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Erasmus University Rotterdam

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The Effect of ESG Dislcosure and Performance on Financial Performance and Twitter Sentiment

Name author	Mitzy van Gelder
Student ID	605137
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Supervisor	N.M. Almeida Camacho
Second assessor	O. Vicil

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Abstract

Firms are under increasing pressure to communicate their environmental, social, and governance (ESG) performance in today's world, as stakeholders value a firm's corporate social responsibility (CSR). CSR communication and ESG disclosure are widely studied topics in marketing and finance, few papers have studied the topics simultaneously in both research fields. This study bridges the gap by conducting OLS regressions to test the effect of ESG disclosure and ESG performance on financial performance, and a sentiment analysis to test the effect of CSR communication on Twitter on firm reputation. According to the findings of this study, ESG disclosure moderates the relationship between ESG performance and financial performance. ESG disclosure, in particular, weakens the negative relationship between ESG performance and financial performance. More importantly, high levels of disclosure transform this relationship into a positive effect of ESG performance on financial performance. The second part of this study discovered, using a multiple-case-study approach, that only Shell's communication had an effect on public sentiment, but the sentiment towards the company decreased rather than increased. Although the relationship between CSR communication on Twitter and firm reputation remains ambiguous, this study contributes to a better understanding of the effects of CSR disclosure in a broader context.

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1 Introduction

Majority of today's firms are confronted with corporate social responsibility (CSR). Whether it is due to regulations or social expectations, most firms are pressured to act responsible. This has become measurable due to common CSR ratings, such as The Environment Social and Governance (ESG) performance score[1]. Even when firms act responsibly, they must effectively disclose their activities to create value. The importance of corporate disclosure has been extensively studied in accounting literature, resulting in a deep understanding of its impact on both stakeholders and firm value. Non-financial reporting, which includes ESG disclosure[2], is a more recent development in literature. However, disclosing ESG is not restricted to accountancy, as CSR activities are frequently communicated through means other than accountancy reports, such as social media.

Even though CSR communication and ESG disclosure are widely studied topic in marketing and accounting, few papers have studied the topics simultaneously in both research fields. This study aims to bridge these research fields, to provide a broad understanding of the topic. Therefore, this study is split in two parts and focuses on CSR communication in two distinct ways; ESG disclosure in relation to ESG performance score and financial performance; and CSR communications through Twitter in relation to non-financial performance, measured in firm reputation.

Specifically, the first part shows whether ESG disclosure affects the relation between ESG performance and financial performance. The relation between ESG performance and financial performance has been studied extensively. Even though there are studies arguing against, the majority of studies found a positive relation between ESG performance and financial performance of a firm (Friede et al., 2015; Friedman, 1970; Kim & Lyon, 2015). Even though increasing ESG activities leads to additional costs, the benefits such as increased efficiency and innovation, often outweigh the costs of investment, thus creating more value (Amec & Lamoie, 2008).

Firms can have different motives behind their levels of CSR communication, depending on their CSR performance. According to the voluntary disclosure theory, firms with a high (low) ESG performance are likely (unlikely) to report their efforts. The high performers want to gain value for their efforts, while the low performers want to avoid losses due to their low ESG activities by

[1] This study uses Refinitiv ESG performance scores and measures a company's CSR performance based on 10 categories around the environmental, social and governance pillars. Scores are also provided for the performance of the sub scores: environmental social and governance. All scores range from 0-100.

[2] Bloomberg has constructed an ESG disclosure score that measures how committed firms are to transparency, based upon sustainability reports, press releases, news events, research by third parties and other publicly available data. Score ranges from 0-100.

minimalizing reporting (Dye, 1985; Verrecchia, 1983). In contrast to voluntary disclosure theory, the attribution theory may point out a negative interaction between performance and disclosure. In essence, when firms disclose their CSR activities, they may influence stakeholders' attributions about the firms' motives to engage in CSR actions, perceiving their motivations are either to serve the public or serve the firm itself (Forehand & Grier, 2003; Kim & Lee, 2012). In turn, this influences how stakeholders respond back to such CSR actions. Forehand and Grier (2003) show that if firms are not consistent with their firm-serving strategies, this raises consumer skepticism. This could be in line with negative impacts of greenwashing on firm performance, which occurs when firms disclose dishonest in efforts to appear more responsible. On the other hand, when companies underperform in ESG activities, they can use disclosure to justify their activities, providing an explanation to stakeholders to limit negative financial consequences (Brown & Deegan, 1998; Cho & Patten, 2007; Fatemi et al., 2018).

These theories show that it is important to jointly model ESG performance and disclosure, as there is no clarity whether performance and disclosure complement each other, or conflict with each other. For example, proponents of a complementary view of the combined effects of performance and disclosure argue that disclosure reinforces performance because it helps to increase awareness among key stakeholders (Dye, 1985; Verrechia, 1983; Fatemi et al., 2018). In contrast, proponents of an alternative view argue that disclosure reduces the performance benefits of CSR because it raises questions about the motivations behind firms' CSR activities ((Forehand & Grier, 2003; Fatemi et al., 2018; Kim & Lee, 2012). Bloomberg's disclosure score helps to understand how transparent a company is towards its ESG performance. A high disclosure score would indicate that companies are committed to disclosing their ESG activities. In practice, this means that the firm are investing resources to make sure that its stakeholders are aware of the firm's CSR efforts.

Fatemi et al. (2018) use a novel approach to explore ESG disclosure, by studying whether ESG disclosure score moderates the relation between ESG performance and firm. Their study shows that ESG disclosure weakens the relation between ESG strength and concerns and financial performance, meaning that when a firm with a high ESG performance score intensifies their ESG disclosure, the firm valuation is lower. On the other hand, when ESG performance is weak, it reduces the negative effect on the value of a firm. This research aims to verify results by Fatemi et al. (2018) by using a different measure for ESG performance, and find out whether this study finds ESG disclosure and performance complementing each other or not in relation to financial performance.

The ESG disclosure score, while useful in understanding how ESG disclosure affects financial performance, does not show us how specific communication approaches affect firm performance. Therefore, the second part of this study will measure how CSR-communication, specifically CSR-

related Tweets, affect non-financial firm performance, measured in firm reputation. Social media plays an important role when measuring opinions and sentiment platform to measure firm reputation or feelings towards a firm, as consumers can share real-time opinions or thoughts on social media (Colleoni et al., 2011; Etter et al., 2018). There is evidence of corporate reputation being related to firm performance, indicating that it is an appropriate proxy to assess performance of a firm (Alrubaiee et al., 2017; Arendt & Brettel, 2010; Jurisova & Durkova, 2012).

Even though different CSR communication strategies have been studied, there is little evidence of the effect of CSR communication approaches on firm reputation. However, research has shown that stakeholders are often skeptical towards CSR communication on social media (Lecuyer, Capelli, & Sabadie, 2017; Vanhamme & Grobben, 2009; Webb & Mohr, 1998). Thus, it is important to identify how the public reacts to different types of CSR-Tweets. According to Etter (2014), firms mostly use traditional one-way communication approaches rather than two-way platforms where firms can interact with stakeholders. According to Bonson and Flores (2011), it is unclear which CSR communication strategy is the most effective.

By splitting this thesis in two parts, I cover and combine different research areas for an important topic in today's businesses. In this way, we will gain a wide understanding of the topic, helping managers in their decision-making process. To find out how ESG communication affects a firm, in relation to its ESG performance, the following research question is constructed:

"What is the effect of a firm's ESG performance and ESG disclosure on firm performance, measured in financial performance and firm reputation?"

For the first part of this study, the ESG performance score, its sub-scores and other financial data were retrieved from the Refinitiv database and the ESG disclosure data from Bloomberg's database. The sample consists of 1538 companies between 2015 and 2020. All firms are based in the United States, as there are no regulations for non-financial reporting making all non-financial reporting is voluntary. An Ordinary Least Squares (OLS) regression method is applied on panel data to assess whether ESG disclosure impacts the relation between ESG performance and financial performance. This relation is assessed for the environmental, social and governance performance score individually. Additionally, firms are classified into four groups and additional regressions were performed to find out which group performs best.

The results showed that ESG disclosure positively impacts the relationship between ESG performance and financial performance, which in isolation was a negative relation. Thus, increasing ESG disclosure is important in order to create value from ESG activities. Similar results were shown for the environmental and social score. No evidence was found for the interaction between ESG disclosure and the governance score.

For the second part of this study, a multiple-case study approach is applied to zoom in on specific CSR-Tweets from eight firms. Text data is scraped from Twitter based around CSR-related Tweets from these firms. Specifically, Tweets towards each company are scraped two weeks before and after the CSR-Tweet was posted. An unsupervised machine learning technique is applied on these Tweet to conduct a sentiment analysis, using Natural Language Processing (NLP). By collecting the sentiment towards each company before and after the CSR Tweet, it is be tested whether the sentiment changed after a Tweet using a Welch's t-test. Only for one company the results showed that the sentiment towards a company changed directly after the CSR-Tweet. Even though the results did not show significant results for most companies, it still offered insight into the different types of Tweets companies post and the reaction towards these.

This study provides three contributions to CSR literature and managers. Firstly, this study contributes to previous findings of the ESG disclosure score acting as a interaction between ESG performance and financial performance (Fatemi, Glaum, & Kaiser, 2018). As there is still little evidence on this interaction effect, this study provides empirical support for the relation between ESG performance, ESG disclosure and financial performance. Moreover, by using a different but commonly used proxy for ESG performance and a more recent time scope this study also helps to validate results of previous findings.

The second contribution to ESG literature is the novelty of the sentiment analysis through Twitter being used as a proxy for firm reputation. By employing a multiple-case study approach, this study offers an in-depth insight into specific Tweets, and whether it impacts public sentiment. Even though the results showed little proof of this, it still offers a more concrete insight into specific CSR communication approaches. As a result, this thesis helps to make CSR more tangible.

A final benefit of this research is that this study helps to provide managers a greater knowledge of the effect communication or transparency has regarding CSR, whether it is to maximize financial performance or to maintain corporate reputation. Managers can use this study's findings to take better strategic decisions.

This study proceeds as follows. The next section provides a literature review. Section 3 presents a description of methods that are applied in this study. The next section presents the data collection together with descriptive statistics of the data. Section 4 shows the results of this study. Section 5 provides a conclusion of the study, in which the main findings are summarized and discussed, incorporating limitations and implications of this study and suggestions for future research.

2 Literature Review

2.1 CSR and ESG

This research focuses on Corporate Social Responsibility (CSR) activities and disclosure of companies. CSR has been a widely studied concept and from the 1950s onwards literature focused on defining CSR, as there was not one agreed definition (Carroll, 1999; Jones, 1980; Vaaland, Heide, & Grønhaug, 2008). According to (Carroll, 1999), most general definitions for CSR have been constructed until the 1980s, followed by a period to which CSR has been applied to different concepts and theories. This research uses the following definition for CSR, which is frequently used in literature and created by Carroll (1979); 'The social responsibility of business encompasses the economic, legal, ethical, and discretionary expectations that society has of organizations at a given point in time.'

The Environmental, Social and Governance (ESG) score is a commonly used measure to assess the sustainability performance of a firm (Rajesh, 2020; Tamimi & Sebastianelli, 2017; Halbritter & Dorfleitner, 2015). The ESG performance score is calculated based on underlying measures, which can be classified into different categories. The ASSET4 database uses ten categories, all belonging to either the environmental, social or governance score pillar. Section 3.1 further explains how these scores are computed exactly.

