 (1.61)
Size	0.000 (0.33)	0.000 (0.33)
Capex	-0.055 (-1.29)	-0.052 (-1.22)
Intangibles	0.006 (0.74)	0.006 (0.73)
R^2	0.064	0.067
N	1,524	1,524

Table 5. Heckman model controlling for self-selection in greenwashing firms

This table presents the results of a two-step Heckman model. The baseline sample consists of 1,524 European listed firms. In column (1), we present the results of a probit analysis of the determinants of greenwashing. The dependent variable is a *Greenwashing* dummy. In column (2), we present the results of an OLS analysis of *CAR*, the firm-specific abnormal stock return (*AR*) cumulated over six GCD adoption events. *IMR*, defined in Online Appendix A.4., represents the Inverse Mills Ratio obtained from the first-step probit analysis. For each firm, we estimate the following regression over a window from 200 trading days prior to the first event on March 22, 2023 to twenty trading days after the final event on June 17, 2024: $R_{i,t} = \alpha_i + \beta_i \times R_{m,t} + \gamma_i \times D_t + \varepsilon_{i,t}$. $R_{i,t}$ is the return on firm i 's stock. $R_{m,t}$ is the return on the MSCI World ex-Europe index. D_t is a dummy variable that equals one on the announcement dates of GCD adoption events. γ_i captures the average abnormal return per event for firm i . We then define the *CAR* for each firm as γ_i multiplied by six. Standard errors are clustered at the country level. Appendix A.4 provides detailed variable definitions and sources. We report t -statistics between parentheses. *, ** and *** represent significance at the 10%, 5% and 1% level, respectively.

Variables	Parameter estimate (t -statistic)	
	Greenwashing (1)	CAR (2)
Intercept	-7.968*** (-9.16)	-0.015 (-0.21)
Greenwashing		0.007* (1.96)
Regulatory quality	0.139 (1.02)	-0.014*** (-3.74)
R&D	-1.868 (-1.00)	-0.049** (-2.80)
Government contracts	0.170 (0.78)	0.010* (2.01)
Consumerfacing	0.432** (2.12)	0.006 (1.40)
Institutional ownership	-0.008 (-0.06)	0.006** (2.41)
Cash	0.835 (1.22)	-0.023 (-1.32)
ROA	-0.639 (-0.77)	-0.004 (-0.36)
LTD	-2.212*** (-4.34)	-0.047*** (-4.09)
Analysts	0.096*** (4.95)	0.001* (1.86)
Size	0.416*** (7.63)	0.002 (0.50)
Capex	8.295*** (3.83)	-0.027 (-0.32)
Intangibles	-0.896** (-2.31)	0.002 (0.22)
Hightech	-0.723*** (-4.80)	
IMR		0.003 (0.55)
R^2	0.440	0.065
N	1,524	1,524

Table 6. Additional analyses of stock price reactions to the adoption of the Green Claims Directive

This table presents the results of additional OLS regressions analyzing the determinants of stock price reactions to the Green Claims Directive. The baseline sample consists of 1,524 European listed firms. The dependent variable in each regression, CAR , is the firm-specific abnormal stock return (AR) cumulated over six GCD adoption events. For each firm, we estimate the following regression over a window from 200 trading days prior to the first event on March 22, 2023 to twenty trading days after the final event on June 17, 2024: $R_{i,t} = \alpha_i + \beta_i \times R_{m,t} + \gamma_i \times D_t + \varepsilon_{i,t}$. $R_{i,t}$ is the return on firm i 's stock. $R_{m,t}$ is the return on the MSCI World ex-Europe index. D_t is a dummy variable that equals one on the announcement dates of GCD adoption events. γ_i captures the average abnormal return per event for firm i . We then define the CAR for each firm as γ_i multiplied by six. Standard errors are clustered at the country level. Appendix A.4 provides detailed variable definitions and sources. We report t -statistics between parentheses. *, ** and *** represent significance at the 10%, 5% and 1% level, respectively.

Variables	Parameter estimate (t -statistic)				
	(1)	(2)	(3)	(4)	(5)
Intercept	0.010 (0.34)	0.039 (1.10)	0.013 (0.54)	0.023 (1.14)	0.013 (0.56)
Greenwashing	0.007* (1.99)	0.008* (2.04)	0.008* (1.99)	0.011** (2.45)	0.007* (1.94)
Regulatory quality			-0.014*** (-3.97)	-0.013*** (-3.09)	-0.014*** (-4.00)
R&D	-0.046** (-2.11)	-0.046* (-2.06)	-0.041* (-1.87)	-0.058** (-2.38)	-0.042* (-1.88)
Government contracts	0.009** (2.32)	0.009** (2.19)	0.009** (2.18)	0.013* (2.08)	0.009** (2.15)
Consumerfacing	0.004 (0.78)	0.004 (0.82)	0.004 (0.78)	0.003 (0.47)	0.004 (0.80)
Institutional ownership	0.005* (1.96)	0.005* (1.91)	0.006** (2.40)	0.005 (1.66)	0.006** (2.41)
Cash	-0.027 (-1.65)	-0.026 (-1.54)	-0.025 (-1.48)	-0.020 (-1.44)	-0.025 (-1.50)
ROA	-0.000 (-0.01)	-0.000 (-0.02)	-0.002 (-0.16)	-0.020* (-1.75)	-0.002 (-0.17)
LTD	-0.042*** (-6.03)	-0.040*** (-5.59)	-0.041*** (-5.66)	-0.033*** (-3.29)	-0.041*** (-5.74)
Analysts	0.001 (1.42)	0.001 (1.39)	0.001 (1.71)	0.001 (1.65)	0.001 (1.52)
Size	0.000 (0.15)	0.000 (0.11)	0.001 (0.34)	-0.000 (-0.17)	0.000 (0.33)
Capex	-0.056 (-1.25)	-0.056 (-1.27)	-0.056 (-1.30)	-0.033 (-0.72)	-0.055 (-1.28)
Intangibles	0.005 (0.58)	0.006 (0.73)	0.006 (0.77)	0.015* (1.88)	0.006 (0.74)
Trust	-0.025* (-1.74)				
EPI		-0.062* (-1.83)			
Interbrand			-0.011* (-1.82)		
E-score				-0.009 (-1.52)	
Carbon offsets					0.000 (0.02)
R^2	0.052	0.053	0.065	0.068	0.064
N	1,524	1,524	1,524	1,524	1,524

