



ESG in URLs: A Novel ESG Measure

An Empirical Analysis of Firms' ESG Disclosure

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ESG's importance has flared widespread debate among investors over the past decade. Thus, it sparked our interest when our supervisor suggested that it would be interesting to find out why firms initiate to disclose ESG information. Our thesis will contribute to managers' and executives' awareness of firms' commitments to ESG when evaluating firm performance.

This thesis uses textual data and statistical analysis to examine the relationship between firms' voluntary ESG disclosure and ESG controversies. We chose to study this topic based on mutual interest in textual analytics, econometrics, and sustainability. Having the opportunity to work with data that very few have worked with, especially in terms of economic research, was incredibly rewarding. In addition, developing a web scraper was challenging and exciting but extremely satisfying to solve, even though it was time-consuming.

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Abstract

This thesis studies firms' incentives to increase ESG disclosures in anticipation of adverse ESG events. We argue that transparent ESG disclosure before adverse events may mitigate the market reaction as it reduces information asymmetries about ESG risk between shareholders and firms. Empirically, we introduce a novel measure assessing firms' ESG disclosure based on historical snapshots of webpages of 469 firms during the period 2007 to 2020. Using URLs allows us to obtain updated information as webpages can change regularly, making it a timelier measure to capture disclosure trends than, for instance, annual reports. Contrary to our main hypothesis, we find that executives withhold information about their ESG risks before adverse ESG events. In addition, ESG disclosure before events worsens the market's response. This thesis expands the theoretical understanding of disclosure using qualitative data from the Wayback Machine, as we are among the first to perform textual analysis on URLs.

Keywords – ESG Disclosure, Textual Analysis, ESG Event, URL, the Wayback Machine

Contents

1	Introduction	1
2	Literature Review and Theory	5
3	Research Question and Hypotheses Development	7
4	Data and Sample Construction	10
4.1	Constructing the ESG Disclosure Measure	10
4.2	Event Data	14
4.3	CRSP/Compustat	15
4.4	Variables	16
4.4.1	Dependent Variable 1: ESG in URLs	16
4.4.2	Dependent Variable 2: Cumulative Abnormal Returns	16
4.4.3	Independent Variables	17
4.4.4	Control Variables	17
4.5	Summary Statistics	19
5	Results	21
5.1	Hypothesis 1	21
5.2	Hypothesis 2	23
5.3	Hypothesis 3	27
6	Discussion	30
6.1	The Relationship between ESG Events and ESG Disclosure	30
6.2	The Timing of ESG Disclosure	31
6.3	The Market Reaction to Upfront ESG Disclosure	31
7	Limitations and Further Research	33
7.1	Limitations	33
7.2	Further Research	34
8	Conclusion	35
	References	36
	Appendix	38
A1	ESG Event Issues	38
A2	ESG Dictionary	39
A3	URL Measure Data	40
A4	Variable Description	41

List of Figures

1.1 Volkswagen AG's ESG Disclosures	3
4.1 ESG Disclosures of Colgate-Palmolive, Unilever, and Volkswagen	13
5.1 Placebo Regression Histogram	29
A1.1 ESG Event Issues	38

List of Tables

4.1	The Tagging Process of ESG in URLs	11
4.2	Sample Construction	15
4.3	Summary Statistics	19
4.4	Differences in Firms Disclosing and Not Disclosing ESG before Event	20
5.1	The Relationship between ESG Events and ESG Disclosure	22
5.2	The Timing of ESG Disclosure	25
5.3	ESG Disclosure on the Month of the ESG Event	26
5.4	The Market Reaction to Upfront ESG Disclosure	28
A2.1	ESG Dictionary by Baier et al. (2020)	39
A3.1	Subset of URL Measure Data	40
A4.1	Variable Description	41

1 Introduction

Over the past decade, there have been many instances where companies made virtuous sustainability claims but neglected their social responsibilities. For instance, the Volkswagen emission scandal: While Volkswagen cheated on its emissions tests by adopting a detection software altering the emission levels released during the tests, they were advertising the vehicles' eco-friendly and low-carbon features to the public. It turned out that the engines emitted up to 40 times the level of pollutants allowed (Hotten, 2015). The scandal is just one example of ESG disclosure¹ used as a marketing strategy to meet the growing demand for sustainable products and practices. Even though examples of positive accomplishments towards sustainability exist, some question the genuineness of engaging in ESG activities when considering both sides. Hence, there needs to be more debate questioning the genuine incentives for a firm to adopt ESG in its business model. Do corporations truly embrace the transformation ESG pose in the business world, or is it merely an attempt at appearing socially aware?

The aim of this thesis is to examine firms' ESG disclosure before experiencing adverse ESG events². We achieve this by constructing a novel and timely measure capturing the ESG disclosure in firms' website URLs. URLs enable us to identify changes and trends in the firms' online communication strategy. Specifically, changes in the structure and content of a firm's website over time may indicate shifts in its strategic priorities. By analysing the URLs, we provide insights into the evolution of a firm's disclosures timelier than, for instance, annual reports. Thus, historical website data can be a valuable information source for understanding a firm's past, present, and future strategies and disclosure.

According to the legitimacy theory, firms that breach social and moral values must defend their existence by legitimising that their actions do not injure society. Conversely, disclosure may depend on the trade-off between disclosing and withholding information. However, we argue that firms responsible for adverse ESG events provide more ESG disclosures to justify their existence in society rather than risk jeopardising their reputation by withholding information.

Given that ESG controversies affect ESG disclosure, we reason that executives may appeal

¹Environmental, social, and governance (ESG) is a framework used to help stakeholders assess an organisation's practices and performance on sustainability issues (PWC, 2023). ESG disclosure is the public reporting by a firm about its ESG issues (Peterdy, 2023).

²In this thesis, the terms "event" and "controversy" will be referred to as negative occurrences of events related to ESG factors.

to increase their ESG disclosure in anticipation of events to address their ESG risks before the public exposes them. We argue that transparent ESG information improves the investors' perception of their ESG risks by reducing information asymmetries. Thus, it might mitigate the market's reaction to adverse ESG events as the event is perceived less as a surprise. However, previous findings suggest that upfront ESG disclosure mitigates and aggravates the market reaction. On the one hand, executives might increase the ESG information before events as the market may react less severely. On the other hand, the increased disclosure might aggravate the adverse reactions, and executives may hesitate to disclose ESG information. Nonetheless, we posit that executives have incentives to increase their ESG disclosure before adverse ESG events due to its potential mitigating effects.

We find that firms tend not to offer any explanation justifying their actions when faced with adverse ESG events, opposing the legitimacy theory. We argue that the trade-off between disclosing and withholding information is a decisive factor when experiencing events, as disclosure might backlash later in the instance of disappointment. Moreover, executives prefer to keep quiet about their ESG concerns before experiencing adverse ESG events. We argue that the behaviour derives from a fear that transparent disclosure might do more harm than withholding the information.

Additionally, we find that upfront ESG disclosure aggravates the market's reaction. We argue that an event breaches shareholders' expectations if the information disclosed does not represent the actual ESG risks the firm faces. Hence, shareholders perceive the event as a shock and more severe.

To investigate our questions of interest, we first obtain data on ESG events from the RepRisk database and consider only the events of the highest severity. Such events include violation of legislation and policies, corruption, forced labour and more. Next, we apply textual analysis to construct the ESG disclosure measure based on URLs retrieved from the Wayback Machine. The ESG dictionary by Baier et al. (2020) provides 482 highly relevant ESG words allowing us to segregate the content of millions of URLs into either of the three ESG pillars. The final sample consists of monthly ESG disclosure measures of 70 103 observations on 469 unique firms and 870 major ESG events from 2007 to 2020.

Most previous research is limited to studying disclosures in annual reports, and thus capturing any timing effects relative to ESG events might be difficult as they are released only once a

year. We find our measure of ESG disclosure better than previous measures used as it captures monthly disclosure, enabling us to analyse disclosure trends more precisely. Additionally, since our measure derives from URLs, it can provide information beyond what is legally required. Therefore, our main contribution to the existing literature is constructing a new and timelier measure capturing firms' monthly ESG disclosure, which has not been done previously in research. Figure 1.1 illustrates our monthly ESG disclosure measure for Volkswagen AG. The emission scandal in 2015 is visible, followed by increased ESG disclosures until 2019.

Figure 1.1: Volkswagen AG's ESG Disclosures

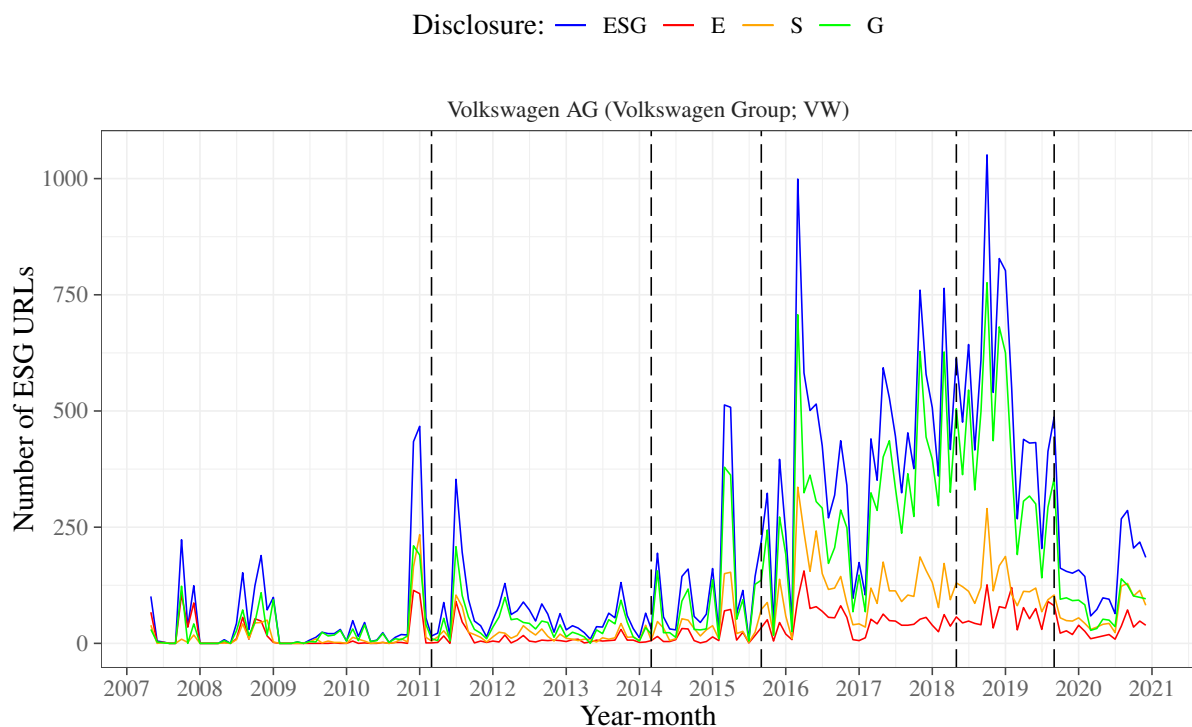


Figure 1.1 displays the development of disclosure measures for Volkswagen AG. Each measure is the monthly sum of ESG URLs. The legend represents the different disclosure measures, and the black lines represent ESG events.