The environmental score pillar is based on three categories; use of resources, emissions and innovation (Refinitiv, 2022). These are centered on the capacity of businesses to strengthen the supply chain by being more eco-efficient, minimizing emissions, and innovating systems, goods, and technologies (Refinitiv, 2022). Moreover, businesses that focus on their environmental impact are better prepared for climate change risks in the long term, as studies claim (Dietz, Bowen, Dixon, & Gradwell, 2016; Mohr, Webb, & Harris, 2001). CSR and ESG performance will be used interchangeably in this research.

The social score pillar can be divided into four categories, namely workforce, human rights, community and product responsibility (Refinitiv, 2022). This pillar focuses on job satisfaction, a safe workplace, equality, human rights, the dedication to local communities, and the commitment to providing excellent products and services. Human resource management plays a central role in studies focusing on the social pillar, as this is an important department within a firm to foster a good work environment and measuring and maintaining employee happiness.

The governance score pillar has management, shareholders and CSR strategy as three category scores. These categories focus on a firm's commitment to treat shareholders equally, successfully implement CSR strategies and good corporate governance practices including board size and board

independence (Refinitiv, 2022). The principal-agent theory, which centers around the separation of ownership and control, is linked to corporate governance (Fama & Jensen, Separation of ownership and control, 1983). The agency problem, which happens when the agent does not acts in its own best interest rather than in the principal's best interest, is linked to this theory. In corporations the management and stockholders are represented by the agent and principal in this case (Fama & Jensen, 1983; Shleifer & Vishny, 2012). Corporate governance aids in prevention of such problems, and is thus essential for a company's financiers since it ensures a return on their investment by the management (Shleifer & Vishny, 2012).

2.1.1 ESG scores and financial performance

As most firms are faced with CSR, it is of important to understand how ESG activities affects the performance of a firm, hence why it is a highly researched topic. According to (Rahman, Rodríguez-Serrano, & Lambkin, 2017) the firm performance can be classified into financial performance and nonfinancial performance, out of which financial performance is the most common. In order to understand how ESG disclosure affects the relation between ESG performance scores and financial performance, the next paragraphs will further elaborate on the relationship between ESG performance ratings and firms' financial performance. The final section of this literature review will elaborate on the relationship between ESG performance and non-financial firm performance.

Literature often mentions that the relation between ESG performance scores and financial performance has been contradictory in past researches (Friede, Busch, & Bassen, 2015; van Beurden & Gössling, 2008; Revelli & Viviani, 2015). This is mainly due to papers from the late 20th century, that mostly conclude on a negative relationship between CSR and financial performance (Friedman, 1970; Vance, 1975). The explanation behind this relationship is that the costs of CSR are higher than the profits from it. These papers claim that firms' goal is to maximize profits for shareholders as they are the only stakeholder a firm is responsible for, they argue that the costs of CSR are higher than the profits (Friedman, 1970). However, from the 21st century onwards there is little evidence of the negative relation between ESG performance scores and financial performance. Most research of the past two decades have agreed that ESG performance scores positively affects financial performance. Friede, Busch and Bassen (2015) confirm this positive relationship after analyzing more than 2000 empirical studies with the aim to find a conclusion in the empirical debate. Their study showed that only 10% of the researched papers found a negative relation, while 90% of the studies found a non-negative relation between ESG and financial performance.

The positive relation between ESG performance scores and financial performance, in contrast to Friedman (1970), can be best explained by the stakeholder theory (Freeman et al., 2010). According to this theory a company should not only create value for its shareholders but all internal and

external stakeholders involved for example employees, customers and local communities. As a firm acts socially responsible, it is in turn creating value for many stakeholders involved. In line with the positive relation, Fatemi and Fooladi (2013) argue that ESG activities help reduce risk. Moreover, Porter and Kramer (2006) argue that CSR can be seen as an opportunity for firms, leading to potential innovation and even a competitive advantage. These ESG related advantages subsequently lead to financial benefits for a company.

2.1.2 ESG Disclosure

Given the increasing relevance of CSR and ESG performance, it is not surprising that stakeholders, such as investors and consumers expect information on the CSR initiatives and obstacles of firms. Non-financial reporting was extremely rare at the start of the 21st century, namely at 44 firms in total (Ioannou & Serafeim, 2017). According to a survey by KPMG (2017), the number of companies engaging in CSR reporting has strongly grown. Their research indicates that in 2017 78% of the biggest companies in the world disclose ESG performance. However, ESG disclosure is not limited to the publication of annual reports; it encompasses all types of communication across different platforms (Gray, Kouhy, & Lavers, 1995). For example, social media platforms have become an important medium for firms to share their CSR initiatives with stakeholders (Reilly & Hynan, 2014).

Despite the fact that the majority of countries lack non-financial reporting regulations, global institutions have developed guidelines to encourage CSR disclosure. The Global Reporting Initiative (GRI) sets non-financial reporting criteria that many firms comply to (Vigneau, Humphreys, & Moon, 2015; Fatemi, Glaum, & Kaiser, 2018). In the European Union, however, stricter reporting laws rather than guidelines are being imposed. Since 2017, the Non-Financial Reporting Directive (NRFD) has been implemented, enforcing companies with more than 500 employees in the European Union to report information on how they manage social and environmental challenges. Additionally, a proposal for a Corporate Sustainability Reporting Directive (CSRD) has been adopted and non-financial reporting standards will be imposed by October 2022 (European Commission, 2022). The United States currently has no regulations governing this form of reporting In addition to official reporting, many companies also publicize their CSR efforts in other ways, such as through social media (Fatemi, Glaum, & Kaiser, 2018; Reilly & Hynan, 2014).

Even though firms are increasingly disclosing their ESG performance, it is still a costly process. According to Brammer and Pavelin (2008) there are two main setbacks to ESG disclosure. To begin with, it can be costly and time consuming to measure, verify and correctly report non-financial performance (Verrecchia, 1983). Moreover, sharing this information means firms have to be

transparent about their CSR strategies. Making such public commitments can be risky for companies (Brammer & Pavelin, 2008). For example, if a company fails to meet certain CSR goals outlined in their strategy, stakeholers are likely to be more critical of such a company.

There are several theories for why firms report their ESG activities. For example, the institutional theory is based on the notion that companies act upon ESG disclosure due to external pressures such as regulations from the government and competition (DiMaggio & Powell, 2012; Tamimi & Sebastianelli, 2017). Another theory that is connected to ESG disclosure is the agency theory. To avoid an agency problem, ESG disclosure can be useful for shareholders so that they are able to monitor the firm's ESG performance and limit information asymmetry (Jensen & Meckling, 1976; Tamimi & Sebastianelli, 2017).

Another motive for firms to disclose ESG information, according to the voluntary disclosure theory, is simply because they are actively involved in improving their CSR performance. This gives such firms reason to share their performance (Cotter, Lokman, & Najah, 2011; Fatemi, Glaum, & Kaiser, 2018) Legitimacy theory explains the social contract firms cannot breach, meaning that firms must 'act, or appear to act, within the boundaries and norms of the societies in which they operate', as Deegan, Ranking and Tobin (2002) state. In line with this view, O'Donovan (2002) argues that ESG disclosure depends on the scenario a firm is in with regards to their ESG activities, and if it needs to retain, grow or even repair its legitimacy to stakeholders. For example, if a firm is involved in an environmental pollution issue, it may boost its disclosure as a reaction to restore or protect the firm's legitimacy (Fatemi et al., 2018). Alternatively, if there is no threat to ESG activities, the organization may not need to intensify its disclosure in order to preserve its legitimacy (O'Donovan, 2002).

Most theories underlying ESG disclosure motivations can be traced back to the stakeholder theory, as ESG performance is often disclosed by firms to either satisfy stakeholders' interest such as shareholders, customers, governments, communities or the environment, or as a response to pressure from these stakeholders (Deegan & Blomquist, 2006; Freeman et al., 2010; Tamimi & Sebastianelli, 2017). Moreover, the level of ESG disclosure can also depend on the industry, as some industries are more pressured to disclose information. These are often companies within socially disputable sectors, such as companies within the energy, alcohol and tobacco or fast-food industry (Cai, Jo, & Pan, 2012; Kim & Lee, 2012).

2.2 Hypothesis development

2.2.1 ESG disclosure and ESG performance

According to Dye (1985) and Verrechia (1983) the extent to which firms disclose their ESG performance relies on the firms' ESG activities, which is in line with the voluntary disclosure principal (Cotter et al.., 2011; Fatemi et al., 2018; Gigler, 1994; Healy & Palepu, 2001). Consequently, the ESG performance can act as a predictor for ESG disclosure; for instance when a firm has a high ESG performance, it is more keen to share their successes. In contrast, when a firm performs poorly, the company would prefer that stakeholders and competitors know as little as possible. However, in accordance with the legitimacy theory, firms can also decide to disclose more information when there are strategic ESG changes or even poor ESG performance, in order to justify their ESG policy and manage stakeholder opinion (Brown & Deegan, 1998; Campbell, Craven, & Shrives, 2003; Cho & Patten, 2007; Deegan, 2002; Fatemi et al., 2018.

There are risks associated with both the stakeholder and legitimacy theory, as they place corporations under pressure to act responsibly, whether to please stakeholders or to maintain legitimacy. This may give firms reasons to accentuate their positive ESG activities, while withholding negative ESG activities, actively making themselves appear more positive than they really are regarding ESG activities (Laufer, 2003; Milne & Pattern, 2002). This behavior is also referred to as 'greenwashing', where firms actively manage their own reputation and stakeholders' perception to falsely maintain a positive impression, by sharing misleading information, disguising negative CSR activities or creating empty CSR reports, strategies and policies without implementation (Bams, van der Kroft, & Maas, 2021; Bowen & Aragon-Correa, 2014; Fatemi et al., 2018; Laufer, 2003). Even though greenwashing is a widely used topic in research, it remains an ambiguous concept in literature (Lyon & Maxwell, 2011). Yu et al. (2020) have attempted to quantify greenwashing by calculating a greenwashing score using the ESG disclosure score and ESG performance score. This shows that greenwashing is highly related to both ESG performance and disclosure.

The relationship between ESG performance and disclosure is inconclusive when comparing empirical studies. Some studies could not find any significance in the relation between ESG performance and ESG disclosure, however these results are mainly from literature in the late 20th century (Ingram & Frazier, 1980; Rockness, 1985; Wiseman, 1982). Later on there has been found evidence for a significant relationship between ESG performance and ESG disclosure. Some studies have found a positive relationship, aligning with the voluntary disclosure theory (Acar & Temiz, 2020; Al-Tuwaijri, Christensen, & Hughes, 2004; Clarkson et al., 2008; Gao et al., 2016). There is also evidence for negative relations between ESG performance and disclosure, which are then more

in line with the legitimacy theory, or can be signs of greenwashing (Hughes, Anderson, & Golden, 2001; Patten, 2002).

There are contradictory results about the relationship between ESG performance and ESG disclosure, with both negative and positive relations being understandable by underlying theories such as the voluntary disclosure theory and the justification theory. This study will examine the relationship between ESG performance and ESG disclosure, as both are relevant topics in empirical research and in organizations. In accordance with the stakeholder theory and the principle of voluntary disclosure, the following hypothesis is developed:

H1-a: There is a positive relation between ESG performance and ESG disclosure

2.2.2 ESG Disclosure and Financial Performance

The relationship between ESG disclosure and financial performance has also been a popular topic in literature, with varying outcomes. Non-financial disclosure is beneficial to investors, as it allows them to receive more meaningful information about the risks connected with a company, hence minimizing information asymmetry and enhancing the firm's value. This is consistent with empirical studies, that have found a positive relation between ESG disclosure and economic performance of firms (Chapple, Clarkson, & Gold, 2013; Cordazzo, Bini, & Marzo, 2020; Gamerschlag, Möller, & Verbeeten, 2011; Healy & Palepu, 2001; Hussainey & Salama, 2010; Reverte, 2016). On the other hand, there is empirical evidence saying that ESG disclosure negatively impacts financial performance., albeit in significantly fewer instances (De Villiers & Van Staden, 2011; Fatemi & Fooladi, 2013; Ho & Taylor, 2007). Fatemi et al. (2018) explain that the ESG disclosure scores in these studies might capture non-financial reporting regulations, if relevant control variables have not been accounted for. This could be an explanation for the negative relation.