Table 7. Stock price reactions to the abolishment of the Green Claims Directive

This table provides the results of an event study analysis of stock price reactions of European listed firms to events associated with the withdrawal of the Green Claims Directive. In Panel A, we consider average and total abnormal stock returns over the two withdrawal events combined. We estimate the following regression equation over a window from 200 trading days prior to the first withdrawal event on January 27, 2025 to twenty trading days after the second event on June 20, 2025: $R_{p,t} = \alpha_p + \beta_p \times R_{m,t} + \gamma_p \times D_t + \varepsilon_{i,t}$. $R_{p,t}$ is the value-weighted return on the portfolio of sample firms with market capitalizations from December 31, 2022 as weights. $R_{m,t}$ is the return on the MSCI World ex-Europe index. γ_p captures the average abnormal return per event (column (1)). We then define the total abnormal return as the coefficient γ_p multiplied by six (column (2)). D_t is a dummy variable that equals one on the announcement dates of GCD adoption events in row (1) and on the three trading days surrounding the actual event dates in row (2). In Panel B, we report abnormal stock returns over individual event dates, obtained through the following regression specification: $R_{p,t} = \alpha_p + \beta_p \times R_{m,t} + \sum_{k=1}^6 \gamma_{p,k} \times D_{t,k} + \varepsilon_{i,t}$. $\gamma_{p,k}$ captures the average abnormal return for event k for the sample firms. $D_{t,k}$ equals one on the announcement date of the respective GCD adoption event and zero otherwise. Our analysis uses a sample of 2,885 firms with complete stock price data and a subsample of 1,524 firms with complete data on all explanatory variables used in the baseline cross-sectional analysis. None of the abnormal stock returns are statistically significant.

Panel A: Cumulative abnormal return over two events combined
2,885 firms

Event window	Average abnormal return (γ_p)	Total abnormal return ($2\gamma_p$)
	(1)	(2)
(1) Day 0	0.655% (1.37)	1.31%
(2) Day (-1,+1)	0.038% (0.14)	0.076%

1,524 firms

Event window	Average abnormal return (γ_p)	Total abnormal return ($2\gamma_p$)
	(1)	(2)
(1) Day 0	0.325% (0.69)	0.650%
(2) Day (-1,+1)	-0.034% (-0.13)	-0.068%

Panel B: Abnormal returns per event
2,885 firms

Event	$\gamma_{p,k}$
January 27, 2025	0.4922% (0.73)
June 20, 2025	0.8169% (1.21)

1,524 firms

Event	$\gamma_{p,k}$
January 27, 2025	0.4300% (0.65)
June 20, 2025	0.2208% (0.33)

Table 8. Baseline regression analysis of stock price reactions to the abolishment of the Green Claims Directive

This table presents the results of our baseline OLS regressions analyzing the determinants of stock price reactions to the abolishment of the Green Claims Directive. The baseline sample consists of 1,524 European listed firms. The dependent variable in each regression, CAR , is the firm-specific abnormal stock return (AR) cumulated over six GCD adoption events. For each firm, we estimate the following regression over a window from 200 trading days prior to the first abolishment event on January 27, 2025 to twenty trading days after the second event on June 20, 2025: $R_{i,t} = \alpha_i + \beta_i \times R_{m,t} + \gamma_i \times D_t + \varepsilon_{i,t}$. $R_{i,t}$ is the return on firm i 's stock. $R_{m,t}$ is the return on the MSCI World ex-Europe index. D_t is a dummy variable that equals one on the announcement dates of GCD adoption events. γ_i captures the average abnormal return per event for firm i . We then define the CAR for each firm as γ_i multiplied by two. Standard errors are clustered at the country level. Appendix A.4 provides detailed variable definitions and sources. We report t -statistics between parentheses. *, ** and *** represent significance at the 10%, 5% and 1% level, respectively.

Variables	Parameter estimate (t -statistic)	
	(1)	(2)
Intercept	-0.015** (-2.56)	-0.015** (-2.52)
Greenwashing	0.000 (0.04)	
Greenmisleading		-0.001 (-0.28)
Greenfraud		0.006 (1.61)
Regulatory quality	-0.002 (-1.35)	-0.002 (-1.38)
R&D	-0.009 (-1.31)	-0.009 (-1.33)
Government contracts	-0.002 (-0.79)	-0.002 (-0.95)
Consumerfacing	0.002 (1.39)	0.002 (1.33)
Institutional ownership	-0.000 (-0.22)	-0.000 (-0.16)
Cash	0.002 (0.32)	0.002 (0.37)
ROA	-0.005 (-0.58)	-0.005 (-0.58)
LTD	0.018*** (3.78)	0.018*** (3.89)
Analysts	0.001** (2.32)	0.000** (2.30)
Size	0.001** (2.55)	0.001** (2.49)
Capex	0.004 (0.21)	0.004 (0.24)
Intangibles	-0.002 (-0.72)	-0.002 (-0.66)
R^2	0.045	0.047
N	1,524	1,524

Figure 1. Conceptual framework

This figure shows the conceptual framework underpinning our hypotheses.