Furthermore, we add to the previous research on voluntary disclosure and the legitimacy theory. Cho and Patten (2007) and Clarkson et al. (2008) find environmental disclosure to be a linear function of toxic emissions released. Maxwell and Lyon (2011) find activist pressures to play a significant role in disclosure behaviour. On the contrary, we focus on whether adverse ESG events affect ESG disclosure.

Additionally, we contribute to the literature that studies the effect of disclosure on the market's reaction to events. Blacconiere and Patten (1994) find firms with more extensive disclosures before Union Carbide's chemical leak in 1984 to sustain a less severe market reaction. Heflin

and Wallace (2017) obtain similar results examining the BP oil spill in 2010. Both papers consider firms exposed to external events, i.e., events they did not foresee or cause, while we study firm-specific events.

Lastly, we add to papers studying ESG disclosure before events. Capelle-Blancard and Petit (2017) provide findings that firms which disclose positive ESG information in the media in the preceding year mitigate the impact of negative ESG news on the stock price. Hummel et al. (2019) find firms with more upfront disclosure in their annual reports to suffer a stronger negative market reaction. Instead, we examine the effect of disclosure by implementing a new and timelier ESG disclosure measure based on firms' webpage URLs.

2 Literature Review and Theory

Two concepts can explain voluntary ESG disclosure: the legitimacy theory and the voluntary disclosure theory. Voluntary disclosure theory suggests disclosure to reduce information asymmetries (Verrecchia, 1983) of which can result in undesired agency problems such as adverse selection and moral hazard problems. Indeed, previous studies on investor premiums (Barry and Brown, 1985; Merton, 1987) find that investors demand a higher risk premium when subject to information asymmetries. However, managers can reduce the information risk through increased voluntary disclosure (Healy and Palepu, 2001). Cheng et al. (2013), who examine the role of CSR transparency in accessing capital, find more transparent disclosure on CSR performance to mitigate the perceived risk of a firm as it reduces the information asymmetry.

The legitimacy theory provides an additional dimension to understanding the determinants of voluntary disclosure. The definition of the theory are many; however, Suchman (1995) defined organisational legitimacy in general terms as “(...) a generalised perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions.”. Burlea and Popa (2013) defined the theory as explaining the behaviour of entities voluntarily disclosing non-voluntary social and environmental information to fulfil society’s perceptions, as the breach of social and moral values may lead to severe societal sanctions. Indeed, scandals and events such as ESG controversies can pose a major threat to a firm’s legitimacy. For instance, Kölbel et al. (2017) find empirical evidence that ESG events increase a firm’s credit risk in conjunction with the event’s severity.

According to the legitimacy theory (Burlea and Popa, 2013), the entity must defend its existence by legitimising that its social and economic actions in the society it operates do not injure the society and the natural environment. Interestingly, Cho and Patten (2007) find higher emission levels to correlate significantly with higher levels of disclosure in the annual reports, especially in environmentally sensitive industries that are more scrutinised. However, Clarkson et al. (2008) discover the opposite - a positive relationship where better environmental performers disclosed a higher level of environmental disclosures. On the other hand, Maxwell and Lyon (2011) argue that the conflicting results stem from activist pressures which induce “greener” firms to disclose less about their environmental performance. Hence, they suggest no monotonic relationship exists between a firm’s environmental performance and its disclosure, as disclosure

varies across firms. However, Kölbel et al. (2017) suspect that executives can influence the impact of events through transparent disclosures, despite the argument that firms perceived as greener risk significant negative public backlash when disclosing negative ESG outcomes (Maxwell and Lyon, 2011).

Blacconiere and Patten (1994) study Union Carbide's chemical leak in India in 1984 which resulted in 4,000 deaths. They find the chemical firms with more extensive environmental disclosures in their annual report before the chemical leak sustained a less severe market reaction. They argue that investors interpret prior extensiveness of disclosures as a positive sign regarding the firm's ability to manage future regulatory costs. Similar results are found studying the BP oil spill in 2010 (Heflin and Wallace, 2017). Additionally, Capelle-Blancard and Petit (2017) find that when the sector has a good ESG reputation, and the affected firms have previously disclosed more positive ESG information than their peers, mitigate the impact of negative news on the stock price. On the other side, Hummel et al. (2019), who study the stock market reaction to major ESG events, find firms with more upfront disclosures of CSR information to suffer a stronger adverse market reaction. They interpret the negative reaction to derive from an alteration in investors' trust, updating their expectations about the firm's prospects.

To the best of our knowledge, we contribute to the existing literature by studying ESG disclosures in an information source that has not been done previously in research, specifically ESG disclosure in URLs. Most previous research on the matter study disclosures in annual reports (Blacconiere and Patten, 1994; Heflin and Wallace, 2017; Hummel et al., 2019; Cho and Patten, 2007; Clarkson et al., 2008); however, the attempt to capture any timing effects of disclosures relative to events becomes unprecise and unreliable as the release of the report and the occurrence of events can happen at two completely different points in time during the year. In addition, the papers typically study firms not directly linked to the event (Blacconiere and Patten, 1994; Heflin and Wallace, 2017). We fill this gap by retrieving daily data on firms directly linked to the specific event. Thus, we can observe the shareholders' actual reaction to the specific event and whether ESG disclosure mitigates the shareholders' reaction.

3 Research Question and Hypotheses Development

The previous literature on the effect of past ESG disclosures on the market reaction following ESG controversies has conflicting results. The results motivate us to investigate whether firms disclose ESG information in advance to mitigate the negative impacts of ESG events. Therefore, our research question is:

Do adverse ESG events affect the firms' ESG disclosure?

To answer the research question, we have developed three hypotheses. The first hypothesis focuses on establishing a relationship between ESG events and disclosure before studying our main hypothesis, which investigates the timing of ESG disclosure relative to events. Lastly, we test the effect of upfront disclosure on market reactions to events.

From the literature review, Cho and Patten (2007) and Clarkson et al. (2008) find the firms' disclosure of social responsibility to be a linear function of environmental performance concerns. However, both papers find opposite relationships. Meanwhile, Maxwell and Lyon (2011) argue that activist pressures play a significant role when explaining disclosure behaviour. More specifically, the public's perception of the firm's ability to achieve successful social and environmental outcomes discourages greener firms from disclosing ESG information as they risk severe reactions in the case of failure. Thus, they argue that no monotonic relationship exists between a firm's environmental performance and disclosure. However, according to the legitimacy theory, given controversies, a firm must provide more extensive environmental disclosures to justify its existence in society. We argue that the legitimacy theory and the arguments of Maxwell and Lyon are two sides of the same coin. As mentioned in the literature review, Kölbel et al. (2017) reason that firms can reduce the impact of controversies through transparent disclosures despite the significant public risk greener firms may face doing so. Accordingly, nothing comes to our attention that suggests that the strategy of withholding information should be stronger than the possibility of a mitigating effect of transparent disclosure.

Based on the previous research and the legitimacy theory, we expect firms to disclose more information when causing ESG events that stem from poor social considerations and behaviour outside the bounds of what society perceives as acceptable. Examples of such events could be corruption, violation of legislation and policies, forced labour, pollution and more. Hence, we first examine the following hypothesis:

H1: Firms disclose a higher level of ESG information when experiencing higher frequencies of adverse ESG events.

The research on firms' specific timing of ESG disclosure when experiencing ESG events is limited. We reason that the timing of disclosure depends on the executives' awareness of the event and their incentives. From previous research, Blacconiere and Patten (1994) find that firms with extensive environmental disclosures before Union Carbide's chemical leak in India in 1984 experienced a less severe market reaction. However, the paper is limited to studying the intra-industry market reactions. Hence, they study firms that could not foresee the event occurring, implying that these firms' prior disclosures were not event-driven. Nevertheless, Kölbel et al. (2017) argue that reporting negative ESG outcomes openly reduces its novelty and allows the firm to explain the issue from its perspective before the public address it. Hence, they imply that firms indeed have the incentive to disclose more on their ESG issues before their events are exposed.

Therefore, it might be appealing for executives to increase the ESG disclosures in anticipation of events to proactively manage and address their ESG risks rather than waiting for them to hit the surface and potentially damage their reputation. Considering the limited empirical evidence, we are interested in investigating the occurrence of firms' disclosures of ESG information before ESG controversies. Accordingly, we consider the following main hypothesis:

H2: Firms increase their ESG disclosure before experiencing adverse ESG events.