According to Bams et al. (2021) the unconclusive findings regarding the relation between ESG performance, ESG disclosure and financial performance can be explained by heterogenous ESG strategies and their varying effects on financial performance, as firms respond differently to stakeholder pressure regarding CSR. They discovered three distinct CSR approaches, namely 'strategic CSR', CSR-as-insurance' and 'corporate greenwashing' and found that each strategy affects financial performance differently (Bams, van der Kroft, & Maas, 2021).

Strategic CSR describes organizations that proactively respond to CSR pressures, by integrating CSR into their business strategy (Bams et al., 2021; Vishwanathan et al., 2020). Firms employing this strategy disclose their performance to reduce controversies, but are careful with their disclosures to maintain a strategic advantage and safeguard their legitimacy (Bams et al., 2021). Strategic CSR firms have the strongest positive relationship with financial performance in

comparison to the other strategies. CSR-as-insurance is less risky since it acts upon stakeholder pressure and regulations in a minimal way, to avoid bad attention but maintaining legitimacy at the same time. As a result, Bams et al. (2021) find a positive relation between CSR-as-insurance and financial performance, albeit with a lesser effect than strategic CSR. Lastly, firms that engage in corporate greenwashing engage in empty CSR disclosure, and while these firms maintain legitimacy, their ESG activities are negatively related with financial performance (Bams et al., 2021).

Non-financial disclosure is growing in importance for firms, yet it remains empirically unclear what effect disclosure has on a company's performance due to the little evidence. However, it appears that the majority of available studies report a positive relation, which is consistent with the agency theory suggesting that ESG disclosure helps to reduce information asymmetries between management and stockholders. Based on this principle and previous studies suggesting a positive relation between non-financial disclosure and financial performance, the following hypothesis is formulated and be tested:

H1-b: ESG disclosure has a positive effect on financial performance

2.2.3 ESG disclosure as a moderation effect

To obtain a return on investments in positive ESG activities, companies must properly communicate their plan; otherwise, it will not be acknowledged by stakeholders (Du, Bhattacharya, & Sen, 2010). Cahan et al. (2015) argue in similar fashion that financial performance as a result of ESG performance will only be realized if there is appropriate media coverage. Fatemi et al. (2018) acknowledge the importance of ESG performance and disclosure in relation to financial performance with a novel approach. They discover a significant interaction effect between ESG disclosure and ESG performance, where performance is expressed in ESG strengths and weaknesses. Specifically, the interaction of ESG strengths and ESG disclosure is negative, indicating that intensive disclosure on ESG strengths may be regarded as justification for overinvestment or as a sort of bragging. The connection between ESG shortcomings and disclosu re, on the other hand, is favorable. This may suggest that disclosure can help corporations rationalize poor ESG performance (Fatemi et al., 2018).

The relation between ESG performance and firm performance has been extensively studied and, as previously indicated, empirical studies appear to have reached a consensus on the relationship between the two (Friede et al., 2015). However, ESG disclosure is relatively more ambiguous in literature, but is gaining importance as society and other key stakeholders dem and visibility into organizations' ESG performance. Therefore, this research will contribute to understanding the effects of ESG communication by researching the interaction effect of ESG disclosure and

performance on firms' financial performance. In addition, the relation will also be tested on each pillar of the ESG score. Thus, the following hypotheses will be tested:

H1-c: ESG disclosure positively moderates the relationship between ESG performance and financial performance

2.2.4 The effect of the environmental, social and governance score

To gain deeper knowledge on the interaction effect of ESG performance and ESG disclosure on financial performance, this study will further investigate the three components of the ESG performance score. Friede et al. (2015) confirm that each ESG pillar is positively related to financial performance. However, in comparison to the social and governance pillars, the environmentally focused studies demonstrate the highest proportion of positive relations. As one of the earlier empirical studies on this specific topic, McGuire, Sundgren and Schneeweis (1988) provide arguments for a positive relation. Even though there are costs involved with improving the environmental performance, these costs do not outweigh the benefits of the increased revenue. Amec and Lanoie (2008) explain that the increased costs lead to increased revenue through product differentiation and reduced costs of materials. Enhanced environmental performance can also boost productivity, enabling a firm to be more efficient and save on costs as a result. In order for new environmental ideas and practices to be effective across an organization, they must be implemented appropriately. As there is little evidence on the relation between the interaction effect of environmental performance and ESG disclosure on the financial performance, the following hypothesis is tested:

H1-d: ESG disclosure positively moderates the relationship between environmental performance and financial performance

In contrast to the environmental pillar, empirical studies focusing on the social pillar relatively have the least positive outcomes according to Friede et al. (2015). According to (Akerlof & Yellen, 1986; Edmans, 2011), high employee satisfaction can enhance firm performance, as there is a positive relation with excess stock return. Moreover, employees are considered as valuable assets in firms, as they are able to innovate, improve processes and relations and thus create value for a company (Maslow, 1943; McGregor, 1966). In addition, if a company has successfully integrated their human resource department into their strategy, it contributes to the development of a competitive advantage (Jackson & Schuler, 1995).

Diversity is another indicator of corporate social performance. Herring (2009) provides arguments that, on the one hand, a diverse work environment can enhance corporate performance, but that different races and genders working together can lead to a less productive work force on the other hand. As a paradox Herring (2009) concludes that a diverse workforce favorably influences the

success of a company, due to the concept that different work environments generate more conflicts. These disagreements force employees to be more innovative and communicative, which enhances firm performance. When investigating the relation between corporate social performance and financial performance for specific industries, a negative relation was found for the industrials sector, but a positive relation for the financial, discretionary and utilities industries (Daszyńska-Żygadło, 2016). The final hypothesis will be tested to contribute to the current empirical evidence of corporate social performance:

H1-e: ESG disclosure positively moderates the relationship between social performance and financial performance

Finally, Friede, Busch, and Bassen (2015) argue that studies on the relationship between governance and firm performance are the most ambiguous, meaning that both positive and negative relationships can still be detected in the literature. Different relations between governance and performance are found between sectors, according to Daszyńska-Żygadło (2016). The relation appears to be negative for the consumer discretionary industry, but positive for the financial, industrial and material sectors. They show that the financial industry has the strongest positive relation in comparison to the other sectors, which could be explained by the sensitive, or socially disputable as previously mentioned, nature of this industry. Negative changes can thus largely impact the company's value. As studies still show conflicting results for the relationship between corporate governance and financial performance, the following hypothesis is constructed.

H1-f: ESG disclosure moderates the relationship between governance performance and financial performance

2.2.5 CSR communication strategies and public reputation

Firms have different ways in which they communicate their ESG performance to their stakeholders and consequently stakeholders can also perceive firms' communication strategies in different ways. According to previous studies consumers are often skeptical and critical towards the communication of CSR, which explains why it is important to understand the effect of CSR communication on stakeholders, and non-financial disclosure in general (Lecuyer, Capelli, & Sabadie, 2017; Vanhamme & Grobben, 2009; Webb & Mohr, 1998). The following paragraphs will further elaborate on the relationship between CSR communication and non-financial performance.

As previously mentioned, the relation between CSR and firm performance has been studied extensively over the past decades, with a primarily focus on financial performance as performance measure. As a result there is far less empirical evidence on the relation between CSR performance and non-financial performance. Firms that also measure their goals on non-financial performance

are more likely to obtain their strategic goals, which can then also enhance their financial success (Fullerton & Wempe, 2009; Lecuyer et al., 2017; Mizik, 2014). Non-financial performance can be expressed through marketing performance, which can be measured through innovation, market share, customer satisfaction, purchase intention, number of (new) customers, retention rates or corporate brand reputation (Amber, Kokkinaki, & Puntoni, 2004; Chahal & Sharma, 2006). Empirical studies have shown evidence for a positive relation between CSR activities and non-financial performance (Brown & Dacin, 1997; Lecuyer et al., 2017; Luo & Bhattacharya, 2006). Rahman et al. (2017) claim that this relationship is positively moderated by advertising intensity.

When identifying the relation between CSR activities and non-financial performance, the majority of studies focus specifically on corporate reputation or brand image as a proxy for non-financial performance. Studies indicate that a company's effective CSR performance and communication can affect its reputation (Alrubaiee et al., 2017; Arendt & Brettel, 2010; Jurisova & Durkova, 2012). Consequently, a company's corporate reputation might result in a competitive advantage (Arendt & Brettel, 2010; Rahman et al., 2017; Vorhies & Morgan, 2005). The importance of the relationship between CSR and corporate reputation is apparent in a research by McKinsey, who imply that maintaining or improving a firm's reputation is one of the most popular motivations to engage in CSR (Bonini & Görner).

CSR performance can have a negative effect on customer perception or brand reputation, frequently as a result of mistrust regarding a company's CSR communication (Lecuyer et al., 2017; Mohr et al., 2001; Sen & Bhattacharya, 2001). Pino et al. (2002) suggests that communications about environmental performance that are phrased negatively have a positive impact on customers' judgment towards a company. They explain that these messages appear as more genuine than positively framed messages, which builds trust. For example, companies should not focus on positive messages such as 'using sustainable packaging' but more on 'packaging with reduced plastic waste'. This aligns with empirical studies that show the impact of a firms' CSR performance on the firms' reputation is highly dependent on the communication approach .

According to the attribution theory, the manner in which stakeholders perceive CSR activities of a firm depends on the firms' motives (Forehand & Grier, 2003; Kim & Lee, 2012). Studies have shown that stakeholders perceive firm's motives to engage in CSR to be public-serving or firm-serving. Forehand and Grier (2003) argue that consumers are skeptical towards firms when they observe a firm's CSR activities as firm-serving, which means that the firm acts purely for its own advantage rather than the public's. On the other hand, Kim and Lee (2012) argue that stakeholders are not always dubious towards firm-serving motives, as long as firms also show compassion for the public's interest. This demonstrates that the motives driving firms' CSR activities are related to the perception towards a firm, which is in turn related to how CSR-activities are communicated.

One way for firms to communicate their CSR actions is through social media. According to Reilly and Hynan (2014) this is a popular platform for firms to communicate their CSR activities towards stakeholders. Moreover, Alrubaiee et al. (2017) argue that communication CSR through online advertisements can also contribute to a stronger corporate reputation. Moreover, social media does not only act for a good platform for firms to communicate on, it also enables stakeholders to share opinions and respond to firms' social media posts. Due to this two-way communication, firms can better understand the stakeholders and improve their firm reputation. This also makes social media a good tool to understand concerns of the general public according to Brown and Deegan (1998), which makes it a useful platform to understand the perception consumers have on firms.

One-way communication is a more traditional communication method, called asymmetric communication approach, as firms publish information to a large audience without expecting a response back (Kollat & Farache, 2017). As social media is becoming a more popular platform, firms can also adjust their communication strategies to the two-way platform, where stakeholders are able to reply directly to firms which constitutes a symmetric communication approach (Etter, 2014). Even though firms are able to employ a symmetric communication approach, most firms are still using traditional CSR communication methods on these two-way platforms. However Kollat and Farache (2017) argue that asymmetric communication strategy can be a useful approach to gain trust among stakeholders. They argue that a symmetric communication strategy should only be used when the target audience is more engaged with CSR. However, effective CSR communication strategies remain ambiguous (Bonson & Flores, 2011).