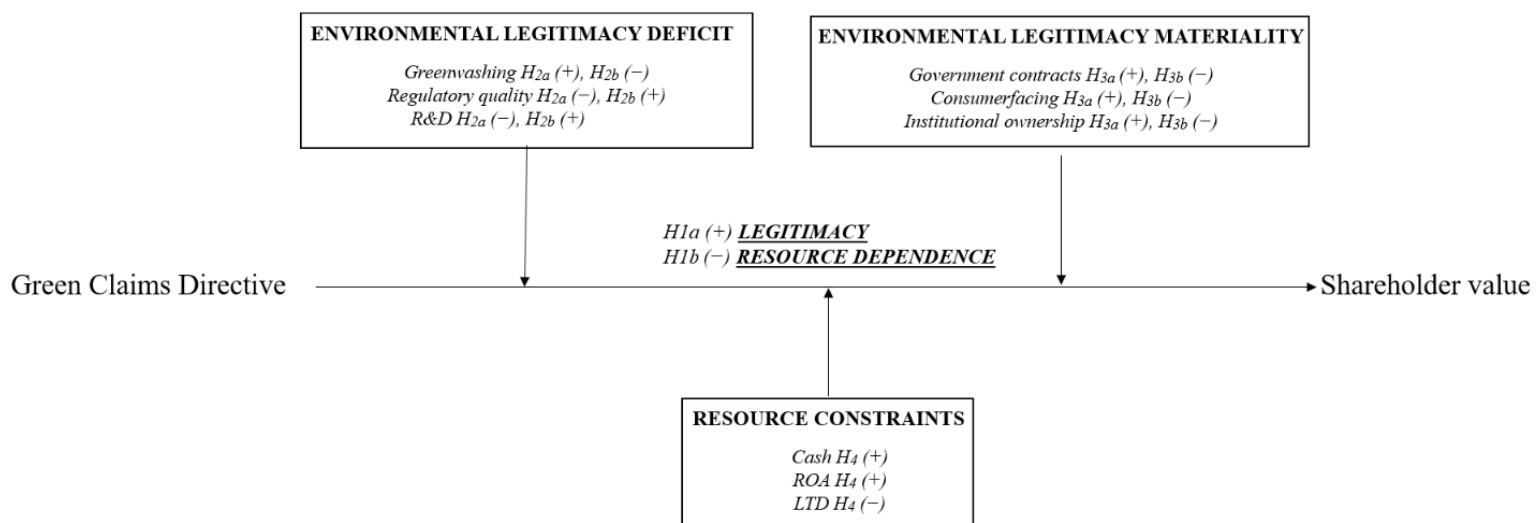


Figure 2. Cross-country sample distribution

This figure shows the distribution of the number of sample firms across countries for the baseline sample used in our multivariate analysis

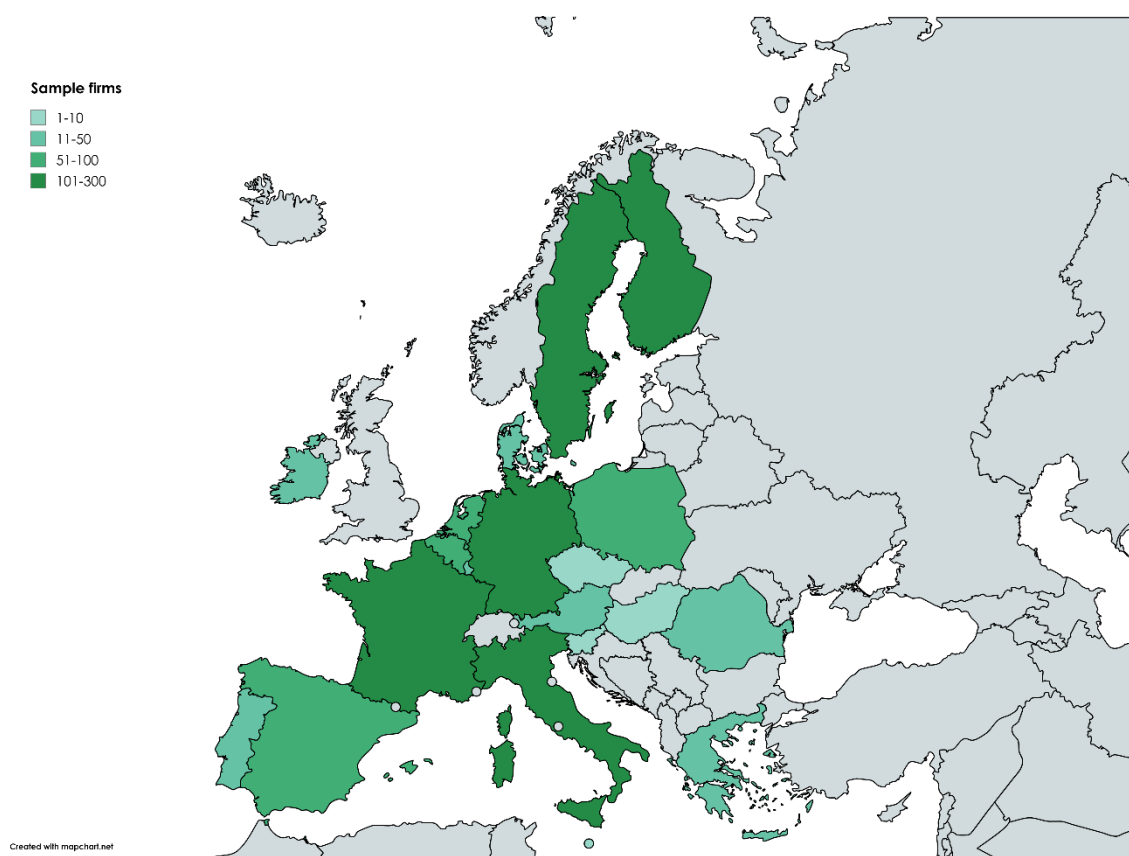
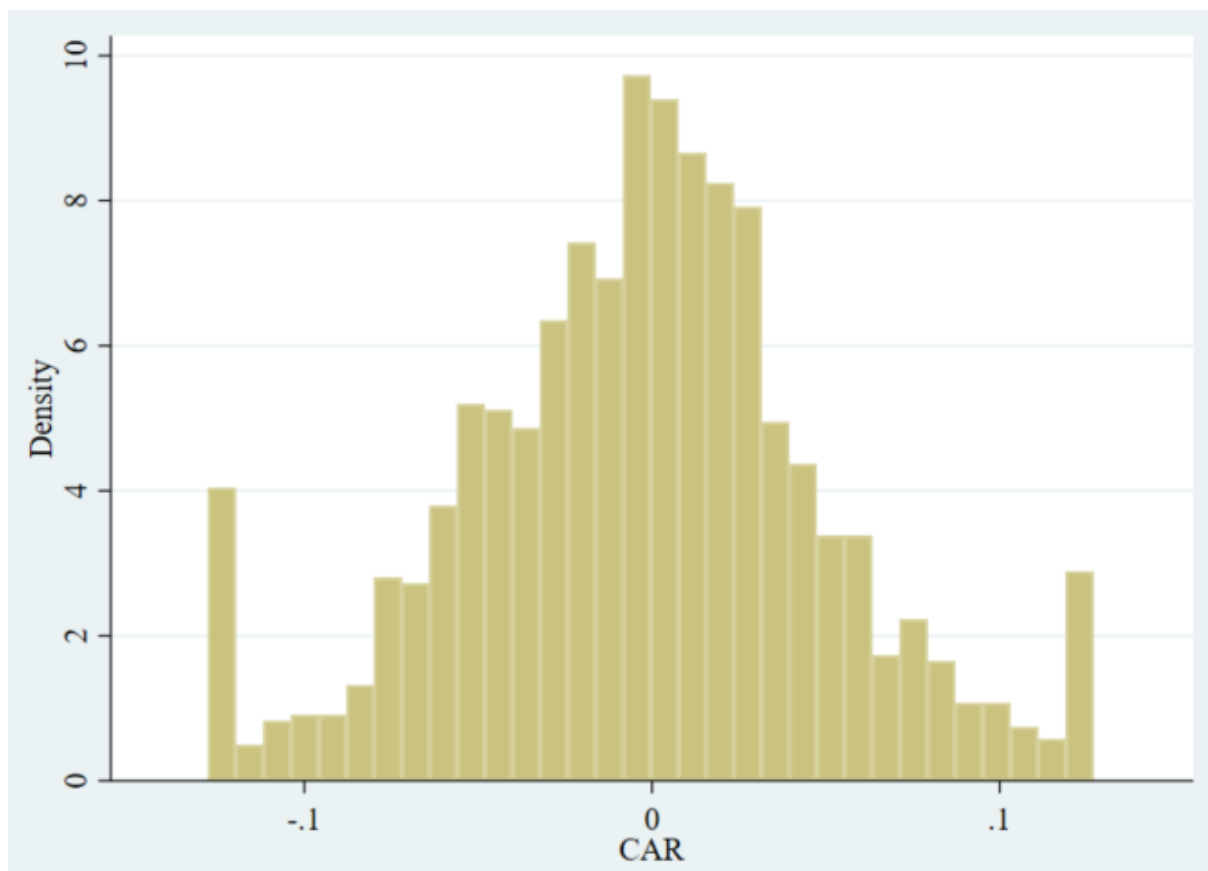