Building further on the arguments of Hypothesis 2, previous findings from the literature (Blacconiere and Patten, 1994; Heflin and Wallace, 2017; Kölbel et al., 2017) suggest disclosures to have a mitigating effect on the market's reaction to ESG events. On the other side, Maxwell and Lyon (2011) argue that "firms that lay claim to being virtuous, and then are discovered to have feet of clay, than firms that never make such claims" are more sanctioned by activists and thus are more hesitant to promote environmental information. Empirically, however, Capelle-BlanCARD and Petit (2017), who study firms directly involved in specific negative ESG news, find firms with more ESG disclosure in the preceding year of the news to mitigate the negative impact on the stock price. Hence, the finding suggests that firms may have a net interest in disclosing ESG information before controversies. However, Maxwell and Lyon's arguments are later supported empirically by Hummel et al. (2019), who find firms with more upfront ESG information to face a more negative market reaction.

As there are conflicting results in the literature, we derive our last hypothesis from the voluntary disclosure theory. We postulate that firms with extensive ESG disclosure provide investors with more information on their ESG practices and performance, reducing information asymmetries and thus improving their perception of the firm's ESG risks. Hence, investors perceive the ESG controversy less as a shock and less significant, and the market reacts accordingly. Overall, we posit the following last hypothesis:

***H3:** Firms that increase their ESG disclosure before experiencing adverse ESG events are less likely to experience significant negative market reactions.*

4 Data and Sample Construction

In this section of the thesis, we present the data to construct the ESG disclosure measure. Further, we present the other data sources used in our analyses before presenting the selection of variables. Lastly, we present the summary statistics of the data.

4.1 Constructing the ESG Disclosure Measure

To construct the ESG disclosure measure, we retrieve data on firms' websites from the Wayback Machine, a digital archive of websites the Internet Archive gathers. The Wayback Machine stores snapshots of websites at different points in time. Using the Wayback Machine, we access the historical data of company websites, including their URLs over time. We use the data to identify changes and trends in a company's online communication strategy. Moreover, changes in the structure and content of a company's website over time may indicate shifts in its strategic priorities, marketing strategy, and product offerings. By analysing the URLs of a company's website, we can also provide insights into the evolution of its digital footprint, including changes in its domain name, subdomains, and landing pages. In this way, historical website data can be a valuable information source for understanding a company's past, present, and future strategies and disclosure.

We collect the historical data of firms' websites from the Wayback Machine API by running queries on the following form:

<https://web.archive.org/cdx/search/cdx?url=https://www.volkswagenag.com&matchType=domain&fl=urlkey,timestamp,original,mimetype&collapse=timestamp:8&filter=mimetype:text/html&from=2007&to=2020&limit=10000000000000000000&output=json>

In the query example above, we request the Wayback Machine API for records of Volkswagen AG's website. We acquire historical records from January 2007 to December 2020 of all the subdomains from <https://www.volkswagenag.com> by setting `matchType=domain`. The query returns a list of rows, each representing a URL.

A URL may appear several times, as the Wayback Machine can scrape the web several times daily. The Wayback Machine stores each crawl with its 14 digits timestamp, and by setting `collapse=timestamp:8`, we filter out duplicated web crawls within the same day. Furthermore,

we only obtain unique URLs describing a firm’s website each month. Thereby, we have a more robust and accurate representation of the URLs of a firm’s website every month.

Since we are interested in firms’ disclosure of ESG information on their websites, we apply an additional filter to our queries. By setting filter=mimetype:text/html, we obtain only the text parts of the websites. We focus solely on the text information without interest in other content, such as images, videos, or specific applications.

We apply textual analysis to the data gathered whenever we query the Wayback Machine API for a given firm. We construct our measure of website disclosure by analysing the words embedded in the URLs themselves. Each URL is a string containing information that can indicate the webpage’s content. For instance, a URL containing "contact" will likely be a webpage where one can find contact information for that given company. Another example is the word “sustainability”, which might inform us about the firm’s sustainability commitments. Based on this logic, we make a measure that captures the likelihood of a URL being about ESG. Accordingly, we are only interested in capturing the fact that a URL with an ESG word is about ESG regardless of the frequency of ESG words in the URL. Table 4.1 demonstrates the tagging process of URLs.

Table 4.1: The Tagging Process of ESG in URLs

Host-URL	Text part in the URL	E	S	G	ESG
https://www.volkswagenag.com	/vwag/vwcorp/content/de/ investor relations /contact_details_ir.html	0	0	1	1
https://www.volkswagenag.com	/vwag/vwcorp/content/de/ investor relations /five_presentations.html	0	0	1	1
https://www.volkswagenag.com	/vwag/vwcorp/content/de/misc/footer/help.html	0	0	0	0
https://www.volkswagenag.com	/vwag/vwcorp/content/de/misc/footer/help.html?showprint=true	0	0	0	0
https://www.volkswagenag.com	/vwag/vwcorp/content/de/misc/footer/help/ir_newsletter.html	0	0	0	0
https://www.volkswagenag.com	/vwag/vwcorp/content/de/misc/footer/help/search.html	0	0	0	0
https://www.volkswagenag.com	/vwag/vwcorp/content/de/misc/footer/help/system_requirements.html	0	0	0	0
https://www.volkswagenag.com	/vwag/vwcorp/content/de/misc/footer/imprint.html	0	0	0	0
https://www.volkswagenag.com	/vwag/vwcorp/content/de/misc/footer/imprint.html?showprint=true	0	0	0	0
https://www.volkswagenag.com	/vwag/vwcorp/content/de/misc/footer/legal_ notice s.html	0	0	1	1
https://www.volkswagenag.com	/vwag/vwcorp/content/de/misc/footer/legal_ notice s.html?showprint=true	0	0	1	1
https://www.volkswagenag.com	/vwag/vwcorp/content/de/misc/footer/sitemap.html	0	0	0	0
https://www.volkswagenag.com	/vwag/vwcorp/content/de/misc/print_order/print_order.html	0	0	0	0
https://www.volkswagenag.com	/vwag/vwcorp/content/de/misc/print_order/print_order.html?showprint=true	0	0	0	0
https://www.volkswagenag.com	/vwag/vwcorp/content/de/misc/rssinfo.html	0	0	0	0
https://www.volkswagenag.com	/vwag/vwcorp/content/de/ press .html	0	0	1	1
https://www.volkswagenag.com	/vwag/vwcorp/content/de/ press .html?showprint=true	0	0	1	1
https://www.volkswagenag.com	/vwag/vwcorp/content/de/ press /overview.html	0	0	1	1
https://www.volkswagenag.com	/vwag/vwcorp/content/de/ sustainability _and_responsibility.html	1	0	0	1
https://www.volkswagenag.com	/vwag/vwcorp/content/de/ sustainability _and_responsibility.html?showprint=true	1	0	0	1
https://www.volkswagenag.com	/vwag/vwcorp/content/de/ sustainability _and_responsibility/achievements.html	1	0	0	1

Table 4.1 demonstrates the tagging process of URLs on the raw data gathered from the Wayback Machine for Volkswagen AG. The two first columns demonstrate splitting the URLs into host-URL and text, where we apply textual analysis on the latter. The four last columns get one if the text contains a word from the ESG dictionary provided by Baier et al. (2020) and zero otherwise. We use stringr’s methods for regular expressions to tag each URL.

To construct our measure, we clean each URL by removing the host-URL (search URL). The step prevents us from misclassifying a non-ESG URL as an ESG URL. To elaborate, a firm might have an ESG word in its name, but the remainder of the URL might not contain any ESG words. Thus, excluding the host-URL adjusts for such instances. Secondly, we tag each URL as Environmental, Social, or Governance based on it containing a word from the ESG dictionary by Baier et al. (2020) which consists of 482 highly relevant ESG words. We provide the dictionary in Appendix. Additionally, we tag them as ESG to aggregate the three pillars. Furthermore, we summarise the tags, count them each month and calculate the total number of URLs and non-ESG URLs. For a subset of the final data, see Table A3.1 in the Appendix.

An issue with the data retrieved from the Wayback Machine is its inconsistency to crawl. It varies from several times a day to a few months a year, resulting in several missing observations in our data and potentially having implications when analysing the timing of disclosure. To solve this issue, we fill each missing month-observations with the previously available value of URLs.

The process results in a data frame with 70 103 observations constituting the ESG disclosure measure between January 2007 and December 2020 of 469 unique firms identified in section 4.2. For a complete list of our variables in the sample, see Table A4.1 in the Appendix.

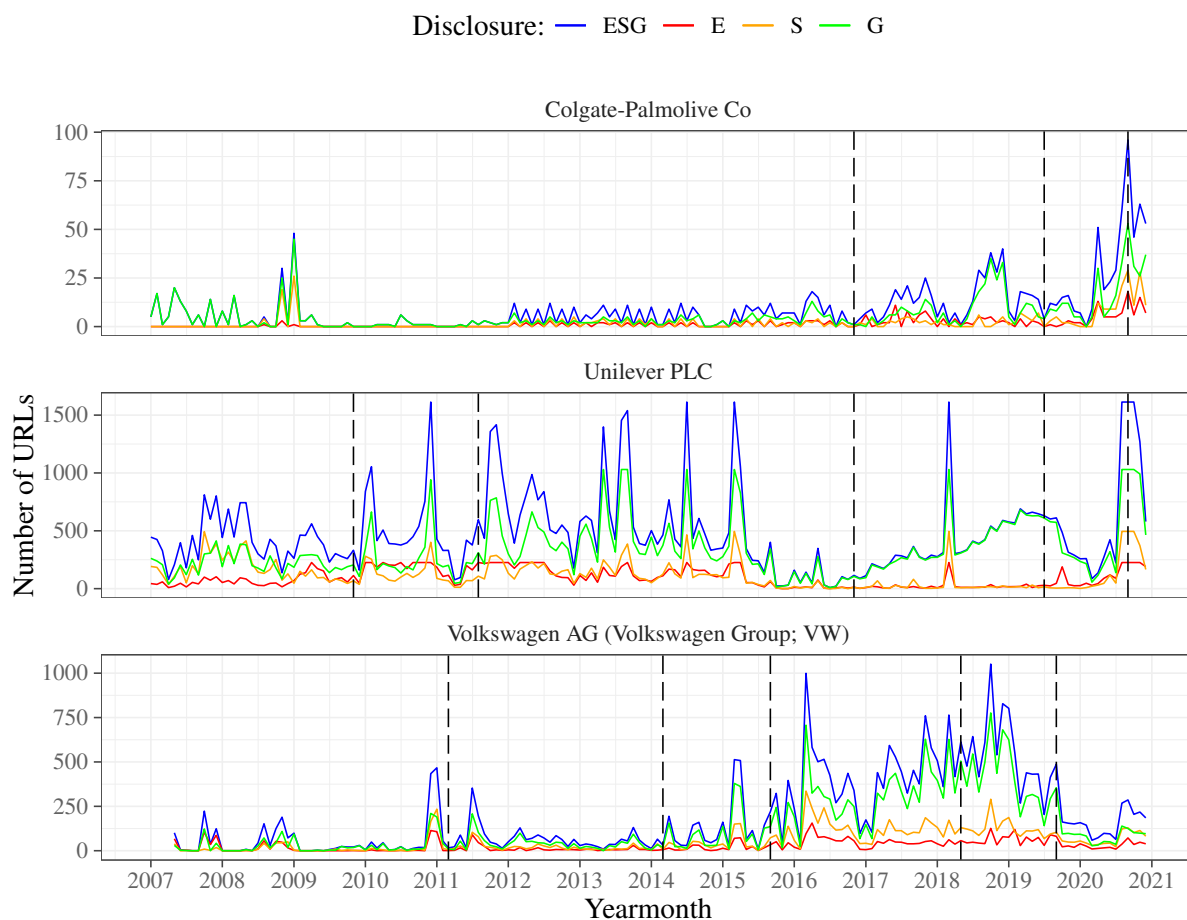
Figure 4.1: ESG Disclosures of Colgate-Palmolive, Unilever, and Volkswagen