Even though it is argued that CSR activities or announcements should be carefully and strategically communicated in order for it to positively affect corporate reputation, there is little empirical evidence concluding on the effect of such online messages on the public perception. The pressure companies face in order to act responsibly and disclose their activities, highlights the importance of understanding CSR communication effects. Therefore, this study aims to further understand the impact of CSR-related messages on public perception. By studying multiple CSR communications, the goal is to find out which type of messages impact the perception towards a firm positively or negatively. Therefore the following hypothesis is tested:

H2: Sentiment towards a company changes positively or negatively depending on the CSR communication strategy and the corporate reputation

3 Methodology

3.1 Hypothesis 1: Regression analyses

3.1.1 Dependent and independent variables

The primary objective of this study is to determine whether ESG disclosure moderates the relationship between ESG performance and financial performance, and if so, in what direction. The study also does this for the environmental, social and governance performance score, thus determining how ESG disclosure affects the relation between each sub-score and financial performance. Therefore, the main variables in this study are; ESG performance, environmental performance, social performance, governance performance, ESG disclosure, and financial performance, which is measured by Tobin's Q.

In line with previous studies, Bloomberg's ESG disclosure score is used as a measure for ESG disclosure (Fatemi et al., 2018; Fatemi & Sebastianelli, 2017; Yu et al., 2020). This score assesses the extent to which companies engage in non-financial disclosure, both negative and positive disclosures. This score is computed independently from firms' ESG performance. For each year, Bloomberg collects all publicly available raw-data for companies, in the form of sustainability reports, information on websites, press-conferences, presentations, and much more. The final score is based on more than 900 variables, such as direct CO2 emissions, employee turnover, % of women in the workforce, or political durations (Yu et al., 2020). The more a firm discloses on all metrics, the higher the disclosure score. The minimum disclosure score is 0.1, and the maximum is 100.

The ESG, environmental, social and governance scores are collected from Refinitiv Asset4 database[3]. This score is computed from more than 630 data points. These datapoints are eventually divided into 10 ESG category scores: emission, innovation, resource use, community, human rights, product responsibility, workforce, CSR strategy, management, and shareholders. For all categories, category scores are computed using the following equation from Refinitiv (2022)[3]:

$$\text{Category Score} = \frac{\#\text{ of firms with a lower value} + \frac{\#\text{ of firms with the same value}}{2}}{\#\text{ firms with a value}}$$

Eventually, these category scores compute the pillar scores (environmental, social, governance score). The environmental, social, governance and ESG performance scores are eventually computed by the category weights (Refinitiv, 2022).

[3] For exact details on how the ESG, environmental, social, and governance score is computed, visit the following link: https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/refinitiv-esg-scores-methodology.pdf

The dependent variable for Model 1 is ESG disclosure, while the dependent variable of the subsequent models is Tobin's Q. Tobin's Q will be used as a proxy for financial performance, as it is commonly used in previous empirical studies (Ambec & Lanoie, 2008; Fatemi et al., 2018; Ioannou & Serafeim, 2017; Surroca, Tribo, & Waddock, 2006). Tobin's Q is a ratio, which is equal to the total market value of a firm divided by the total asset value. The primary objective is to determine whether significance exists in order to reject the null hypothesis, and to find out in which direction the coefficients go. The equations below represents the main theoretical models without control variables:

$$\text{Tobin's } Q_{i,t} = \alpha_{i,t} + \beta_1 \text{ ESG Disclosure}_{i,t} + \beta_2 \text{ ESG performance}_{i,t} + \beta_3 \text{ ESG Disclosure}_{i,t} * \text{ESG performance}_{i,t} + \varepsilon_{i,t}$$

$$\text{Tobin's } Q_{i,t} = \alpha_{i,t} + \beta_1 \text{ ESG Disclosure}_{i,t} + \beta_2 \text{ Environmetal performance}_{i,t} + \beta_3 \text{ ESG Disclosure}_{i,t} * \text{Environmetal performance}_{i,t} + \varepsilon_{i,t}$$

$$\text{Tobin's } Q_{i,t} = \alpha_{i,t} + \beta_1 \text{ ESG Disclosure}_{i,t} + \beta_2 \text{ Social performance}_{i,t} + \beta_3 \text{ ESG Disclosure}_{i,t} * \text{Social performance}_{i,t} + \varepsilon_{i,t}$$

$$\text{Tobin's } Q_{i,t} = \alpha_{i,t} + \beta_1 \text{ ESG Disclosure}_{i,t} + \beta_2 \text{ Governance performance}_{i,t} + \beta_3 \text{ ESG Disclosure}_{i,t} * \text{Governance performance}_{i,t} + \varepsilon_{i,t}$$

In addition to Tobin's Q, a second measure is used as a dependent variable to ensure that the outcomes of the analyses are robust. For this, market value is used, as it is another good indicator for firm performance and used by previous studies (Brown & Deegan, 1998; Cho & Patten, 2007; Klassen & McLaughlin, 1996). Market value is calculated as the multiplication of shares outstanding by the share price.

3.1.2 Control variables

The following paragraphs will describe the control variables that are included in this study, namely shareholder dispersion, CSR committee, firm size, advertising expenses, leverage, profitability and risk. Shareholder dispersion and CSR committee are only included in the first model. The other variables are included in every model. The models are depicted in Section 3.1.3. An overview of all variables and definitions are presented in Appendix A.

Previous studies have provided evidence that the number of big shareholder of a firm influence the extent to which companies engage in voluntary disclosure (Brammer & Pavelin, 2008; Fatemi et al., 2018). For example, if a firm has many small shareholders, then there is more information symmetry between management and shareholders. To avoid this, firms are more likely to disclose non-financial information. On the other hand, if a firm only has a few shareholders, these shareholders are likely to know better what is going on in a firm, and are less dependent on official reports of a firm. The relation between ownership dispersion and disclosure has been confirmed for

ESG related disclosure specifically, which indicates that this variable is relevant in relation to ESG disclosure (Brammer & Pavelin, 2005; Bouten et al., 2012). . It is still unclear whether there is a relation between share ownership and financial performance. Fatemi et al. (2018) show evidence that this variable can be used as an instrument for ESG disclosure. Therefore, shareholder dispersion is used only to estimate the effect on ESG disclosure.

This study will also take into account whether a firm has a CSR committee or not. Firms with a CSR committee on senior management or board level have a positive effect on ESG disclosure (Fatemi et al., 2018). Peters and Romi (2015) provide evidence that the presence of a CSR committee can lead to a demand in assurance services for the reporting of their sustainability performance. This shows that these firms have a higher desire to have high quality non-financial reports. Fatemi et al. (2018) and Peters and Romi (2015) argue that the presence of a CSR committee does not influence financial performance, which is why the variable is only included to control for the effect of ESG performance on ESG disclosure.

All models will also include control variables for which related studies have indicated to affect ESG financial performance, ESG performance and ESG disclosure. Firm size is a commonly used control variable (Brammer & Pavelin, 2008; Cho & Patten, 2007; Patten, 2002). Bigger firms have a larger impact on society and the planet, which causes stakeholders to be more concerned about their performance. Moreover, there is also more expectations from society that these firms act responsibly, due to their impact. As a result of this pressure, bigger firms are more likely to enhance their ESG performance and disclosure (Brammer & Pavelin, 2008). In this study, total assets will act as a measure for firm size.

In similar fashion, the extent to which firms are exposed to the media influences the extent to which firms disclose (Bouten, Everaert & Roberts, 2012; Brammer & Pavelin, 2008; Patten, 2002). This is again related to the visibility of a firm, but with a greater emphasis on media presure. Clarkson et al. (2008) use the number of times a firm is mentioned as a measure for media exposure, while Jo and Harjoto (2011) use the advertising expenses of a firm. Media exposure will be measured as advertising expenses in this study.

Other firm characteristics that act as control variables are leverage, profitability and risk (Bouten et al., 2012; Fatemi et al., 2018; Ioannou & Serafeim, 2017; Jo & Harjoto, 2011). The ratio of total debt to total assets is used to calculate leverage. As a firm's leverage increases, debtholders can exert greater pressure on that firm as an important stakeholder, as Ioannou and Serafeim (2017) imply. This then influences the performance of a firm. In contrast to this, they argue that firms with high profitability have less debtholder pressure, allowing them to respond to the needs of other

stakeholders other than debtholders. The return on assets will be used to calculate profitability. Finally, risk will be measured by the beta, which represents the firm's stock volatility.

3.1.3 Models

Panel data and is used to test the relation between ESG performance, ESG disclosure and financial performance, including 1538 firms over a five-year period from 2015 until 2020. The data is described more extensively in Section 3.1. Employing a panel dataset means that cross sectional data and time series data is included at the same time, indicating that different variables are collected for multiple points in time. According to Hsiao (2007), panel data has more degrees of freedom, as cross-sectional data only has one time point, and time series data only has one variable. As a result, the model's estimations become more accurate. Moreover, panel data allows us to capture more information, both across variables and over time, which helps to better understand the complexity of observed behavior or concepts (Hsiao, 2007). One difficulty with panel data is accounting for features that remain constant throughout time. For example, traits of a firm that do not change, but are also not controlled for. Using a fixed-effects model is a solution to control for these unobserved fixed effects. An Ordinary Least-Squares Regression (OLS) is the technique employed to test hypotheses 1a-1f. Both time- and industry-fixed effects are taken into account, following Fatemi et al. (2018). To test the hypotheses, the following models are constructed:

Model 1 – The Explanatory Variables of ESG Disclosure:

$$\begin{aligned}\text{ESG disclosure}_{i,t} = {} & \alpha_{i,t} + \beta_1 \text{ESG Performance}_{i,t} + \beta_2 \text{Shareholder dispersion}_{i,t} + \beta_3 \text{CSR committee}_{i,t} \\ & + \beta_4 \text{Firm size}_{i,t} + \beta_5 \text{Advertising expenses}_{i,t} + \beta_6 \text{Leverage}_{i,t} + \beta_7 \text{Profitability}_{i,t} \\ & + \beta_8 \text{Risk}_{i,t} + \beta_9 \text{Time}_{i,t} + \beta_{10} \text{Industry}_{i,t} + \varepsilon_{i,t}\end{aligned}$$

Model 2 – Main Effects on Financial Performance:

$$\begin{aligned}\text{Tobin's Q}_{i,t} = {} & \alpha_{i,t} + \beta_1 \text{ESG Disclosure}_{i,t} + \beta_2 \text{ESG performance}_{i,t} + \beta_3 \text{Firm size}_{i,t} \\ & + \beta_4 \text{Advertising expenses}_{i,t} + \beta_5 \text{Leverage}_{i,t} + \beta_6 \text{Profitability}_{i,t} + \beta_7 \text{Risk}_{i,t} \\ & + \beta_8 \text{Time}_{i,t} + \beta_9 \text{Industry}_{i,t} + \varepsilon_{i,t}\end{aligned}$$

Model 3 – Moderating Effect of ESG Disclosure on ESG performance and Financial Performance:

$$\begin{aligned}\text{Tobin's Q}_{i,t} = {} & \alpha_{i,t} + \beta_1 \text{ESG Disclosure}_{i,t} + \beta_2 \text{ESG performance}_{i,t} \\ & + \beta_3 \text{ESG performance}_{i,t} * \text{ESG Disclosure}_{i,t} + \beta_4 \text{Firm size}_{i,t} \\ & + \beta_5 \text{Advertising expenses}_{i,t} + \beta_6 \text{Leverage}_{i,t} + \beta_7 \text{Profitability}_{i,t} + \beta_8 \text{Risk}_{i,t} \\ & + \beta_9 \text{Time}_{i,t} + \beta_{10} \text{Industry}_{i,t} + \varepsilon_{i,t}\end{aligned}$$