Figure 3. Histogram of stock price reactions to the adoption of the Green Claims Directive

This histogram documents the spread in the abnormal stock returns cumulated over the six GCD adoption events for 1,524 European listed firms, winsorized at the 2.5 and 97.5% level.



Appendix

A.1. Detailed outline of the EU Green Claims Directive

This Appendix summarizes the coverage, key requirements, exemptions, and enforcement of the GCD, as outlined in the European Parliament Briefing by Ashton & Ragonnaud (2024).

1. *Scope and general principles*

- The directive covers explicit environmental claims in business-to-consumer transactions and takes precedence over any conflicting provisions of Directive 2005/29/EC.
- It applies to voluntary claims that are not regulated by existing EU legislation, including the EU Ecolabel, organic product regulations, EMAS, and future certification frameworks for carbon removals.

2. *Requirements for substantiating claims*

- Companies must clearly specify whether the claim applies to the whole product, a part of the product, or specific activities of the company.
- Claims must be based on recognized scientific evidence and comply with international standards.
- A life-cycle perspective must be adopted, and all significant environmental aspects and impacts must be considered.
- Companies must ensure that claims go beyond legal requirements and indicate if the product or company performs significantly better than common practice.
- Positive achievements must not cause negative environmental impacts on climate change, resource use, water, biodiversity, or ecosystems.
- Greenhouse gas offsets must be reported transparently.
- Companies must include primary data and may use secondary data only if primary data are unavailable.
- No single assessment method is mandated, and the Commission may adopt delegated acts for sector-specific rules.
- Comparative claims must use equivalent data and methods, cover the same stages of the value chain and environmental aspects, and apply the same assumptions.

3. *Requirements for communication of claims*

- Only substantiated claims may be communicated.
- If most of a product's environmental impact occurs during its use, the company must give clear instructions to consumers on how to use the product in an environmentally responsible way.
- Information on the product, the company, and the substantiation of the claim must be made available in physical or digital form.
- Environmental labels must comply with these requirements and be subject to verification.
- The Commission may adopt delegated acts to specify additional communication requirements.

4. Scope exemptions

- Micro-enterprises, defined as those with fewer than 10 employees and with an annual turnover or balance sheet total of no more than €2 million, are exempt from the requirements for substantiating and communicating claims unless they voluntarily request verification.

5. Requirements for environmental labelling schemes

- Environmental certification schemes must provide transparent information on ownership, governance, objectives, and compliance monitoring.
- Participation requirements must be proportionate to ensure small and medium-sized enterprises are not excluded.
- The requirements must be scientifically robust and socially relevant.
- Schemes must have mechanisms for complaints and dispute resolution and procedures to withdraw labels in case of non-compliance.
- Labels presenting aggregated scores or ratings are prohibited unless awarded under EU-recognized schemes.
- The creation of new publicly owned labelling schemes after transposition is prohibited, although pre-existing compliant schemes may continue.
- New private schemes must be approved by Member States.
- The Commission will publish a list of officially recognized environmental labels.