Figure 4.1 depicts the development of disclosure measures for Colgate-Palmolive Co, Unilever PLC and Volkswagen AG. Each measure defines the monthly sum of URLs tagged as E, S, or G. ESG aggregates the pillars. The legend represents the different disclosure measures, and the black lines represent events.

Figure 4.1 shows the measure of ESG disclosure divided into environmental, social, and governance disclosure of three firms. The first firm is Colgate-Palmolive Co., an American multinational consumer products company. The figure shows that they had low ESG disclosures until 2017, where we observe an increase. The second firm is Unilever PLC, a British multinational consumer goods company. We observe by the figure the Fair & Lovely controversy (Jones, 2020) they experienced in 2020. The third firm is Volkswagen AG which is a German multinational automotive manufacturer. Their emission scandal, which came public in September 2015, is present in the figure. Different sources (Reuters, 2017) suspected their abnormally large emission levels as early as May 2014. Our data identify this suspicion.

We present these three specific firms because they represent three different characteristics distinctive from the firms in our sample. Colgate-Palmolive Co. has a small average number of URLs, Unilever PLC has a high average number of URLs, and Volkswagen AG has many events.

4.2 Event Data

To identify material ESG events, we use the RepRisk database, which systematically flags news that can impact a firm's reputational, compliance, and financial risk. RepRisk's methodology consists of daily screening of public sources and stakeholders such as print media, online media, social media, and other relevant text data using artificial intelligence, machine learning, and human intelligence. RepRisk intentionally excludes firms' self-disclosures to avoid unreliable information. However, it does not confirm whether the allegations are true but instead seeks to provide relevant information and transparency which could alter a company's ESG risks (RepRisk AG, 2021).

Through screening, RepRisk identifies events, segregates them into 28 different ESG issues, and links them to companies worldwide. The UN Global Compact Principles, the SASB Materiality Map, and the Sustainable Development Goals map the 28 topics. Each risk event is graded based on three parameters: 1) Severity, 2) Reach, and 3) Novelty. Severity is graded from 1 to 3 (3 – high severity) based on the event's consequences, the extent of the impact, and the degree of intent. Reach describes the reach of the information source and ranges from 1 to 3 (3 – high reach). A high reach is information covered in global media sources, while a low reach includes exposure limited to local sources. Novelty addresses the newness of the issue – whether the issue has occurred before for a company. Finally, the findings from the screening process go through a quality assurance check by a senior RepRisk analyst before being approved and published (RepRisk AG, 2021).

The news data provided by RepRisk covers thousands of companies with several hundred events each. Hence, we need to filter the data to achieve a more accurate and correct representation of actual events firms experience. Table 4.2 summarises the limitations imposed on the raw data.

Table 4.2: Sample Construction with ESG Events

	Unique Firms		Number of Events	
All ESG Events	18,203		348,190	
Include only events of highest severity	100%	1,748	100%	5,798
Firm URL available	96%	1,685	98%	5,674
Aggregate to firm-month level	96%	1,685	80%	4,661
Exclude serial offenders (> 20 events)	95%	1,652	66%	3,837
Minimum gap of 12 months between events	95%	1,652	46%	2,690
Events matched to firms in Compustat	29%	515	17%	990
Events matched to firms in the Wayback Machine	27%	469	15%	870

Table 4.2 displays summary statistics of the sample of events extracted from the raw data from RepRisk, where each row explains the limits done.

First, we filter the data of ESG events from RepRisk to only include high-severity events and firms with available URLs. Second, we aggregate the daily observations into firm-month observations. Then, we exclude serial offenders, defined as firms experiencing more than 20 events, as findings from Glossner (2021) show that higher event rates predict more future events and hence, markets underreact to events.

Moreover, we require a minimum gap of 12 months between the events to prevent overlapping events. For instance, for an event, RepRisk can register several confounding events around the event date and thus needs to be adjusted to assess unbiased estimations in our tests. Lastly, we merge the data with firm-fundamentals data from Compustat and available URL measures from the Wayback Machine. The final sample consists of 870 event-months and 469 unique firms between January 2007 and December 2020. Figure A1.1 in the Appendix represents the sample's distribution of firm-months on ESG-related issues.

4.3 CRSP/Compustat

The CRSP/Compustat merged database is a comprehensive financial database that combines historical data on stock prices, returns and detailed financial information such as income statements and balance sheets of publicly traded companies from the NYSE and NASDAQ (Center for Research in Security Prices, 2023). The database is created by merging the CRSP and Compustat financial databases. By merging these datasets, analysts can access large amounts of information on companies' financial health and performance over time. We use the CRSP/Compustat merged database primarily to add firm fundamentals to fit control variables in our analyses and acquire stock prices to calculate abnormal returns.

We use the Market model as our return-generating model to compute the estimated expected return. Hence, we retrieve data on the market portfolio from the S&P 500 index from CRSP. The float-weighted market index constitutes the leading 500 companies listed on the NYSE and NASDAQ, covering approximately 80% of the available market capitalization. (S&P Dow Jones Indices, 2023). Thus, the S&P 500 index is preferable, considering our sample consists of firms listed on the stock exchanges the index covers.

4.4 Variables

4.4.1 Dependent Variable 1: ESG in URLs

We obtain our dependent variable of ESG disclosure from URLs retrieved from the Wayback Machine. The mathematical formula for the disclosure measure is as follows:

$$Disclosure_{i,t}^{URL} = \sum_t URL_{w,i} \quad w \in E, S, G, ESG \quad (4.1)$$

where $Disclosure_{i,t}^{URL}$ is the ESG disclosure at time t for firm i . $URL_{w,i}$ is a dummy equalling one if the URL contains one or more w words. We calculate the monthly disclosure for every firm as the sum of URLs containing w words.

4.4.2 Dependent Variable 2: Cumulative Abnormal Returns

To measure the effects of ESG disclosure on stock market reactions, we use cumulative abnormal returns (CAR) which is common to use in event studies. To compute the CAR, we first derive the abnormal return for each event for each firm as:

$$AR_{i,t} = R_{i,t} - E(R_{i,t}|X_t) \quad (4.2)$$

where $AR_{i,t}$ is the abnormal return for firm i at time t . $R_{i,t}$ is the observed return for firm i at time t . $E(R_{i,t}|X_t)$ represents the estimated expected return derived from the Market model conditional on X_t that no other event occurs in the time t . Following MacKinley (1997), we use ordinary least squares (OLS) regression to estimate the expected return based on an estimation window of 130 days ([-150, -20]) before the ESG event.

Finally, we aggregate the abnormal returns over a short period around each event to limit potential confounding effects which could be present in a larger event window. The sum of abnormal returns of each event yields the cumulative abnormal return:

$$CAR_i^e[-t, t] = \sum_{\tau=-t}^t AR_{i,t}^e \quad (4.3)$$

4.4.3 Independent Variables

We regress on three main independent variables depending on the hypothesis studied. To test Hypothesis 1, we aggregate the number of *ESG events* the firm experienced in a year to represent our independent variable. Then, we introduce a binary variable to test Hypothesis 2, *Event*, which values one if an ESG event occurred at the specific month and zero otherwise. Lastly, to test Hypothesis 3, we introduce a dummy variable, *Disclosed*, valuing one if the firm disclosed significantly more ESG information before its ESG event and zero otherwise.

4.4.4 Control Variables

We mainly follow previous literature on voluntary disclosures to determine relevant control variables to include in our models. Moreover, we consider and include control variables to mitigate omitted variable bias and limit the possibility of confounding effects.

Firstly, we control for size, which is consistently proven to impact environmental disclosures significantly. Larger firms may have the capability and resources to engage in more ESG activities (McWilliams and Siegel, 2001) and thus provide more information on their ESG practices than smaller ones. Furthermore, previous studies show that investors are more sensitive to ESG events related to larger firms (Aouadi and Marsat, 2016). Hence, we use the logarithm of total assets to control for firm size.

Moreover, we control for the number of non-ESG URLs a firm has on its website. More specifically, some firms may construct their websites more sophisticatedly with many URLs than others. Accordingly, we expect how a firm constructs its website to affect how they disclose ESG information on its site. Subsequently, by capturing this factor, we can control whether changes in ESG URLs disclosed attributes to the complexity of the website. To be specific, the variable captures URLs which only have non-ESG words in them.