Model 4 – Moderating Effect of ESG Disclosure on Environmental Performance and Financial Performance:

$$\begin{aligned}\text{Tobin's Q}_{i,t} = {} & \alpha_{i,t} + \beta_1 \text{ESG Disclosure}_{i,t} + \beta_2 \text{Environmental performance}_{i,t} \\ & + \beta_3 \text{Environmental performance}_{i,t} * \text{ESG Disclosure}_{i,t} + \beta_4 \text{Firm size}_{i,t} \\ & + \beta_5 \text{Advertising expenses}_{i,t} + \beta_6 \text{Leverage}_{i,t} + \beta_7 \text{Profitability}_{i,t} + \beta_8 \text{Risk}_{i,t} \\ & + \beta_9 \text{Time}_{i,t} + \beta_{10} \text{Industry}_{i,t} + \varepsilon_{i,t}\end{aligned}$$

Model 5 – Moderating Effect of ESG Disclosure on Social Performance and Financial Performance:

$$\text{Tobin's } Q_{i,t} = \alpha_{i,t} + \beta_1 \text{ ESG Disclosure}_{i,t} + \beta_2 \text{ Social performance}_{i,t} + \beta_3 \text{ Social performance}_{i,t} * \text{ESG Disclosure}_{i,t} \ \beta_4 \text{ Firm size}_{i,t} + \beta_5 \text{ Advertising expenses}_{i,t} + \beta_6 \text{Leverage}_{i,t} + \beta_7 \text{ Profitability}_{i,t} + \beta_8 \text{Risk}_{i,t} + \beta_9 \text{ Time}_{i,t} + \beta_{10} \text{ Industry}_{i,t} + \varepsilon_{i,t}$$

Model 6 - Moderating Effect of ESG Disclosure on Governance Performance and Financial Performance:

$$\text{Tobin's } Q_{i,t} = \alpha_{i,t} + \beta_1 \text{ ESG Disclosure}_{i,t} + \beta_2 \text{ Governance performance}_{i,t} + \beta_3 \text{ Governance performance}_{i,t} * \text{ESG Disclosure}_{i,t} + \beta_4 \text{ Firm size}_{i,t} + \beta_5 \text{ Advertising expenses}_{i,t} + \beta_6 \text{Leverage}_{i,t} + \beta_7 \text{ Profitability}_{i,t} + \beta_8 \text{Risk}_{i,t} + \beta_9 \text{ Time}_{i,t} + \beta_{10} \text{ Industry}_{i,t} + \varepsilon_{i,t}$$

The interaction effects will be interpreted according to floodlight tests from Johnson and Neyman (1936)[4]. The floodlight technique is employed as this study is not interested in one specific value for ESG disclosure, but rather this study aims to find out how ESG disclosure impacts the effects of financial performance on all levels (Spiller et al., 2013). In this study, the floodlight test indicates regions at which levels of ESG disclosure the simple effect of ESG, environmental, social or governance, is significant. Based on these regions, the interaction effects are interpreted.

In addition to these models, a final model is added to analyze how different CSR approaches affect firm performance. These approaches imply the level in which firms perform ESG activities in relation to the level in which firms disclose their ESG activities. Thus, this study identifies four types of firms; firms below-median versus above-median of ESG performance score and below-median versus above-median of ESG disclosure score. In this way, four different ESG approaches can be measured; high ESG disclosure and high ESG performance approach; high disclosure and low performance; low disclosure and high performance; and low disclosure and low performance. For this analysis, the following model is created:

Model 7 – ESG Strategies on Financial Performance:

$$\text{Tobin's } Q_{i,t} = \alpha_{i,t} + \beta_1 \text{ High Discl} - \text{High Perf}_{i,t} + \beta_2 \text{ High Discl} - \text{Low Perf}_{i,t} + \beta_3 \text{ Low Discl} - \text{High Perf}_{i,t} + \beta_4 \text{ Low Discl} - \text{Low Perf}_{i,t} \ \beta_5 \text{Firm size}_{i,t} + \beta_6 \text{ Advertising expenses}_{i,t} + \beta_7 \text{ Leverage}_{i,t} + \beta_8 \text{ Profitability}_{i,t} + \beta_9 \text{ Risk}_{i,t} + \beta_{10} \text{ Time}_{i,t} + \beta_{11} \text{ Industry}_{i,t} + \varepsilon_{i,t}$$

3.2 Hypothesis 2: Sentiment Analysis

3.2.1 Research design

A multiple-case-study approach is employed in order to test hypothesis 2. The purpose of this approach is not to make generalizable conclusions, but to generate insights into specific contexts of

[4] The Johnson-Neyman tests were calculated and plotted using the 'interactions' package in R, and with the johnson_neyman() function specifically.

CSR communication, contributing to existing theory on this (Eisenhardt, 1989). By employing multiple case studies, this research is able to understand the effect of CSR communication in a more concrete way in different contexts, as it will zoom in directly on CSR-Tweets from several companies. This case study focuses on 8 companies, and focuses on the reaction towards one CSR-related Tweet per company. For this, Tweets are gathered two weeks before until two weeks after the date of the CSR-Tweet. The descriptive statistics of the gathered data is further explained in Section 4.2.2.

Even though CSR is a widely studied topic, CSR disclosure remains a complex topic due to the ambiguity of different theories for CSR communications. Therefore, a multiple-case-study approach is chosen, as this method helps to improve understanding of complex issues and allows to approach CSR communication in a more practical matter, zoomed in on real life events (Yin, 2009).

Empirical studies have shown that companies are increasingly communicating their CSR performance on social media. Twitter is an example of such a social media platform that is used by many companies to communicate CSR activities (Etter, 2014). The interactive nature of the platform enables this study to understand how people feel towards a company, as consumers can share real-time opinions or thoughts on Twitter (Etter et al., 2018). The real-time sentiment or opinion towards firms gathered from Twitter will be used in the study as a measure for corporate reputation (Colleoni et al., 2011). Then, this study will analyze whether the sentiment towards each company changes as a result of the CSR-related Tweet.

Tweets have been selected from different firms as a measure for CSR communication. Tweets with different CSR strategies are chosen, based on strategies mentioned in previous empirical research. Strategies that are incorporated are symmetric and asymmetric communication approaches, where some companies are Tweeting with the aim to start a conversation (symmetric approach), and some to solely share information (asymmetric approach). Moreover, some of the CSR strategies from the first part of the study are also linked back to the case study, as the ESG disclosure and performance score will be identified for each company. As the first part of this study does not focus on a specific industry, this case study also uses firms from various industries. Tweets are collected one month before and one month after the CSR-related Tweet has been posted.

3.2.2 Sentiment Analysis

Sentiment analysis, also called opinion mining, is a machine learning method used to identify opinions, emotions or sentiment behind textual data, commonly used to detect the sentiment. This method is commonly used to understand the opinion about a product or service by analyzing the reviews, for example (Fang & Zhan, 2015). It can be used as a method for both supervised and unsupervised learning. As the sentiment is not labelled yet, this study applies an unsupervised

learning approach. Sentiment analysis is part of Natural Language Processing (NLP), which is a technique that tries to interpret text in the most human way possible. An example of such a challenges for machines is to understand sarcasm in a text, which is something people are able to detect.

A sentiment analysis is performed on all collected Tweets. As Twitter allows a maximum of 280 characters per Tweet, one Tweet is most likely to be about just one topic (Lovejoy, Waters, & Saxton, 2012). Therefore, sentiment is analyzed on document-level, and not on sentence- or topic-level. First, a sentiment dictionary is selected which identifies the sentiment for each word in a document (Medhat, Hassan, & Korashy, 2014). In this study, the dictionary from Hu and Liu (2004) is used. The dictionary from Hu and Liu (2004) is used in this study. Text is classified for each document, and a sentiment score is calculated based on this. Each word gets a sentiment score of -1, 0 or +1, in accordance to the sentiment dictionary. For example, according to Hu and Liu (2004)'s dictionary, the word 'harmful' has a negative sentiment score of -1, whereas the word 'lovely' has a positive sentiment score of 1. Words can only receive scores of -1, 0 or +1, and the polarity sentiment score generates an overall score for a phrase, sentence, or document that can range from -1 to 1. The following paragraph explains how an overall sentiment score is calculated.

Even though sentiment scores can be computed for one Tweet based on their sentiment, it is important to take the polarized context of each word into account (Medhat et al., 2014). For example, (de)amplifiers and negations must be taken into account. Amplifiers can intensify or reduce the valence of a word. An example of an amplifier is 'the quality is very good', where 'very' would act as an amplifier on the word 'good'. A sentence containing 'the quality is very good' should receive a higher sentiment score than a sentence with 'the quality is good'. On the other hand, a negation can impact the negative of positive nature of a Tweet. For example, if 'good' is included in a sentence, a dictionary would identify a score of +1. However, it is important to look at the surrounding words in a sentence, cause it could change the meaning of the word 'good'. For example, if the complete sentence is 'the quality is not good', the sentence should receive a negative sentiment score.

This study uses the package 'sentimentr' in R to conduct the sentiment analysis, which measures the polarity sentiment score by taking negations, amplifiers and de-amplifiers into account. For each polarized word in a Tweet, the algorithm assesses all 4 words before, and 2 words after. These words are used to compute the score for the polarized word, by checking if these surrounding words are (de-)amplifiers or negations. The following sentence is used to explain how a polarity sentiment score is computed in this R package; 'the CSR initiatives are not so good'. With a simple sentiment analysis, this sentence would get a score of +1, as 'good is the only polarity word in the sentiment dictionary. The polarity function, however, takes into account the 4 words before and 2 words after

the word 'good'. As there is a negation in the example sentence, the total score of +1 is flipped to -1. For every amplifier, the score also has to be subtracted by 0.8. In this case, due to the presence of 'so', the score is decreased to -1.8. Finally, the score of -1.8 is divided by the squared-root number of words. Dividing (-1.8) by the squared-root of 5, equals a sentiment score of -0.8. One limitation to this method, and most sentiment algorithms, is that it is difficult to detect sarcasm. For example 'Great job in once again putting in effort to appear more sustainable than you are!', is difficult to detect as a negative sentence, as the sarcasm can only be detected by the tone of the sentence.

To detect whether the public sentiment of twitter is impacted by the selected CSR Tweet, Welch's *t* test is performed, comparing the mean sentiment two days before and after a CSR-Tweet, and two weeks before and after the CSR-Tweets (Basharm, 2022). In this way, it can be tested whether the average sentiment changed significantly after the CSR-Tweet. The results are reported for both the short-term period (2 days before and after), and the long-term period (2 weeks before and after). However, it is important that there is significance in the average sentiment in at least the short term period. If there is no significance in the short term period, but only the long-term period, it is difficult to tell whether this change in sentiment is due to the CSR-Tweet.

4 Data

4.1 Hypothesis 1

4.1.1 Data collection and sample

The sample consists of 1538 publicly listed U.S. based firms with annual data from 2016 until 2020. As there are no regulations for non-financial reporting in the U.S., disclosing ESG activities is voluntary for these companies. Due to the Non-Financial Reporting Directive (NRFD) in Europe, European companies could cause noise to the disclosure score as they are enforced to report their CSR performance. This sample is based on companies with available ESG, environmental, social and governance scores in the Refinitiv ASSET4 Database.

ESG, environmental, social, and governance performance scores were retrieved from the Refinitiv ASSET4 ESG Database, as it can be regarded as a reputable data source (Ioannou & Serafeim, 2017). Bloomberg has established a score specifically for ESG disclosure, which assesses the amount of information shared and transparency of companies, measured in annual reports, press releases and many more sources. Hence, ESG disclosure scores were retrieved from Bloomberg. Firms with missing values have been omitted. Tobin's Q and all other control variables are gathered from the Refinitiv Database.