6. *Verification and compliance*

- Companies must review and update claim substantiation when circumstances change.
- Ex ante verification must be conducted by accredited third-party conformity assessment bodies, which will issue certificates of conformity.
- Member States must support SMEs in complying with the directive through awareness campaigns, training, financial assistance, and technical guidance.
- National authorities must carry out regular checks on claims and labelling schemes and publish the results.
- Penalties must be established for infringements.

A.2. Relation between the EU Green Claims Directive and other environmental regulation

The GCD complements the *Empowering Consumers for the Green Transition Directive* (ECGT Directive, also referred to as the “Empco Directive”), which also forms part of the EU Green Deal. The Empco Directive is primarily a consumer-protection instrument, focusing on improving the availability of information about product durability, reparability, and consumer rights, and only indirectly constraining misleading green claims. The GCD, by contrast, is explicitly designed to combat greenwashing, imposing rigorous requirements for life-cycle-based substantiation, independent verification, and robust label governance. In essence, while the ECGT Directive regulates how firms communicate with consumers about product circularity and related topics, the GCD governs the veracity of green claims themselves. As such, it is the more direct instrument for addressing greenwashing and therefore the focus of our study.

The GCD also complements EU regulation intended to avoid greenwashing in mutual funds. Allcott et al. (2026) do not find that this regulation materially affects fund flows or sustainability performance.

Unlike the EU, the United States (US) do not have a dedicated anti-greenwashing statute. Instead, environmental marketing claims are governed indirectly under the Federal Trade Commission (FTC) Act’s general prohibition of deceptive practices, reflected in the FTC’s non-binding “Green Guides”. These Guides, last substantively updated in 2012, are advisory in nature. While they outline best practices for substantiating environmental claims, they do not create enforceable legal obligations. Consequently, enforcement remains limited and largely case-specific, supplemented by state-level consumer protection laws and private litigation. Overall, US regulation of greenwashing relies more on broad consumer-protection principles and voluntary compliance than on prescriptive, binding rules (Gourier & Mathurin, 2024).

A.3. Sample firms by industry

This table shows the sample distribution across industries.

NACE main code	N	%	NACE main code	N	%
A. Agriculture, forestry and fishing	8	0.52	K. Financial and insurance activities	100	6.56
B. Mining and quarrying	24	1.57	L. Real estate activities	62	4.07
C. Manufacturing	583	38.25	M. Professional, scientific and technical activities	109	7.15
D. Electricity, gas, steam and air conditioning supply	64	4.20	N. Administrative and support service activities	43	2.82
E. Water supply; sewerage, waste management and remediation activities	7	0.46	O. Public administration and defense; compulsory social security	8	0.52
F. Construction	57	3.74	P. Education	1	0.07
G. Wholesale and retail trade; repair of motor vehicles and motorcycles	140	9.19	Q. Human health and social work activities	29	1.90
H. Transportation and storage	48	3.15	R. Arts, entertainment and recreation	14	0.92
I. Accommodation and food service activities	13	0.85	S. Other service activities	21	1.38
J. Information and communication	193	12.66	Total	1,524	100

A.4. Variable definitions and sources

The table shows the definition and sources of all variables used throughout this paper. Unless noted otherwise, we use the most recent available value of the independent variables available prior to the first event (March 22nd 2023). We report the variables in their order of first appearance in the paper.

Variable	Definition	Source
Greenwashing	Dummy variable equal to one for firms having RepRisk incidents that are simultaneously classified as involving (i) an Environmental Issue and (ii) either Misleading Communication or Fraud in the year prior to the first GCD event (2022), and zero otherwise. RepRisk does not provide a standalone greenwashing variable. Environmental Issues include RepRisk's environmental issue group (e.g., pollution, climate change, biodiversity impacts), while Misleading Communication and Fraud correspond to RepRisk's governance-related issue groups capturing deceptive, false, or materially misleading disclosures or conduct. This construction follows RepRisk's own conceptual framework, which identifies greenwashing as arising from the intersection of environmental issues and misleading corporate behavior (Reprisk, 2024).	Reprisk
Greenmisleading	Dummy variable equal to one for firms having RepRisk incidents that are simultaneously classified as involving (i) an Environmental Issue and (ii) Misleading Communication in the year prior to the first GCD event (2022), and zero otherwise.	Reprisk
Greenfraud	Dummy variable equal to one for firms having RepRisk incidents that are simultaneously classified as involving (i) an Environmental Issue and (ii) Fraud in the year prior to the first GCD event (2022), and zero otherwise.	Reprisk
Regulatory quality	Score reflecting perceptions of the ability of firm's country of domicile's government to formulate and implement sound policies and regulations that permit and promote private sector development.	World Governance Indicators (RQ) data obtained from: https://www.worldbank.org/en/publication/worldwide-governance-indicators
R&D	Research and development expenses scaled by sales. Missing values are set equal to zero.	Refinitiv Eikon
Government contracts	Indicator variable equal to one if the firm operates in defense (SIC-code 37) and building (SIC-code 15-16), industries that have an unusually high dependence on direct government procurement.	Refinitiv Eikon
Consumerfacing	Indicator variable equal to one if the firm operates in a consumer-facing industry, i.e. transportation, retail, hospitality, personal services, and leisure/recreation (SIC-codes 41, 44, 45, 47, 52-59, 70, 72 and 79).	Refinitiv Eikon
Institutional ownership	Indicator variable equal to one if the firm has an institutional owner with at least 5% ownership	Orbis Global
Cash	Cash scaled by total assets.	Refinitiv Eikon
ROA	Return on assets, calculated as net profit after tax divided by average total assets.	Refinitiv Eikon
LTD	Long term debt scaled by total assets.	Refinitiv Eikon
Analysts	Number of analysts following the firm.	Refinitiv Eikon
Size	Natural logarithm of total assets.	Refinitiv Eikon
Capex	Capital expenditures scaled by total assets.	Refinitiv Eikon