Previous research papers (Cho and Patten, 2007; Patten, 2002) also find that firms operating in environmentally sensitive industries tend to disclose more extensive environmental information. Accordingly, we control for firms in environmentally sensitive industries, such as the oil and gas industry, as they may be especially prone to disclose more ESG information as they face greater exposure to ESG risks. Therefore, we control for the industry by including a dummy, *Environmentally Sensitive Industry*, taking one to designate firms classified as environmentally sensitive based on the NAICS provided by NorthWest Business Development Association (2018).

Lastly, we control for profitability based on the return on assets. We expect a positive relationship between profitability and ESG disclosure, as those who are profitable may be able to allocate more funds to ESG activities. Their URLs might reflect this relationship.

4.5 Summary Statistics

Table 4.3 displays summary statistics for the variables used in our analyses to test Hypotheses 1 and 2. From Panel A, we observe that firms have, on average, two events and a maximum of eight events. The sample also consists of a few firms that do not experience any events due to the Wayback Machine not crawling webpages during the period their events happened. Nevertheless, we include these firms as they still provide valuable information on disclosure for periods without the occurrence of events.

Panel B provides detailed information on the variables used in the analyses. Note that the mean and standard deviation of the number of URLs is high compared to the other disclosure variables. This difference is reasonable as the total number of URLs constitutes all the subsets of the other URL measures. Furthermore, it is evident that between Environmental, Social and Governance URLs, Governance dominates. A reasonable explanation is that the SEC usually mandates and regulates governance disclosures requiring firms to disclose more regarding governance issues.

Table 4.3: Summary Statistics

Panel A: Firm Characteristics					
	N	Mean	SD	Min	Max
Unique Firms	469				
Number of Events per Firm		1.86	1.37	0	8

Panel B: Variable Characteristics					
Variables	N	Mean	SD	Min	Max
Dependent Variables					
Number of URLs	70,103	481.49	1,042.41	1	7,098.15
ESG URLs	70,103	100.51	227.89	0	1,612.95
Environmental URLs	70,103	12.47	32.80	0	226
Social URLs	70,103	27.67	69.61	0	495
Governance URLs	70,103	61.71	144.34	0	1,029.85
Independent Variables					
ESG Event	70,103	0.012	0.11	0	1
Control Variables					
Number of non-ESG URLs	70,103	372.08	840.03	1	5,795.65
Return on Assets	70,103	-0.04	2.35	-150.13	1.49
Logarithm of Total Assets	70,103	9.71	2.29	-2.79	15.04
Environmentally Sensitive Industry	70,103	0.04	0.19	0	1

Table 4.3 presents summary statistics of our main data sample generated after constructing the novel ESG measure from URLs and data retrieval of other firm characteristics and event data. Panel A provides characteristics for each unique firm, and Panel B summarises the firm-month data. We report the number of observations, mean, standard deviation, and minimum and maximum values for all measures.

Table 4.4 provides summary statistics of the data used in Hypothesis 3, where we separate the data into two groups - firms that increase disclosure before an event and firms that do not. The separation follows the identification procedure described in section 5.3. Moreover, we have calculated the CAR on three different event windows. Additionally, we adjust event dates on weekends to the following trading day.

Fifty-four firms increased their ESG disclosure before events, and 292 did not. Moreover, the data consists of 139 and 604 firm-events, respectively. We use a t-test to address the variables' significance. The most notable fact about the data is that the means of CAR on the event date significantly differ between the two groups according to the t-test, making us confident that CAR [0] is a measure worth analysing in Hypothesis 3. Another notable observation is that neither of the firms that increased their disclosures before events belonged to an environmentally sensitive industry.

Table 4.4: Differences in Firms Disclosing and Not Disclosing ESG before Event

Firm Characteristics	No ESG before Event				ESG before Event				T-value
	Mean	SD	Min	Max	Mean	SD	Min	Max	
Number of Unique Firms	292				54				
Observations	604				139				
Dependent Variables									
CAR [0]	0	0.03	-0.29	0.3	-0.01	0.05	-0.29	0.09	2.13***
CAR [-1,1]	0	0.06	-0.55	0.66	-0.01	0.07	-0.45	0.19	1.13
CAR [-5,5]	-0.02	0.14	-0.85	1.14	-0.04	0.19	-1.23	0.76	1.07
Independent Variables									
Return on Assets	0.04	0.09	-1.15	0.31	0.03	0.08	-0.31	0.29	0.68
Environmentally Sens. Ind.	0.04	0.2	0	1	0	0	0	0	4.99***
Logarithm of Total Assets	10.47	2.19	2.1	15.04	10.8	2.01	7.41	14.43	-1.72

Statistical significance markers: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 4.4 shows summary statistics of the data covering the cumulative abnormal returns for each firm-event on the event day [0] over a 3-day [-1,1] and a 10-day [-5,5] event window. At the top of the table, we report each group's unique firms and observations count. The rest of the table presents all measures' means, standard deviation, and minimum and maximum values. Lastly, we perform a two-sample t-test to address the two groups' variables' differences in means.

5 Results

In this section, we present the main results of our hypotheses in section 3 by conducting OLS regressions. First, we aim to establish a relationship between the extent of ESG disclosed by a firm and the number of ESG events it has experienced. Further, we examine the timing of ESG disclosure relative to ESG events. Lastly, we analyse the impact of past disclosures on the market reactions to ESG events by estimating the cumulative abnormal return (CAR) specified and formulated in Equation 4.3.

5.1 Hypothesis 1

In Hypothesis 1, we posit that firms disclose more ESG information for higher frequencies of ESG events. We develop a firm-year panel measuring the ESG information disclosed as formulated in Equation 4.1 to test the hypothesis. We estimate the following model to establish whether a firm's number of ESG URLs disclosed correlates with the number of ESG events it has experienced:

$$Disclosure_{i,t}^{URL} = \alpha + \beta \times ESG\ events_{i,t} + \Lambda X_{i,t} + \mu_i + \varphi_t + u_{i,t} \quad (5.1)$$

where $Disclosure_{i,t}^{URL}$ indexes the types of ESG URLs disclosed by firm i in year t . $ESG\ events_{i,t}$ is the sum of adverse ESG events firm i experienced in year t . $\Lambda X_{i,t}$ is a vector of control variables. The models also include firm and time-fixed effects μ_i and φ_t , respectively, to control for unobserved effects influencing the disclosure measure. $u_{i,t}$ is the error term. Additionally, we use robust standard errors clustered by firm in all the estimations to adjust for heteroskedasticity.

Based on the measures, we conduct four regressions represented in Table 5.1. In columns 1-3, we regress the three pillars of ESG disclosure, while column 4 aggregates the pillars on our main independent variable, $ESG\ events$, and a set of control variables capturing specific firm characteristics. For our hypothesis to be supported, we would expect the estimator, β , to be significantly positive.

Our main explanatory variable, $ESG\ events$, indicates no significant relationship between the *Environmental*, *Social*, *Governance*, and *ESG URL* measures in all the models. The logarithm of *Total Assets*, which controls for firm size, is significant at the 5% level in Model

1 indicating, a negative relationship between firm size and the environmental information disclosed. Nevertheless, the control is insignificant for the rest of the models. The control variable proxying for firm profitability, *Return on Assets*, is positively but weakly significant at the 10% level in Model 1. The control variable remains insignificant for the other models. The lack of significance applies in all the models for the dummy variable, *Environmentally Sensitive Industry*, indicating whether the firm operates in an environmentally sensitive industry. The variable controlling for the complexity of the website, *Number of non-ESG URLs*, is positively significant at the 1% level for all the models, indicating that more complex websites disclose more ESG information.

Table 5.1: The Relationship between ESG Events and ESG Disclosure

	<i>Dependent variable:</i>			
	<i>Type of URLs</i>			
	Environmental (1)	Social (2)	Governance (3)	ESG URLs (4)
ESG Events	-0.630 (0.610)	1.209 (1.453)	0.131 (2.921)	2.126 (4.196)
Log(Total Assets)	-1.841** (0.839)	-2.728 (1.839)	3.509 (2.639)	-0.866 (4.152)
Return on Assets	0.093* (0.048)	0.089 (0.089)	-0.216 (0.136)	-0.014 (0.208)
Environmentally Sensitive Industry	-9.501 (7.272)	-11.879 (17.443)	-82.700 (74.163)	-118.470 (95.290)
Number of non-ESG URLs	0.020*** (0.002)	0.047*** (0.005)	0.093*** (0.008)	0.171*** (0.013)
Firm FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Clustered SE	Yes	Yes	Yes	Yes
Observations	5,880	5,880	5,880	5,880
R ²	0.316	0.369	0.331	0.440
Adjusted R ²	0.254	0.312	0.270	0.389

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 5.1 reports the coefficient estimates from the ordinary least squares regressions for Hypothesis 1. The sample comprises 469 firms listed on the NYSE and NASDAQ from 2007 to 2020. The dependent variables are the measures of ESG in URLs in a year. The main independent variable is the number of ESG events experienced each year. White standard errors clustered by firm in parentheses.

5.2 Hypothesis 2

In Hypothesis 2, we posit that when firms behave unethically, causing ESG events, they are more inclined to address and manage their ESG risks before the public exposes them. To test the hypothesis, we develop a year-month firm panel measuring each firm's ESG information disclosed monthly. We specify a model which includes the dummy, $Event_{i,t}$, equalling one if the firm i experienced an ESG event in month t and zero otherwise. By lagging the dummy variable nine months ($[-6, 3]$) around the event, we can examine the timing of disclosure relative to the ESG event:

$$\begin{aligned}
 Disclosure_{i,t}^{URL} = & \alpha + \beta_1 Event_{i,t+6} + \beta_2 Event_{i,t+5} + \beta_3 Event_{i,t+4} \\
 & + \beta_4 Event_{i,t+3} + \beta_5 Event_{i,t+2} + \beta_6 Event_{i,t+1} \\
 & + \beta_7 Event_{i,t} + \beta_8 Event_{i,t-1} + \beta_9 Event_{i,t-2} \\
 & + \beta_{10} Event_{i,t-3} + \Lambda X_{i,t} + \mu_i + \varphi_t + u_{i,t}
 \end{aligned} \tag{5.2}$$

We conduct four regressions based on the ESG measures, which we regress on our lagged independent variable, t months before the event, to capture the timing of ESG disclosure. We expect either of our six estimators, β_{1-6} , to be significantly positive to support our hypothesis.