4.1.2 Descriptive Statistics

Table 1 depicts the descriptive statistics of the variable included in the models. The mean, standard deviation, minimum and maximum values for each variable are displayed. Tobin's Q has an average value of 1.81, with a minimum value of 0.03 and maximum value of 23.89. Even though the ESG disclosure score can range between 0 and 100, the lowest available ESG disclosure score is 14.39 and the highest score is 82.01. The average ESG disclosure score is 40.48, with a standard deviation of 18.11. ESG performance score and its sub scores (environmental, social, and governance score) can also range between 0 and 100. It is interesting to note that the mean of the environmental score at 22.70 is much lower than the mean of the ESG, social and governance score, which are 40.48, 49.68 and 43.08 respectively. The minimum score for both the ESG score and its sub scores are close to 0, namely at 0.32 for ESG, 0 for the environmental score and 0.31 and 0.52 for the social and governance scores, respectively. The maximum ESG performance score is at 93.76, and the maximum score for the environmental, social and governance score are closer to 100, namely at 97.09, 99.41 and 98.09 respectively.

Table 1: Descriptive statistics

This table shows the descriptive statistics for the variables used in Model 1-6. *Tobin's Q* is measured as the total market value divided by the total asset value. The *ESG disclosure, ESG, environmental, social and governance performance scores* all range between 0 and 100. *Shareholder dispersion* indicates the percentage of available shares to investors. *CSR Committee* indicates whether a firm has a CSR committee available. *Ln Firm size* is the natural logarithm of total assets. *Ln Advertising expense* is the natural logarithm of the Selling, General & Administrative Expenses. *Leverage* is the debt-to-equity ratio. *Risk* is equal to the firms' beta.

	Mean	Standard Deviation	Min	Max
Main Variables				
Tobin's Q	1.81	1.79	0.03	23.89
ESG Disclosure Score	38.02	10.02	14.39	82.01
ESG Performance Score	40.48	18.11	0.32	93.76
Environmental Performance Score	22.70	26.604	0	97.09
Social Performance Score	43.08	19.97	0.31	98.09
Governance Performance Score	49.68	21.61	0.52	99.41
Control Variables				
Shareholder dispersion	.81	.16	.03	1
CSR Committee YES	34.7%			
CSR Committee NO	65.3%			
Ln Firm size	15.04	1.66	10.01	21.76
Ln Advertising expense	12.82	1.56	6.29	18.53
Leverage	0.732	8.47	-235.64	154.48
Profitability	.023	.162	-3.09	1.537
Risk	1.19	0.68	-3.815	5.487

Shareholder dispersion has an average of 81% and standard deviation of 16%. As this instrument variable is measured by free float, a low number indicates that the ownership is very concentrated with a few large shareholders. A mean at 81% indicates that there is high shareholder dispersion on average, as there is a high percentage of shares available to investors. The minimum value for shareholder dispersion is 3% and the maximum 100%. Furthermore, the majority of the firms (65%) do not have a CSR committee, while 35% does have a CSR committee active within the firm.

The descriptive statistics for firm size and advertising expenditures are visualized in their natural logarithms, as these are high values with a large range. However, this makes them harder to interpret. The average value for firm size is 15.0, which is equal to total assets of $17,997,380. The minimum value is 10.0 ($22,271), maximum value 21.8 ($2,812,180,000) and standard deviation 1.7 ($94,624,914). For advertising expenses[5], the mean value is 12.8 ($1,499,491), standard deviation equals 1.6 ($5320350) and the minimum and maximum value are 6.3 ($539) and 18.5 ($111,888,000) respectively. Even though these seem like extremely low and high values, the natural logarithm of total assets and advertising expenses shows to be normally distributed with no extreme outliers, which explains why these minimum and maximum values are included. Leverage has a relatively high minimum at -235.6 and maximum at 154.48, but a reasonable average at 0.7. For profitability and risk, the mean (0.02, 1.2), minimum (-3.1, -3.8) and maximum (1.5, 5.5) also show no surprising values.

Finally, the appendix also provides more information on the collected data. Appendix B provides an overview of the industries in the sample, showing the percentage of firms in each industry. The table shows that most companies are within the industrials industry (18%), followed by the financials (18%) and consumer discretionary (16%). The least companies are within the utilities (2.5%), telecommunication (2.4%) and energy industry (3.7%). Appendix C depicts an overview of the mean average for four different ESG strategies; high ESG disclosure and high ESG performance strategy; high disclosure and low performance; low performance and high disclosure; and low disclosure and low performance.

4.2 Hypothesis 2

4.2.1 Data collection and pre processing

As mentioned before, Twitter is the main data source for the second section of this study. Twitter has its own developer platform with a Twitter API, but does not allow to scrape historical Tweets without extra payment. As this study analyzes Tweets for specific periods in history, the free Twitter API cannot be utilized. As Twitter is an open data source, it is possible to scrape large quantities of Twitter data for research purposes without the Twitter API. Instead of the Twitter API, an advanced Python scraping tool called Twint - Twitter Intelligence Tool[6] is used to scrape all. This tool allows users to scrape Tweets from specific Twitter users as well as search for Tweets containing specific keywords or hashtag. Moreover, it is possible to scrape Tweets for specific time periods. Even though the data is scraped using Python, all of the data in this study is analyzed with R.

[5] The variable 'advertising expenses' is represented by the 'Selling, General & Administrative Expenses' from Refinitiv. Even though this does not directly represent advertising expenses, Refinitiv includes it as one of the measures for this expense.

[6] https://github.com/twintproject/twint

For each firm included in this case study, Tweets are collected based on if they include the company's username for a time period of two weeks before and two weeks after the CSR-related Tweet. The specific search term and time period for each firm is presented in Table 2. The specific usernames for companies are used, as it includes all Tweets from users that reply directly to the firm's Tweets, but also indicates the Tweet is directly trying to communicate with or approach a company. After the data is collected, the Tweets have been cleaned by converting all words to lower cases, deleting hashtags, tags ('@'), links. Even though it is not feasible to spot all spam Tweets, there has been efforts to detect terms often used in spam. As a result, Tweets containing 'giveaway', 'podcast' and 'advertisement' have been removed. For each dataset specifically, Tweets that were repeated multiple times and detected as spam have also been removed.

4.2.2 Data Sample and Descriptive Statistics

The sample consists out of 8 datasets. Each dataset contains Tweets about a particular organization for a period of 29 days: 2 weeks prior to the CSR-Tweet, the day of the CSR-Tweet, and 2 weeks following the CSR-Tweet Some firms' CSR-Tweets have common characteristics, while others demonstrate different characteristics. Some companies' CSR-Tweets share traits, but others are completely distinct. As a result, this study is able to identify the effects of different types of communication. Appendix D shows the CSR-related Tweet of each firm.

Table 2 shows the Twitter dataset collected for each company and the corresponding Tweets are visible in Appendix D. In Table 2, *n* indicates the number of total Tweets per data set, the second column indicates the search item the Tweets are selected upon. Furthermore, the dates indicate the time period for which the Tweets are collected. For each dataset, a time period of 29 days is used; 14 days before the CSR-related Tweet, the day of the CSR Tweet, and 14 days after. The last two columns indicate the number of words per dataset and the number of unique words per dataset. The table shows that the Tesla dataset contains most Tweets, most words and most unique words. On the other hand, The Coca-Cola dataset contains the least Tweets, words and unique words.

Bank of America and McDonald's both posted a CSR Tweet on the 22nd of April, which is on Earth Day. Both companies posted a similar Tweet, describing their commitment to the environment. Bank of America posted 'We're committed to helping create a sustainable world, today and for future generations. #EarthDay'[7], which got 51 likes and 8 quote Tweets, which is a ReTweet with an additional comment by a user. McDonalds's posted 'Climate change is the biggest environmental issue of our time, which is why we've committed to decrease our greenhouse gas emissions in our restaurants, offices and supply chain. Learn more about how we're using our #ScaleForGood this

[7] https://twitter.com/BofA_News/status/1517518975239872515

#EarthDay'[8]. This Tweet received 45 likes and 9 quote Tweets. It is important to note, however, that McDonald's has posted more Tweets in the consecutive days with the hashtag '#ScaleForGood'.

On June 1st 2020, Goldman Sachs announced their sustainability report on Twitter. The Tweet received 86 likes and 1 quote Tweet. Goldman Sachs announced their annual report in which they disclose their approach to sustainability. They Tweeted 'Our new sustainability report arrives at a critical time. Learn about our $750 billion commitment and explore the imperative and the opportunity of a sustainable future. #GSsustainability'.[9] In similar fashion, Tesla posted a simple Tweet about their views on governance, saying 'At Tesla, we support a diverse, inclusive and safe environment for all.'[10]

Table 2: Descriptive Table of Datasets for Sentiment Analysis

This table depicts the descriptive statistics for the 8 Twitter datasets. The first column depicts the firms for which the related Tweets are collected. The second column shows the number of Tweets collected for each dataset. *Search term* indicates the term based on which the Tweets were collected. *Dates* indicates the dates based on which the Tweets for each dataset were collected. *Number of words* depict the total words per dataset. *Number of unique words* depicts the number of unique words per dataset.

Firm	*n*	Search term	Dates	Number of words	Number of unique words
Bank of America	2 555	@bofa_news	08/04/2022 – 06/05/2022	52400	8208
Mc Donald's	3 662	@mcdonaldscorp	09/04/2019 – 07/05/2019	42 680	6 318
Goldman Sachs	9534	@goldmansachs	18/05/2020 – 15/06/2020	155 144	20 043
Tesla	180 899	@tesla	18/05/2019 – 15/06/2019	1 715 236	84 202
Coca-Cola	1 404	@cocacolaco	17/08/2014 – 14/9/2014	22 754	5863
Microsoft	61 913	@microsoftgreen	05/02/2020 – 04/03/2020	1 688 746	120 833
Nike	78 359	@nike	22/01/2020 – 19/02/2020	709 555	66 428
Shell	16 057	@shell	19/10/2020 – 16/11/2020	253 111	25 342

On the other hand, companies also post CSR Tweets related to their products, such as Coca-Cola, Microsoft and Nike. Coca-Cola's Tweet is about the launch of a new product, namely Coca-Cola Life; 'Learn about Coca-Cola Life, our new reduced-calorie cola making its U.S. debut: http://CokeURL.com/uvcs3'[11]. This launch received a lot of critics though and even claims of greenwashing, due to the green packaging and the high amount of stevia as an ingredient. The name and packaging made the drink seem healthier than it actually was. Therefore, it is interesting to understand what the direct reaction to the Twitter launch of this drink was.

[8] https://twitter.com/McDonaldsCorp/status/1120345468691734531?s=20&t=MuZ5BHFC2bISNH5Jj8_uiw

[9] https://twitter.com/goldmansachs/status/1267530976722391041

[10] https://twitter.com/Tesla/status/1134841446316404736

[11] https://twitter.com/cocacolaco/status/505863554759925762

Microsoft showed the environmental effects of their product with the following Tweet: 'With the power of #AI, @NOAAFisheriesAK is working to save ice seals and beluga whales from extinction. Dive in: https://msft.it/6007TwCqD'[12]. This Tweet received 208 likes and 9 quote Tweets. Nike's CSR-Tweet is, similar to Coca-Cola, about the launch of a new footwear collection. With this new product line, Nike's Tweet is clearly focused on their CSR. Nike posts 'Nike takes a bold step to reimagine solutions for critical environmental problems. Transforming scrap material from factory floors, the Nike Space Hippie Footwear Collection has earned the brand's lowest carbon print score to date.'[13].