Variable	Definition	Source
Intangibles	Intangible assets scaled by total assets. Intangible assets represent the balance-sheet item for intangible assets as reported by the company and standardised by Refinitiv Eikon, based on underlying accounting definitions under IFRS/US GAAP.	Refinitiv Eikon
Hightech	Dummy variable equal to one for high-technology firms.	European Commission, obtained from: https://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an_3.pdf
IMR	Inverse Mills ratio obtained from the Heckman (1979) model, calculated as $\frac{\varphi(\widehat{Z}_i)}{1 - \psi(\widehat{Z}_i)}$ With $(\widehat{Z}_i)$ the predicted value from the first-step probit analysis, $\varphi(.)$ the standard normal distribution function, and $\psi(.)$ the cumulative standard normal distribution function.	
Trust	Country-level trust, measured as the share of respondents in a country agreeing with the survey statement ‘most people can be trusted’.	Ourworldindata, obtained from: https://ourworldindata.org/trust
EPI	Environmental performance index at the country level.	Yale, obtained from https://epi.yale.edu
Interbrand	Indicator variable equal to one if the firm’s brand is featured in the 2022 Interbrand Best Global Brands list.	Interbrand
E-score	Environmental pillar score.	Refinitiv Eikon
Carbon offsets	Indicator variable equal to one if the firm reports carbon offsets. Missing values are set equal to zero.	Refinitiv Eikon

A.5. Correlation matrix

The table shows the Pearson correlation matrix of all explanatory variables used throughout this paper. * denotes significance at the 5% level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
(1) Greenwashing	1.000																				
(2) Greenmisleading	0.934*	1.000																			
(3) Greenfraud	0.617*	0.451*	1.000																		
(4) Regulatory quality	0.019	0.028	0.024	1.000																	
(5) R&D	-0.067*	-0.069*	-0.024	0.106*	1.000																
(6) Government contracts	0.063*	0.045	0.106*	0.002	-0.057*	1.000															
(7) Consumerfacing	0.044	0.031	0.022	0.009	-0.090*	-0.077*	1.000														
(8) Institutional ownership	0.001	0.017	-0.024	0.126*	0.079*	-0.009	0.031	1.000													
(9) Cash	-0.085*	-0.079*	-0.068*	0.005	0.392*	-0.013	-0.021	0.006	1.000												
(10) ROA	0.070*	0.065*	0.052*	-0.078*	-0.435*	0.018	0.021	-0.056*	-0.307*	1.000											
(11) LTD	-0.029	-0.036	-0.030	0.013	-0.041	-0.026	0.082*	0.024	-0.186*	-0.044	1.000										
(12) Analysts	0.435*	0.431*	0.280*	0.049	-0.067*	0.054*	0.019	0.000	-0.208*	0.174*	0.103*	1.000									
(13) Size	0.405*	0.398*	0.265*	0.009	-0.185*	0.110*	0.019	0.022	-0.354*	0.269*	0.196*	0.732*	1.000								
(14) Capex	0.049	0.052*	-0.003	-0.047	-0.065*	-0.026	-0.014	-0.069*	-0.058*	0.005	0.116*	-0.017	-0.048	1.000							
(15) Intangible	-0.116*	-0.117*	-0.065*	0.118*	0.010	-0.089*	0.044	0.114*	-0.185*	-0.013	0.069*	0.061*	-0.040	-0.230*	1.000						
(16) Hightech	-0.142*	-0.123*	-0.088*	0.034	0.227*	-0.047	-0.214*	0.016	0.169*	-0.097*	-0.121*	-0.020	-0.109*	-0.145*	0.220*	1.000					
(17) Trust	-0.008	-0.005	-0.014	0.771*	0.052*	0.012	0.010	0.149*	-0.052*	-0.039	-0.046	-0.010	-0.075*	-0.060*	0.140*	-0.009	1.000				
(18) EPI	-0.023	-0.011	-0.022	0.795*	0.070*	-0.012	0.026	0.110*	-0.011	-0.066*	0.006	-0.028	-0.108*	-0.064*	0.191*	0.025	0.814*	1.000			
(19) Interbrand	0.162*	0.176*	0.166*	0.023	0.008	0.003	-0.007	0.000	-0.024	0.038	0.004	0.210*	0.163*	-0.031	0.035	-0.003	0.001	0.001	1.000		
(20) E-score	0.320*	0.304*	0.227*	-0.144*	-0.176*	0.105*	-0.006	-0.031	-0.235*	0.226*	0.102*	0.568*	0.679*	0.040	-0.104*	-0.137*	-0.194*	-0.213*	0.111*	1.000	
(21) Carbon offsets	0.191*	0.183*	0.109*	-0.027	-0.040	-0.003	0.020	0.014	-0.062*	0.034	0.076*	0.268*	0.247*	0.005	-0.010	-0.005	-0.018	-0.064*	0.105*	0.187*	1.000

A.6. Stock price reactions to leaked information related to the GCD

This table provides the result of an event study analysis of stock price reactions of European listed firms to events associated with information leaks related to the GCD on January 20, 2023 (Panel A) and May 22, 2024 (Panel B). We estimate the following regression equation over a window from 200 trading days prior to the respective event date to twenty trading days after the event: $R_{p,t} = \alpha_p + \beta_p \times R_{m,t} + \gamma_p \times D_t + \varepsilon_{i,t}$. $R_{p,t}$ is the value-weighted return on the portfolio of sample firms with market capitalizations from December 31, 2022 as weights. $R_{m,t}$ is the return on the MSCI World ex-Europe index. γ_p captures the average abnormal return of the event. D_t is a dummy variable that equals 1 on the event date in row (1) and on trading days surrounding the event date in rows (2-4). We report t -statistics between parentheses. The table provides no asterisks as none of the results are significant at conventional levels.