Determining the Lag Length

One common challenge with including lags in regressions is choosing the length of lags. However, to determine the length of our lagged independent variable, $Event_{i,t}$, we perceive a time window of six months before the event as a reasonable time in which the management is more likely to address its ESG risks. Thus, we first lag the event on the consecutive six months before its occurrence. Moreover, we also lag the event on the following three months to control for potential inference after the event. Lastly, we narrow the length by statistical significance. More specifically, we continuously shorten the lag by one period if we cannot reject the null hypothesis that the coefficient at the longest lag in both ends is zero until it is statistically significant.

Timing of Disclosure

Table 5.2 displays the results from Equation 5.2 lagged nine months $([-6, 3])$ around the event. In Model 1, our main lagged independent variable shows a negative but weak significant relationship between the *Environmental* information disclosed six months before the event. However, we consider the significance level of 10% inadequate for evidence as we run a higher risk of obtaining false positives. Thus, we will not emphasise the finding further.

Moreover, none of our main lagged independent variables is significant in the other models. Consequently, we cannot draw any statistical inference on the timing of disclosure. The control variable, the logarithm of *Total Assets*, shows a weak negative significance in Model 1 but is insignificant for the other three models. The same applies to the control variable, *Return on Assets*; however, has a positive coefficient in Model 1. The variable controlling for the complexity of the website is positively significant at the 1% level for all the models.

Table 5.2: The Timing of ESG Disclosure

	<i>Dependent variable:</i>			
	<i>Type of URLs</i>			ESG URLs
	Environmental	Social	Governance	
	(1)	(2)	(3)	(4)
6 months before the event	-1.178* (0.704)	-0.024 (1.914)	-0.141 (3.811)	1.132 (5.614)
5 months before the event	-1.013 (0.729)	-0.416 (1.878)	-2.124 (3.800)	-1.512 (5.977)
4 months before the event	-1.356 (0.868)	-0.294 (1.924)	-5.420 (3.892)	-6.596 (5.910)
3 months before the event	-0.536 (0.863)	3.041 (2.288)	-4.471 (4.042)	1.197 (6.345)
2 months before the event	-0.697 (0.919)	0.755 (2.553)	-1.150 (5.046)	0.841 (8.025)
1 month before the event	-0.639 (0.833)	0.370 (2.183)	-1.410 (3.909)	-1.197 (5.699)
Month of the ESG event	-0.741 (0.832)	1.058 (2.176)	0.733 (4.010)	4.565 (6.454)
1 month after the event	0.344 (0.901)	-0.202 (1.830)	-2.169 (4.121)	-2.760 (5.947)
2 months after the event	-0.518 (0.992)	-0.905 (1.640)	-2.457 (4.154)	-3.245 (5.896)
3 months after the event	0.386 (0.919)	0.210 (1.620)	-0.770 (3.849)	0.098 (5.512)
Log(Total Assets)	-1.673* (0.954)	-3.079 (2.070)	3.869 (2.907)	-0.748 (4.851)
Return on Assets	0.092* (0.052)	0.128 (0.100)	-0.180 (0.147)	0.066 (0.242)
Environmentally Sensitive Industry	-3.741 (6.496)	-0.332 (14.743)	-58.058 (79.467)	-76.131 (98.700)
Number of non-ESG URLs	0.006*** (0.001)	0.013*** (0.002)	0.027*** (0.004)	0.050*** (0.007)
Firm FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Clustered SE	Yes	Yes	Yes	Yes
Observations	65,882	65,882	65,882	65,882
R ²	0.153	0.173	0.167	0.231
Adjusted R ²	0.145	0.165	0.159	0.224

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 5.2 reports the coefficient estimates from the ordinary least squares regressions for Hypothesis 2. The sample comprises 469 firms listed on the NYSE and NASDAQ from 2007 to 2020. The dependent variables are the measures of ESG in URLs each month. The main independent variable, *t months before the event*, is a dummy variable equalling one for each month $t \in \{-6, -5, -4, -3, -2, -1\}$ before the event. White standard errors clustered by firm in parentheses.

Disclosure on the Month of the Event

The regressions in Table 5.2 include our independent variable lagged nine months around the event month. Next, we follow the procedure presented earlier. The process removes all trailing lags before and after the event month, as presented in Table 5.3. *Month of the ESG Event* indicates no significance for either of the models. The variable controlling for firm size becomes negatively significant at 5% in Model 1. The control variables, *Return on Assets* and *Number of non-ESG URLs*, remain the same as in the previous regressions in Table 5.2.

Table 5.3: ESG Disclosure on the Month of the ESG Event

	<i>Dependent variable:</i>			
	<i>Type of URLs</i>			
	Environmental	Social	Governance	ESG URLs
	(1)	(2)	(3)	(4)
Month of the ESG Event	-0.190 (0.798)	2.562 (2.028)	3.284 (3.983)	8.199 (6.213)
Log(Total Assets)	-1.822** (0.918)	-2.533 (1.963)	3.718 (2.787)	-0.392 (4.649)
Return on Assets	0.103* (0.053)	0.108 (0.098)	-0.173 (0.146)	0.062 (0.243)
Environmentally Sensitive Industry	-4.558 (6.001)	0.362 (12.831)	-59.928 (74.327)	-76.527 (91.151)
Number of non-ESG URLs	0.006*** (0.001)	0.013*** (0.002)	0.029*** (0.004)	0.053*** (0.006)
Firm FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Clustered SE	Yes	Yes	Yes	Yes
Observations	70,103	70,103	70,103	70,103
R ²	0.158	0.181	0.174	0.237
Adjusted R ²	0.150	0.174	0.166	0.230

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 5.3 reports the coefficient estimates from the ordinary least squares regressions for Hypothesis 2. The sample comprises 469 firms listed on the NYSE and NASDAQ from 2007 to 2020. The dependent variables are the measures of ESG in URLs each month. The main independent variable, *t months before the event*, in Table 5.2, is removed after narrowing the length of lags by statistical significance. White standard errors clustered by firm in parentheses.

5.3 Hypothesis 3

In Hypothesis 3, we hypothesise that firms which disclose more ESG before events are less prone to severe market reactions. To test the hypothesis, we aggregate the sample to firm-event observations and divide the dataset into two groups - those that disclosed before the event and those that did not. To identify the groups, we run the model specified in Equation 5.2 for each firm lagged six months $([-6, 0])$ before each firm's event. Section 4.4 presents the descriptive statistics for the two different groups. Next, we estimate the following regression model:

$$CAR_i^e[-t, t] = \alpha + \beta \times Disclosed_{e,i} + \Lambda X_{e,i} + u_{e,i} \quad (5.3)$$

for which $CAR_i^e[-t, t]$ is the cumulative abnormal return around ESG event e committed by firm i considered on the event day $[0]$ over a 3-day $[-1, 1]$ and a 10-day $[-5, 5]$ event window. $Disclosed_{e,i}$ is a dummy equalling one if the firm i significantly increased its disclosure of ESG information within six months before its event e and zero otherwise. Our estimator of interest, β , captures the effect of disclosing ESG information on stock price reactions. Hence, we would expect to observe a significant positive estimate for our hypothesis to be supported. Table 5.4 represents the results from the regressions.

The results indicate that firms with upfront disclosures of ESG information experience a significant negative impact on the abnormal returns of 83 basis points, on average, on the event day at the 5%-level compared to the counterfactual group. However, the significance diminishes when expanding the event window. Furthermore, the variable, logarithm of *Total Assets*, controlling for firm size indicates no significant correlation with CAR. The same applies to the variable controlling for firm profitability *Return on Assets*. The dummy, *Environmentally Sensitive Industry*, is positively significant at the 5%-level in Model 3 but diminishes when narrowing the event window in Model 1 and 2.

Table 5.4: The Market Reaction to Upfront ESG Disclosure

	<i>Dependent variable:</i>		
	Cumulative Abnormal Returns		
	[0]	[-1, 1]	[-5, 5]
	(1)	(2)	(3)
Disclosed	-0.829** (0.369)	-0.654 (0.653)	-1.516 (1.729)
Log(Total Assets)	0.076 (0.080)	0.039 (0.140)	-0.177 (0.283)
Return on Assets	2.809 (2.144)	0.812 (5.402)	1.868 (11.238)
Environmentally Sensitive Industry	1.472 (0.938)	2.056 (1.353)	6.482** (3.214)
Constant	-0.897 (0.930)	-0.850 (1.711)	-0.191 (3.437)
Firm FE	No	No	No
Time FE	No	No	No
Clustered SE	Yes	Yes	Yes
Observations	743	743	743
R ²	0.021	0.005	0.009
Adjusted R ²	0.016	0.0001	0.003

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 5.4 reports the coefficient estimates from the ordinary least squares regressions for Hypothesis 3 scaled to percentage. The sample consists of two groups of firms listed on the NYSE and NASDAQ from 2007 and 2020. The groups consist of 54 firms that increased ESG before an event and 292 that did not. The dependent variables are the cumulative abnormal returns on the event day [0] over a 3-day [-1,1] and a 10-day [-5,5] event window. The main independent variable *Disclosed* is a dummy equalling one if the firm increased its ESG disclosure significantly within the six months preceding the event, and zero otherwise.

Placebo Regression

We conduct placebo regression estimates for Model 1 in Hypothesis 3 to validate our finding that upfront disclosure aggravates the market reaction. Specifically, we re-sample the group which disclosed ESG before its events randomly 10,000 times and re-estimate the coefficients of the models. Hence, the placebo regression aims to eliminate the concerns that our findings in Hypothesis 3 are due to chance – that increased ESG disclosure before events aggravates the market reaction is not random.