Most Tweets mentioned above illustrate more of an asymmetric communication approach, as most Tweets are not aimed to engage a conversation. As mentioned before, this is a more popular approach for companies. Even though it is more difficult to find a Tweet with a symmetric approach, it is still important to include such a Tweet in this research. From the previously mentioned Tweets, Coca-Cola can also start some conversation, as they urge consumers to learn more about their new drink. However, the following Tweet of Shell shows an even more asymmetrical communication approach: 'What are you willing to change to help reduce emissions? #EnergyDebate'.[14] This Tweet is clearly aimed to start a conversation on Twitter, where people can engage on the hashtag '#EnergyDebate'. It is important to note that Shell is in a social disputable industry, which increases pressure for Shell to act responsible, but also makes it easier for stakeholders to be skeptical on their communication approaches (Kim & Lee, 2012).

5 Data Analyses and Results

5.1 Hypotheses 1

5.1.1 Correlation and multicollinearity

The Pearson correlation coefficients are shown in Table 3, with the bold numbers having a significance level of 5% or less. Tobin's Q is negatively correlated with ESG disclosure, ESG, Environmental, and Governance score. A possible explanation could be that some companies are more confronted to CSR than others, indicating that companies with a high Tobin's Q still have low ESG disclosure and performance scores. Social score is the only variable to be correlating positively with Tobin's Q, as all other variables also show a negative correlation with Tobin's Q. ESG disclosure correlates positively with ESG performance score and all three sub-scores. Shareholder dispersion, advertising expense, profitability, firm size and risk also correlate positively with ESG disclosure. ESG performance score highly correlates with its sub-scores environmental, social and

[12] https://twitter.com/Microsoft/status/1230194177738182662

[13] https://twitter.com/nike/status/1225132665470377988

[14] https://twitter.com/Shell/status/1323184318735360001?s=20&t=RgjVugszLSpEMBD6hxKFQQ

governance score. This is expected as the ESG performance score is compiled by these three scores. Moreover, the plot shows that ESG performance score correlates positively with shareholder dispersion, advertising expense, profitability and firm size. There is a negative correlation with leverage and risk, however not significant at the 5% significance level. The environmental, social and governance score are all positively correlated with one another. Leverage only shows a significant negative correlation with Tobin's Q. All other variables show correlation coefficients at zero or close to zero with leverage, with a significance level above 5%.

Table 3: Correlation matrix
This table shows the Pearson correlation coefficients between the variables included in Model 1-6

	Tobin's Q	ESG discl.	ESG score	Env. score	Social score	Govern. score	Shareh. Disp.	Adv. Exp.	Profitability	Firm Size	Leverage	Risk
Tobin's Q	1											
ESG Disclosure Score	**-.06**	1										
ESG Performance Score	**-.03**	**.67**	1									
Environmental Performance Score	**-.15**	**.68**	**.69**	1								
Social Performance Score	**.03**	**.58**	**.82**	**.53**	1							
Governance Performance Score	**-.09**	**.43**	**.70**	**.39**	**.32**	1						
Shareholder dispersion	**-.05**	**.28**	**.28**	**.23**	**.20**	**.25**	1					
Advertising expense	-.02	**.50**	**.45**	**.39**	**.41**	**.22**	**.21**	1				
Profitability	-.02	**.15**	**.13**	**.24**	**.01**	**.16**	**.10**	**.15**	1			
Firm size	**-.36**	**.57**	**.48**	**.53**	**.40**	**.32**	**.26**	**.68**	**.27**	1		
Leverage	**-.04**	-.02	-.01	.00	.00	-.02	.00	-.01	.00	.02	1	
Risk	**-.18**	**.03****	-.02	**.07**	**-.04**	-.01	-.03*	.01	**-.06**	.02	-.01	1

Note: significance at 5% level is indicated by bold numbers.

Moreover, Appendix E depicts the Variance Inflation Factor (VIF) scores for each variable, which checks for multicollinearity. Multicollinearity occurs when there is strong correlation between two independent variables, which should be avoided because it indicates that the variables are heavily dependent on one another. Appendix E demonstrates that all variables are below the VIF threshold value of 2.5, indicating that there is no multicollinearity issue.

5.1.2 Hypotheses tests

The regression results for models 1 through 6 are displayed in Table 4. By clustering standard errors, firm-level correlation is taken into account, resulting in robust standard errors (White, 1980). Additionally, industry- and year-fixed effects are also included into all models. The first column shows model 1, which measures the effect of ESG performance score on ESG disclosure. The final 5 columns show model 2 to model 6, which test the influence of ESG disclosure, ESG, environmental, social, governance performance score and its interaction effects, respectively, on

financial performance. The natural log is taken for Tobin's Q, ESG disclosure score, ESG performance score, environmental score, social score, shareholder dispersion, company size, advertising expenses, leverage, profitability, and risk as these variables were skewed.

The coefficients for Model 1 are presented in Table 4 and show the effect of ESG performance score on ESG disclosure, with shareholder dispersion, CSR committee, firm size, advertising expenses, leverage, profitability and risk included as control variables. As expected, ESG performance score has a positive significant effect of .166 ($p < .01$) on ESG disclosure, indicating that the ESG

Table 4: Regression results for hypotheses 1a-1f

This table shows the OLS regression results for Models 1-6. The first column depicts Model 1 has ESG disclosure as dependent variable. Model 2-6 are shown in the following columns, and all have Tobin's Q as dependent variable. *Tobin's Q* is measured as the total market value divided by the total asset value. The *ESG disclosure, ESG, environmental, social and governance performance scores* all range between 0 and 100. *Shareholder dispersion* indicates the percentage of available shares to investors. *CSR Committee* indicates whether a firm has a CSR committee available. *Firm size* is total assets. *Advertising expense* is the natural logarithm of the Selling, General & Administrative Expenses. *Leverage* is the debt-to-equity ratio. *Risk* is equal to the firms' beta. All variables, except Governance Score, are taken as the natural logarithm. Standard errors are clustered at the firm-level.

	(1)	(2)	(3)	(4)	(5)	(6)
	ESG Disclosure	Tobin's Q	Tobin's Q	Tobin's Q	Tobin's Q	Tobin's Q
ESG Disclosure Score		.362*** (.024)	-.650*** (.178)	-.160* (.084)	-.667*** (.186)	.345*** (.052)
ESG Performance Score	.166*** (.010)	.026 (.016)	-.855*** (.151)			
Environmental Performance Score				-.595*** (.088)		
Social Performance Score					-.781*** (.163)	
Governance Performance Score						-.006* (.003)
ESG Discl * ESG Performance			.253*** (.046)			
ESG Discl* Env Performance				.166*** (.025)		
ESG Discl* Social Performance					.243*** (.047)	
ESG Discl* Governance Perf.						.002 (.001)
Shareholder dispersion	.045*** (.007)					
CSR Committee (yes)	.134*** (0.016)					
Firm Size	.029*** (.003)	-.293*** (.017)	-.298*** (.018)	-0.295*** (.018)	-.297*** (.018)	-.292*** (.017)
Advertising Expenses	.018*** (.002)	.176*** (.006)	.178*** (.005)	.181*** (.006)	.173*** (.006)	.178*** (.006)
Leverage	.000 (.000)	-.002** (.001)	-.002** (.001)	-.002** (.001)	-.002** (.001)	.002** (.001)
Profitability	.000 (.000)	0.844*** (.115)	.847*** (.116)	.866*** (.119)	.857*** (.114)	.857*** (.116)
Risk	.013 (.014)	-.628** (.195)	-.615** (.194)	-.611** (.190)	-.612** (.194)	-.631** (.197)
Industry	included	included	included	included	included	included
Years	included	included	included	included	included	included
Constant	2.448 (0.033)	-.54 (.226)	3.003 (1.011)	1.274 (1.011)	294 (.953)	-.407 (.371)
Adj. R^2	.648	0.381	.382	.384	.383	.382

Note: *, **, and *** indicate the 10%, 5% and 1% significance levels. Standard errors are in parentheses.

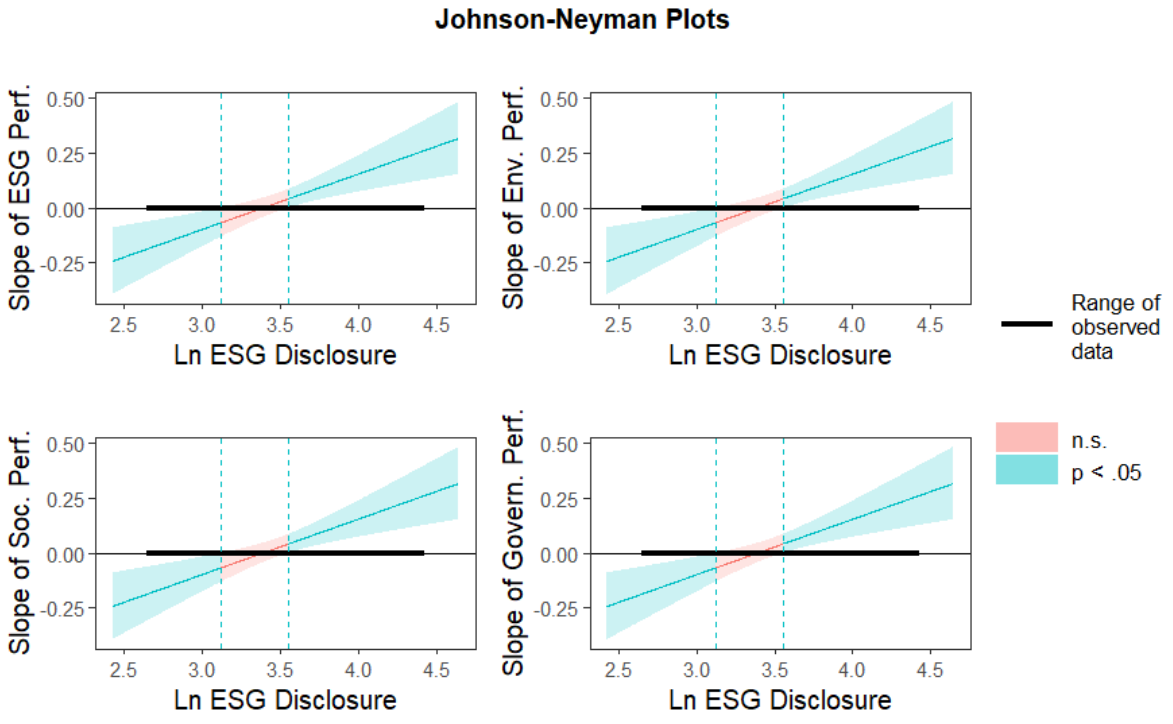
disclosure score increases by .166% when the ESG performance score of a firm increases by 1%.

Shareholder dispersion also has a positive effect on ESG disclosure, indicating that as shareholder dispersion increases by 1%, ESG disclosure score increases by .045% ($p < .01$). This means that when there are more shareholders, the ESG disclosure is higher. Furthermore, CSR also shows a positive significant effect on ESG disclosure, indicating that ESG disclosure in .134% higher when there is a CSR committee active in firm. Finally, firm size and advertising expenses also show a positive significant effect below the 1% significance level, with coefficients of.029 and .018 respectively. Given that the results for the ESG performance score are in line with hypothesis 1a, the null hypothesis can be rejected.

Model 2 shows the only the main effects of ESG performance score and ESG disclosure score on Tobin's Q. This model shows that ESG disclosure score positively effects Tobin's Q, namely as the disclosure score increases by 1%, Tobin's Q increases by .36% ($p < .01$). Even though the coefficient for ESG performance score is positive, there is no significant effect. Firm size and risk negatively affect Tobin's Q, namely with coefficients of -.29 and -.63 at the 1% and 5% significance level respectively. Advertising expenses has a positive effect on financial performance, indicating that if the advertising expenses of a firm increase by 1%, Tobin's Q increases by .18% ($p < .01$). Profitability also positively affects Tobin's Q at the 1% significance level, with a coefficient of .844. Even though leverage is significant at the 5% level, the coefficient is at .0 indicating that there is no, or a very small effect on Tobin's Q. As ESG performance has a significant positive effect on Tobin's Q, the null hypothesis for hypothesis 1-b can be rejected.