Panel A: Abnormal return for the leak on January 20, 2023

2,885 firms

Event window	Abnormal return (γ_p)
(1) Day 0	-0.2819% (-0.38)
(2) Day (-1,+1)	-0.4974% (-1.12)

1,524 firms

Event window	Abnormal return (γ_p)
(1) Day 0	-0.3154% (-0.42)
(2) Day (-1,+1)	-0.5051% (-1.17)

Panel B: Abnormal return for the leak on May 22, 2024

Event window	Abnormal return (γ_p)
(1) Day 0	-0.2751% (-0.56)
(2) Day (-1,+1)	-0.1418% (-0.50)

1,524 firms

Event window	Abnormal return (γ_p)
(1) Day 0	-0.4023% (-0.81)
(2) Day (-1,+1)	-0.1691% (-0.59)

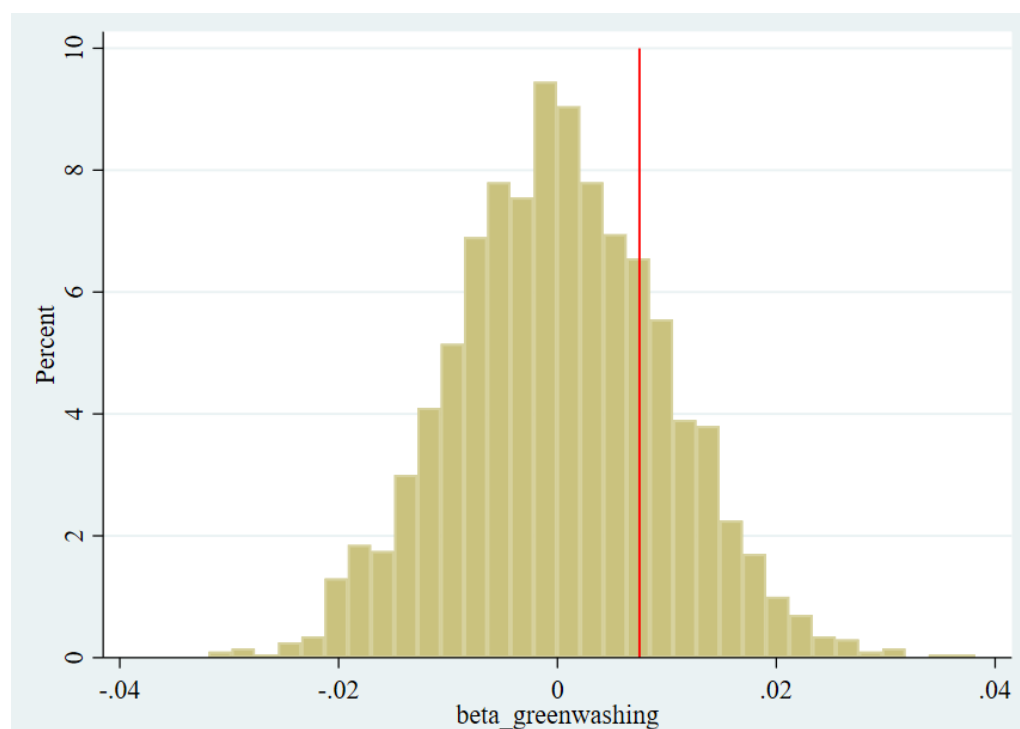
A.7. AI prompt used to retrieve environmental claims

Copilot prompt (executed on November 14, 2025): For the firms attached, please indicate if they have made any environmental claims during 2022, using the definition of environmental claims in the European Green Claims Directive. You can source these claims from their website, annual reports, or other relevant public sources. For each company, mention Y/N on whether a claim was made (Y = Yes, N = No), plus mention a short description of the claims made (e.g. “sustainable products”). If more than one claim was made, one description is sufficient.