In Figure 5.1, we present the histogram of the re-estimated coefficients of the main independent variable *Disclosed* from the 10,000 placebo regressions. The dashed line displays the 95th percentile of the distribution of the placebo coefficients, while the blue line represents the true estimated coefficient from Model 1. As observed, the true estimate is below the 5% confidence interval providing additional evidence that our finding is not due to randomness but more likely to stem from upfront ESG disclosure before the events.

Figure 5.1: Placebo Regression Histogram

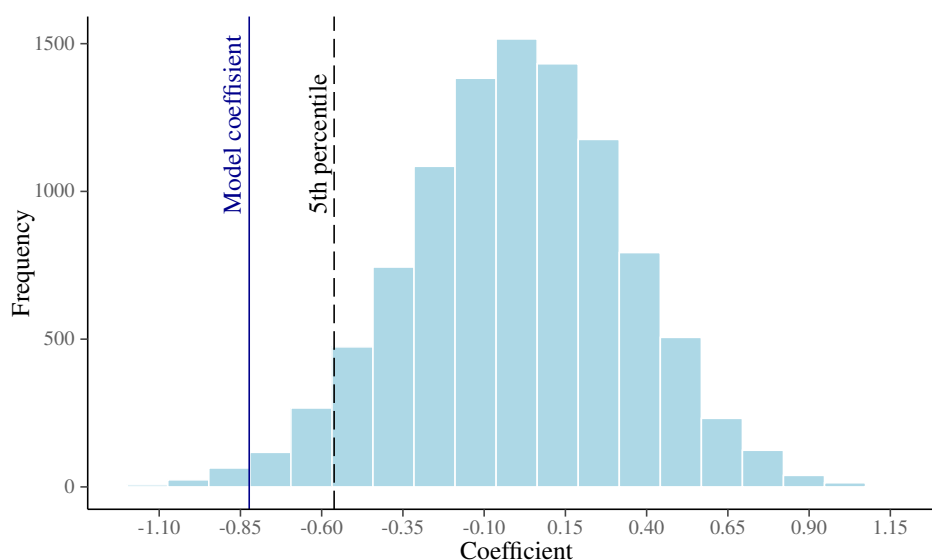


Figure 5.1 plots the estimated placebo regressions ($n = 10,000$) coefficients that randomly assign the dummy *Disclosed* indicating whether the firm significantly disclosed more ESG in the preceding six months before the event. The vertical blue line denotes the true coefficient estimate reported in Table 5.4 Model 1. The dashed line denotes the empirical 5th percentile.

6 Discussion

In this thesis, we attempt to discover a phenomenon where executives deliberately provide more upfront ESG information before experiencing ESG events. We suspect possible mitigating effects of upfront disclosure can incentivise such behaviour. To empirically explore whether this phenomenon exists, we developed and tested three hypotheses presented in section 3 and 5, respectively. Thus, in this section of the thesis, we discuss the results of our hypotheses by comparing them to previous literature on the topic.

6.1 The Relationship between ESG Events and ESG Disclosure

We find contradicting results compared with the findings of Cho and Patten (2007) and Clarkson et al. (2008). Both papers find a linear relationship between the levels of toxic emissions and the ESG information disclosed in the annual reports. However, our results show no evidence suggesting a linear relationship between ESG disclosure and the frequency of ESG events. A simple explanation for the dissimilarities may be the difference in measures analysed - they study toxic emissions while we study firm-specific ESG events. However, the legitimacy theory suggests that firms causing controversies must justify their existence in society; otherwise, they risk severe sanctions, which may lead to insolvency. Based on this theory, we expect a relationship between events experienced and information disclosed.

Nevertheless, our finding suggests otherwise. A possible explanation is that disclosure behaviour likely depends on other factors, such as the individual traits of the firm and the individual event. We suggest that the management's overall perception of the specific event may play an essential factor in the decision to disclose information. Maxwell and Lyon (2011) find that disclosure behaviour is mainly explained by activist pressures and the trade-off between disclosing and withholding information. Therefore, the management must consider the implications of disclosing more information for the individual event, as disclosure might backlash later in the instance of disappointment. Accordingly, and in line with Maxwell and Lyon's (2011) findings, we can expect not to observe a linear relationship between ESG events and ESG disclosure.

6.2 The Timing of ESG Disclosure

Further, we investigate the timing of ESG disclosure before ESG events. We find no tendency for firms to disclose significantly more ESG information in the six months before its controversies. The finding contradicts the arguments of Kölbel et al. (2017), who suggested that firms might seek to influence the event's impact by addressing its ESG risks openly. The arguments of Kölbel et al. (2017) might be valid under certain circumstances. However, our empirical findings generally suggest that firms keep quiet about their ESG issues before the public exposes them. We explain such behaviour to possibly derive from a fear that being transparent might do more harm than withholding the information. Hence, executives might worry about the potential negative implications of disclosing more ESG information preceding the controversy and instead take the chance of not addressing its ESG concerns. Our results make an additional empirical contribution to Maxwell and Lyon's (2011) findings, who find the threat of public backlash to clam firms up, rather than becoming more transparent. Therefore, the strategy of withholding information appears to be stronger than a possible mitigating effect of transparent disclosure.

6.3 The Market Reaction to Upfront ESG Disclosure

In Hypothesis 3, we argue that a firm's upfront disclosures might mitigate the market's reaction to its event. Our findings from Hypothesis 2 reveal that firms are surprisingly hesitant to disclose ESG information before its controversies. To identify a possible mechanism motivating this behaviour, we examine the market reaction to firms that significantly increased their ESG disclosures within six months before their controversies. In line with Hummel et al. (2019), these firms experience a significantly stronger adverse market reaction, contradicting our hypothesis. We suggest that a breach of expectations between the investors and the firm probably explains the finding. According to the voluntary disclosure theory and previous findings in research (Cheng et al., 2013; Healy and Palepu, 2001), increased transparent disclosure can mitigate the perceived risk of the firm as it reduces information asymmetries. Therefore, a possible explanation for our finding is that the occurrence of an ESG controversy might not align with investors' expectations. The information disclosed in the months before the event does not necessarily represent the whole picture of the ESG risks the firm currently faces. Accordingly, shareholders perceive the ESG controversy as a shock and more severe.

Conversely, Capelle-Blancard and Petit (2017) find more positive disclosure to mitigate the market reaction to negative ESG news. However, we argue that their conclusion needs to be more consistent. Specifically, they lack proxying for the event's severity, which is vital as the investors' reaction to disclosure might differ depending on the severity of the event. For instance, past disclosures might have a mitigating effect on the market reaction to unforeseen events such as accidents and natural disasters, as suggested by the findings of Blacconiere and Patten (1994) and Heflin and Wallace (2017). Most likely, this increase in disclosure reflects genuine improvements in the firms' ESG performance rather than window dressing. However, the conclusion might be different when consistently considering events that are highly likely caused with intent and in a systematic way, as we do. Hence, the shareholders question the truthfulness of the previous disclosures.

As insinuated, our results contradict the findings of Blacconiere and Patten (1994) and Heflin and Wallace (2017). The reasonable explanation is that both studies examine the disclosure of firms exposed to an external event, i.e., events they did not cause themselves, while we study firm-specific events.

7 Limitations and Further Research

Our research findings provide insights into the effect of adverse ESG events on firms' ESG disclosure. In addition, we investigate how upfront ESG disclosure before adverse ESG events affects the market reaction. However, there are some limitations to our analysis. Moreover, several avenues for further research could contribute to a deeper understanding of the determinants of firms' motivation to disclose ESG information. This thesis section provides the limitations and three suggestions for further research.

7.1 Limitations

The first limitation that affects our analyses is how we limit the news data from RepRisk to identify events. RepRisk provides multiple news related to the same event, and we filter to avoid confounding events. However, we are still determining which news reflects the correct beginning of an event. Therefore, the main events' start dates may have been wrongly identified, consequently affecting our observed timing of disclosure. Additionally, as we only consider events of the highest severity, we assume they are identical and have the same characteristics on our measures. However, it might only sometimes be valid as the events can concern various types of ESG issues with varying importance.

We calculate our disclosure measure based on a data source that no other researcher has used earlier, and to construct the measure, we have made some assumptions. Firstly, we assume that the list of URLs from the Wayback Machine is correct. Next, we assume that the number of unique URLs each month represents the totality of the firm's website. Additionally, since the Wayback Machine crawls websites inconsistently, we assume that the level of disclosure in a month where we have missing data is equal to the closest available data point in the past. Lastly, we tag each URL based on its content and do not differentiate between positive and negative disclosures.

7.2 Further Research

We scratch only the surface of what the Wayback Machine as a data source can contribute to research. Instead of analysing the content of URLs, one could study the content of each website. That way, one could get a more precise measure of how much ESG a firm discloses. Additionally, this can enable the researcher to find sentiment on ESG disclosure, that is, to differentiate the information as positive or negative and then analyse whether firms experiencing adverse ESG events have an abnormal disclosure of positive or negative ESG information compared to their peers.

Secondly, future research could investigate the impact of regulatory requirements on firms' ESG disclosure practices before and after ESG events. Disclosure of ESG information has been almost entirely voluntary until now. However, in January 2023, the Corporate Sustainability Reporting Directive (CSRD) under the European Commission strengthened the rules around the social and environmental information companies must report. The effective date for these rules is set to be in 2024 (The European Commission, 2023). Hence, it would be interesting to investigate whether firms with less strict disclosure requirements provide more ESG information before events than firms with stricter requirements.

Lastly, future research can investigate the role of investor pressure on firms' ESG disclosure practices. Pressures from investors that prioritise ESG factors may make firms increase their ESG disclosures before ESG events. Additionally, future research can investigate how effective different types of pressures from investors are in encouraging firms to increase their ESG disclosures.

8 Conclusion

History unfolds many instances of attempts to cover up unethical practices. Do corporations embrace the transformation ESG represent, and do firms have a genuine ulterior motive to adopt ESG in their business model we ask ourselves. Considering this critical view, we examine whether adverse ESG events influence the firms' ESG disclosure. The purpose is to address whether executives intentionally use transparent ESG disclosure in anticipation of events to mitigate the event's impact on the stock price.

We find that executives tend not to address or justify their actions when experiencing adverse ESG events, contradicting the legitimacy theory. Contrary to our main hypotheses, executives prefer to withhold information about their ESG concerns before experiencing events, indicating that they fear transparent disclosure might harm them more than remaining silent. Moreover, we show that upfront ESG disclosure aggravates the market's reaction. We argue that if the information disclosed upfront does not represent the actual picture of the firm's current ESG risks, the shareholders question the truthfulness of the information. Hence, they react more severely to the event. Our findings suggest that adverse ESG events do not affect the firms' ESG disclosure but that executives withhold information about their ESG concerns.

Our research contributes to several papers studying voluntary disclosure and adverse ESG events. Mainly, we contribute to the existing literature by constructing a novel and timely ESG disclosure measure using textual analysis. By analysing the disclosures in firms' URLs over time, we gain valuable insights into the evolution of firms' disclosures more precisely and timely than most other metrics previously used in the literature. Lastly, we contribute to a growing field in the literature on textual analysis by demonstrating its applications in analysing finance research topics, as we are among the first to perform textual analysis on firms' website URLs from the Wayback Machine.

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Appendix

A1 ESG Event Issues

Figure A1.1: ESG Event Issues Obtained from the RepRisk Database



Figure A1.1 displays the number of firm-months with ESG events for different related issues for our sample after limiting the raw data from RepRisk. Each firm-months can be associated with multiple related issues. Human rights violations top the list.

A2 ESG Dictionary

Table A2.1: ESG Dictionary by Baier et al. (2020)

Topic	Words
Environmental	clean, environmental, epa, sustainability, climate, warming, biofuel, biofuels, green, renewable, solar, stewardship, wind, atmosphere, emission, emissions, emit, ghg, ghgs, greenhouse, agriculture, deforestation, pesticide, pesticides, wetlands, zoning, biodiversity, species, wilderness, wildlife, freshwater, groundwater, water, cleaner, cleanup, coal, contamination, fossil, resource, air, carbon, nitrogen, pollution, superfund, biphenyls, hazardous, householding, pollutants, printing, recycle, recycling, toxic, waste, wastes, weee
Governance	align, aligned, aligning, alignment, aligns, bylaw, bylaws, charter, charters, culture, death, duly, independent, parents, cobc, ethic, ethical, ethically, ethics, honesty, bribery, corrupt, corruption, crimes, embezzlement, grassroots, influence, influences, influencing, lobbied, lobbies, lobby, lobbying, lobbyist, lobbyists, whistleblower, compliance, conduct, conformity, governance, misconduct, parachute, parachutes, perquisites, plane, planes, poison, retirement, approval, approvals, approve, approved, approves, approving, assess, assessed, assesses, assessing, assessment, assessments, audit, audited, auditing, auditor, auditors, audits, control, controls, coso, detect, detected, detecting, detection, evaluate, evaluated, evaluates, evaluating, evaluation, evaluations, examination, examinations, examine, examined, examines, examining, irs, oversee, overseeing, oversees, oversight, review, reviewed, reviewing, reviews, rotation, test, tested, testing, tests, treadway, backgrounds, independence, leadership, nomination, nominations, nominee, nominees, perspectives, qualifications, refreshment, skill, skills, succession, tenure, vacancies, vacancy, appreciation, award, awarded, awarding, awards, bonus, bonuses, cd, compensate, compensated, compensates, compensating, compensation, eip, iso, isos, payout, payouts, pension, prsu, prsus, recoupment, remuneration, reward, rewarding, rewards, rsu, rsus, salaries, salary, severance, vest, vested, vesting, vests, ballot, ballots, cast, consent, elect, elected, electing, election, elections, elects, nominate, nominated, plurality, proponent, proponents, proposal, proposals, proxies, quorum, vote, voted, votes, voting, attract, attracting, attracts, incentive, incentives, interview, interviews, motivate, motivated, motivates, motivating, motivation, recruit, recruiting, recruitment, retain, retainer, retainers, retaining, retention, talent, talented, talents, brother, clicking, conflict, conflicts, family, grandchildren, grandparent, grandparents, inform, insider, insiders, inspector, inspectors, interlocks, nephews, nieces, posting, relatives, siblings, sister, son, spousal, spouse, spouses, stepchildren, stepparents, transparency, transparent, visit, visiting, visits, webpage, website, announce, announced, announcement, announcements, announces, announcing, communicate, communicated, communicates, communicating, erm, fairly, integrity, liaison, presentation, presentations, sustainable, asc, disclose, disclosed, discloses, disclosing, disclosure, disclosures, fasb, gaap, objectivity, press, sarbanes, engagement, engagements, feedback, hotline, investor, invite, invited, mail, mailed, mailing, mailings, notice, relations, stakeholder, stakeholders, compact, ungc
Social	citizen, citizens, csr, disabilities, disability, disabled, human, nations, social, un, veteran, veterans, vulnerable, dignity, discriminate, discriminated, discriminating, discrimination, equality, freedom, humanity, nondiscrimination, sexual, communities, community, expression, marriage, privacy, peace, bargaining, eeo, fairness, fla, harassment, injury, labor, overtime, ruggie, sick, wage, wages, workplace, bisexual, diversity, ethnic, ethnically, ethnicities, ethnicity, female, females, gay, gays, gender, genders, homosexual, immigration, lesbian, lesbians, lgbt, minorities, minority, ms, race, racial, religion, religious, sex, transgender, woman, women, occupational, safe, safely, safety, ilo, labour, eicc, children, epidemic, health, healthy, ill, illness, pandemic, childbirth, drug, medicaid, medicare, medicine, medicines, hiv, alcohol, drinking, bugs, conformance, defects, fda, inspection, inspections, minerals, standardization, warranty, endowment, endowments, people, philanthropic, philanthropy, socially, societal, society, welfare, charitable, charities, charity, donate, donated, donates, donating, donation, donations, donors, foundation, foundations, gift, gifts, nonprofit, poverty, courses, educate, educated, educates, educating, education, educational, learning, mentoring, scholarships, teach, teacher, teachers, teaching, training, employ, employment, headcount, hire, hired, hires, hiring, staffing, unemployment

Table A2.1 shows the ESG dictionary by Baier et al. (2020) we use for textual analysis of firms URLs. The dictionary separates Environmental, Social and Governance words.

A3 URL Measure Data

Table A3.1: A Subset of the URL Measure Data of Volkswagen AG

Reprisk-ID	Name	Year-month	E	S	G	ESG	non-ESG	Sum
370	Volkswagen AG	2013-08-01	6	9	51	65	231	296
370	Volkswagen AG	2013-09-01	7	12	42	55	170	225
370	Volkswagen AG	2013-10-01	30	43	93	131	257	388
370	Volkswagen AG	2013-11-01	7	13	46	60	165	225
370	Volkswagen AG	2013-12-01	7	14	14	32	103	135
370	Volkswagen AG	2014-01-01	2	6	5	12	40	52
370	Volkswagen AG	2014-02-01	3	39	34	65	116	181
370	Volkswagen AG	2014-03-01	6	7	20	31	117	148
370	Volkswagen AG	2014-04-01	15	47	156	194	313	507
370	Volkswagen AG	2014-05-01	4	33	23	57	156	213
370	Volkswagen AG	2014-06-01	4	6	23	31	137	168
370	Volkswagen AG	2014-07-01	8	10	13	29	113	142
370	Volkswagen AG	2014-08-01	32	53	91	144	422	566
370	Volkswagen AG	2014-09-01	31	50	117	160	206	366
370	Volkswagen AG	2014-10-01	6	32	30	58	219	277
370	Volkswagen AG	2014-11-01	1	16	29	45	304	349
370	Volkswagen AG	2014-12-01	4	29	31	63	241	304
370	Volkswagen AG	2015-01-01	14	38	137	161	207	368
370	Volkswagen AG	2015-02-01	6	10	10	25	118	143
370	Volkswagen AG	2015-03-01	70	150	379	513	1096	1609
370	Volkswagen AG	2015-04-01	73	153	362	508	1493	2001

Table A3.1 shows a subset of Volkswagen AG's disclosure measures after the tagging process of URLs. Each line in the table represents the measures on a firm-month level. The measure is the sum of the type of ESG URLs for that given firm that month.

A4 Variable Description

Table A4.1: An Overview of Variables and Sources

Variable Name	Definition	Source
Dependent Variables		
Number of URLs	The number of URLs. Winsorized at the 0.01%/99% level.	The Wayback Machine
Number of ESG URLs	Our measure of the number of URLs that contain one or more ESG words. Winsorized at the 0.01%/99.0% level.	The Wayback Machine
Number of Environmental URLs	Our measure of the number of URLs that contain one or more environmental words. Winsorized at the 0.01%/99% level.	The Wayback Machine
Number of Social URLs	Our measure of the number of URLs that contain one or more social words. Winsorized at the 0.01%/99.0% level.	The Wayback Machine
Number of Governance URLs	Our measure of the number of URLs that contain one or more governance words. Winsorized at the 0.01%/99.0% level.	The Wayback Machine
Cumulative Abnormal Returns	The accumulated abnormal returns derived from the Market model, on the event day [0] over a 3-day [-1,1] and a 10-day [-5,5] event window.	CRSP
Independent Variables		
ESG Event	Indicator variable equalling one if the firm experienced a negative ESG event in the given month.	RepRisk
Disclosed	Indicator variable equalling one if the firm significantly increased its ESG disclosures within six months before the event.	
Control Variables		
Log(Total Assets)	The natural logarithm of total assets.	Compustat
Return on Assets	The firm's ROA measuring profitability (net income divided by total assets).	Compustat
Environmentally Sensitive Industry	Indicator variable equalling one if the firm is in an environmentally sensitive industry. Categorized by NAICS code.	Compustat
Number of non-ESG URLs	Our measure of the number of URLs that do not contain any ESG word. Winsorized at the 0.01%/99.0% level.	The Wayback Machine

Overview of all variables. The table provides the definition and source of each variable.