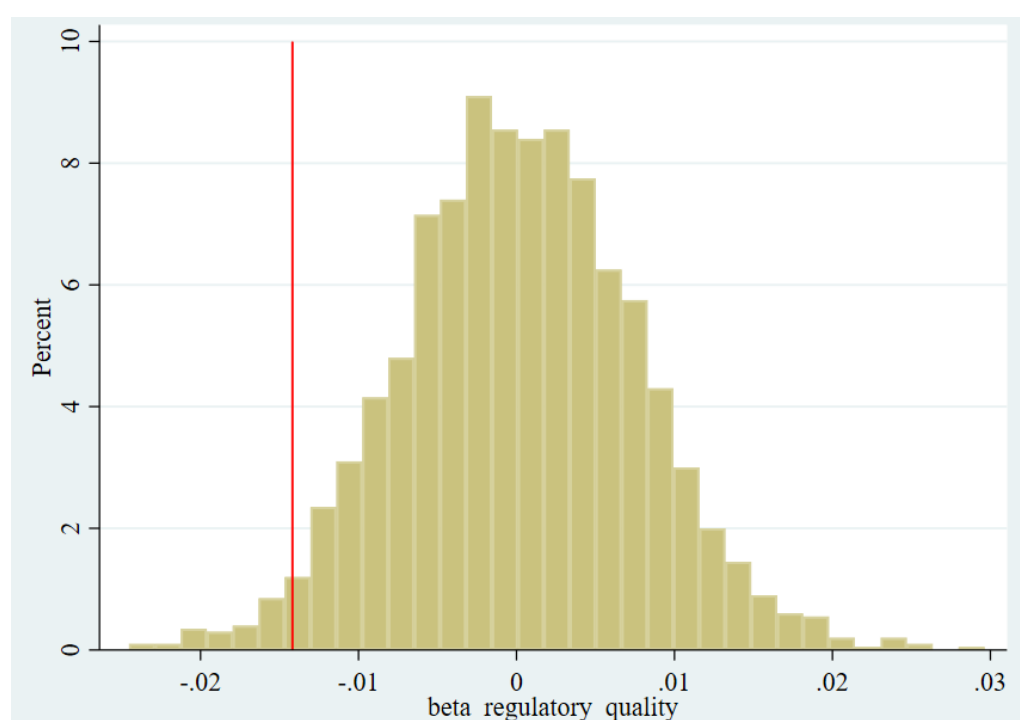
A.8. Placebo test results

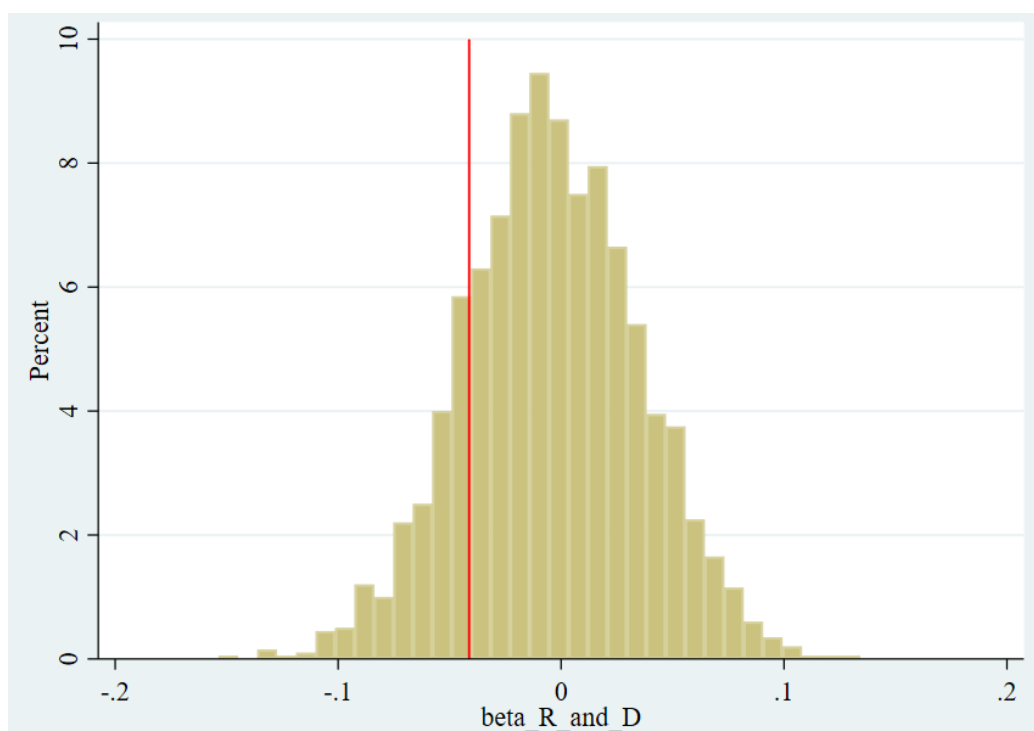
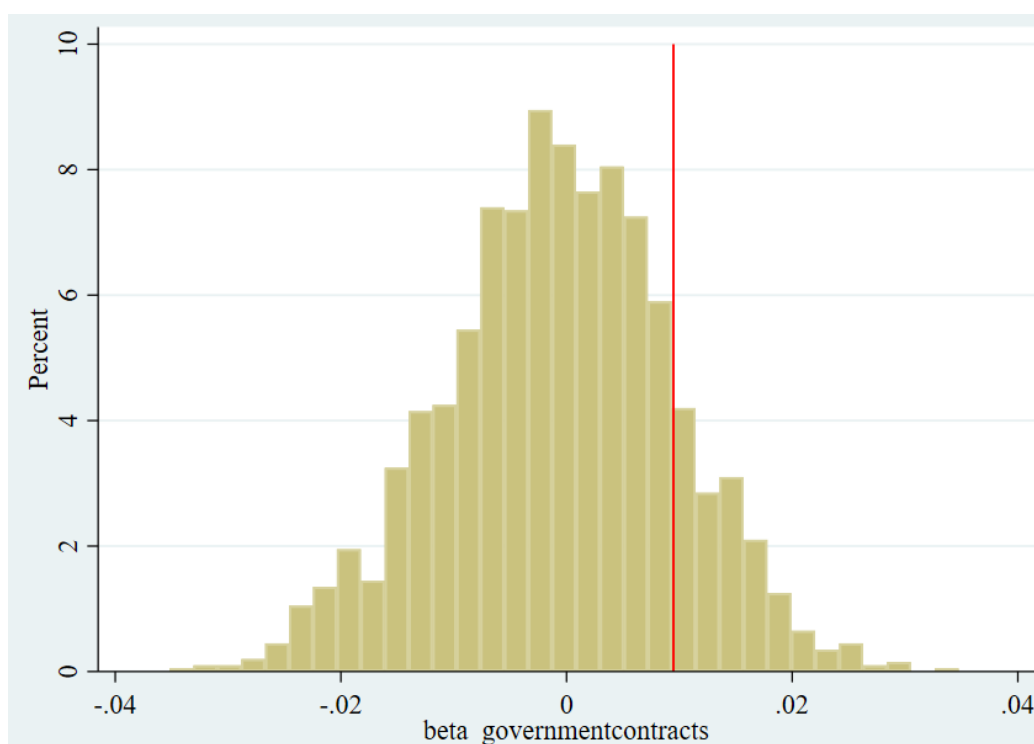
These figures report the results of the placebo analysis, randomly drawing 500 firms and assigning six randomly selected pseudo-event dates over 2000 iterations. The red line denotes the actual beta relative to the distribution of estimated beta's from the placebo test. Panel A focuses on the beta of our *Greenwashing* variable, Panel B examines the beta of *Regulatory quality*, Panel C of *R&D*, Panel D of *Government contracts*, and Panel E of *Institutional ownership*.

Panel A: Greenwashing



Panel B: Regulatory quality



Panel C: R&D**Panel D: Government contracts**

Panel E: Institutional ownership