Model 3 included the interaction effect between ESG disclosure score and ESG performance score in addition to Model 2. The control variables for this and following models show similar results as

Figure 1: Johnson-Neyman plots for model 3-6



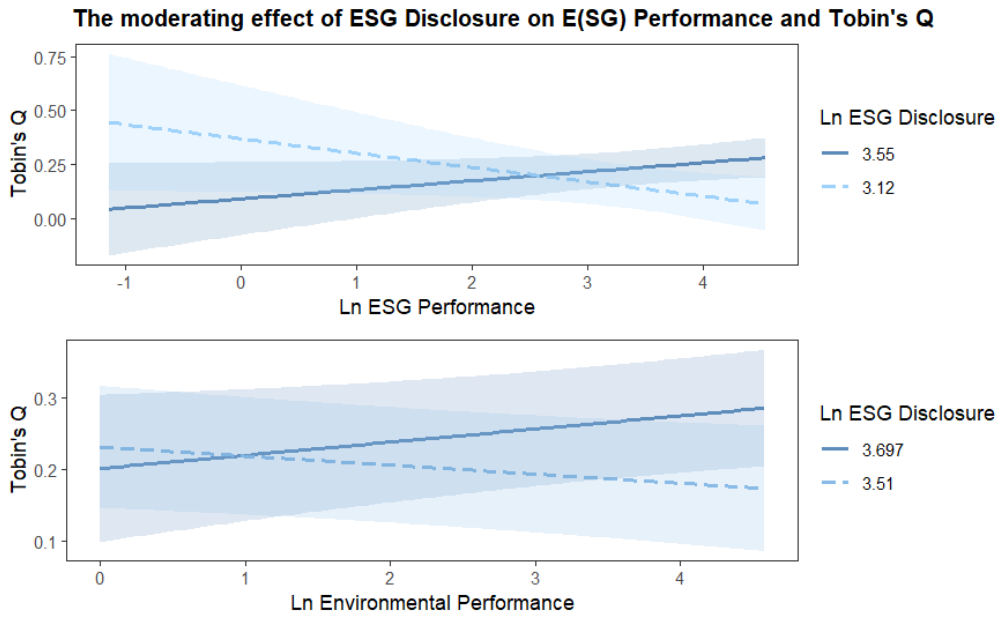
with Model 2. Both main effects ESG disclosure and ESG performance negatively affect Tobin's Q at 1% significance level. ESG disclosure increases by 1%, Tobin's Q decreases by .65%, however this effect can only be interpreted when ESG performance score is 0. When ESG performance score increases by 1%, Tobin's Q decreases by .86%, in isolation from ESG disclosure. These coefficients cannot be taken individually, as the results showed that there is a significant interaction effect between the two variables at 1% significance level. This interaction effect of ESG disclosure and ESG performance score has a positive coefficient of .25. This indicates that ESG disclosure weakens the negative effect of ESG performance score on Tobin's Q.

Figure 1 shows the plots of the Johnson-Neyman tests. The blue area shows at which levels of Ln ESG disclosure the slope of natural logarithm of independent variables ESG, environmental, social, and governance performance are significant at a 5% significance level. The red area represents the values of ESG Disclosure for which the slopes of Ln ESG, environmental, social, and governance performance is insignificant ($p > .05$). The top left plot in Figure 1 shows the results for Ln ESG disclosure and Ln ESG performance specifically. It shows that the slope of Ln ESG performance is insignificant when ESG disclosure is higher than 3.12 and lower than 3.55, which are values in the natural logarithm. Following the floodlight technique, the interaction effect for Ln ESG disclosure and Ln ESG performance on Tobin's Q is plotted for these two values, and visible in the above plot of Figure 2.

The first plot in Figure 2 shows that the direction of the slope is different for the values of the natural logarithm ESG disclosure. Specifically when Ln ESG disclosure is 3.12, a one percent increase in ESG performance negatively affects Tobin's Q by .07%. However, when Ln ESG disclosure is 3.55, the slope of Ln ESG performance is positive. Indicating that given that Ln ESG disclosure is 3.55, a one percent increase will also lead to an increase in Tobin's Q by 0.4%. Even though the model is interpreted using the logarithms, for interpretation purposes it is useful to know that a Ln ESG disclosure of 3.12 and 3.55 is equal to a disclosure score of 22.65 and 34.81 respectively. The null hypothesis can thus be rejected, as the results show that ESG disclosure positively impacts the relation between ESG Performance.

Model 4 focuses on the interaction effect of the Ln ESG disclosure score and the environmental score specifically. As Ln ESG disclosure is only significant at the 10% level, no conclusions can be drawn on the direct effect of Ln ESG disclosure on Ln Tobin's Q. Ln environmental performance, however, score has a negative effect on Tobin's Q in isolation, and is significant at the 1% significance level. The interaction effect of ESG disclosure and environmental performance has a significant positive effect ($p < .01$). This indicates that higher ESG disclosure improves the negative relation between environmental performance score and Tobin's Q. The null hypothesis can be rejected, as the results are in line with hypothesis 1d.

Figure 2: The interaction effects for Model 3 and 4



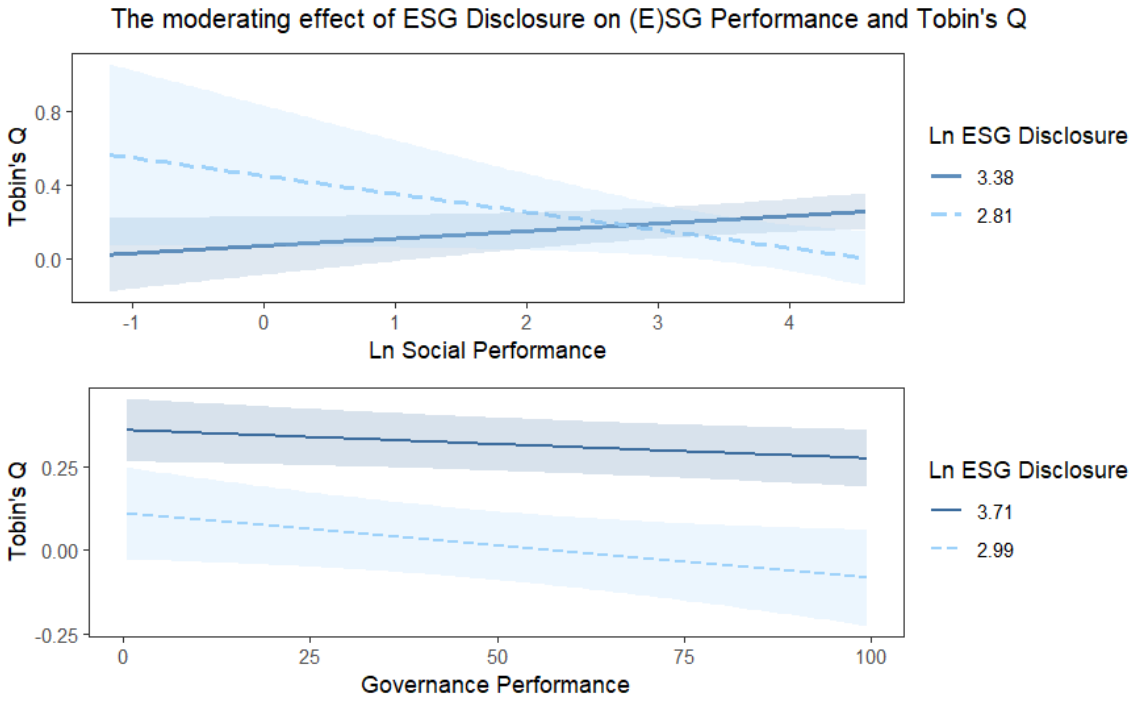
In line with the upper right plot in Figure 1, the interaction effect between ESG disclosure and environmental performance have been plotted for values 3.51 and 3.7 of Ln ESG disclosure and are equal to an ESG disclosure score of 33 and 40 respectively. The results are visible in the bottom plot of Figure 2. These results show that, again, the slope of Ln environmental performance change for different values of Ln ESG disclosure. When Ln ESG disclosure is 3.51 (ESG Disclosure = 33), a 1% increase of environmental performance score leads to a .01% decrease in Tobin's Q. However, when ESG disclosure is increased to 40, the slope of Ln ESG performance is .02, indicating that a 1% increase in the environmental score leads to a .02% increase of financial performance.

The interaction effect of ESG Disclosure and Social Performance Score is depicted in Table 4, model 5. In isolation, the social score has a negative effect on financial performance, namely if the social score increases by 1%, Tobin's Q decreases by .78% ($p < .01$). Again, in isolation ESG disclosure has a negative effect on financial performance at a 1% significance level. The coefficient for the variable of interest, the interaction term, shows a positive coefficient of .243 at a significance level of 1%. This indicates that the negative relation between social performance score and Tobin's Q can be reduced by increasing the disclosure level. The slope in the upper plot in Figure 3 shows the values for Ln ESG disclosure from the Johnon-Neyman test. In accordance to ESG performance and Environmental Performance, the slope for Ln social performance also changes from a negative slope into a positive one. As Ln ESG disclosure equals 2.81 (ESG disclosure score = 17), a one percent increase in social performance score results into a .1% decrease in Tobin's Q. On the other hand, when Ln ESG disclosure is equal to 3.38 (ESG disclosure score = 29), an 1% increase in Social Performance Score leads to a .04% increase in Tobin's Q. The positive interaction between

social performance and ESG disclosure is in line with hypothesis 1e, indicating that the null hypothesis can be rejected.

The final model shows the effect of the ESG disclosure score, governance score and its interaction effect on financial performance. Unlike previous models, ESG disclosure positively affects Tobin's Q ($p < .01$). This indicates that a 1% increase in disclosure, would result in a .35% increase in Tobin's Q. Moreover, the coefficient for governance score shows a small negative effect of .006 on Tobin's Q, however on the 10% significance level. For the final model, the interaction term is not significant. Therefore, no implications can be made on the effect of ESG disclosure on governance performance and financial performance. The bottom plot in Figure 3 also shows that there is no interaction. Therefore, the null hypothesis cannot be rejected.

Figure 3: The interaction effect for model 5 and 6



Finally, Table 4 also depicts the adjusted R-squared for each model. Model 1 has a adjusted R-squared of .65, indicating that 65% of the variance of ESG disclosure is explained by the model. From this it can be concluded that Model 1 performs well. Model 1 performs better than Model 2-6, as these models all show an R-squared. However, these models cannot be compared properly, as the dependent variables are different for Model 1 and the remaining models. Focusing on Model 2 and 3, there is a slight improvement in R-Squared of .001 when the interaction term is included. Indicating that the interaction term contributes to a higher model performance. Model 4 has the highest R-Squared of .348. However, as all models show a relatively similar performance, Model 3

is chosen as the best-performing Model 3 as it incorporates the environmental, social and governance score. This helps to better understand a company's CSR performance as a whole.

5.1.3 Additional analyses

After the main analyses, Models 2-6 were again tested with market value as dependent variable to test if the outcomes are robust. The results for these models are depicted in Table 5 and are briefly discussed, as they solely act for robustness purposes. The interaction term between ESG Disclosure and ESG, Environmental, and Social Performance was similar to the original models in that it was all positive at the 1% significance level, improving the negative effect of ESG, environmental, and social performance. n contrast to the original analyses, ESG performance has a positive significant effect in Model 3 at a 1% significance level. Again, the interaction term between ESG disclosure and governance performance was not significant. From these results, it

Table 5: Additional regression results for Models 2-6

This table shows the additional OLS regression results for Models 2-6 with Market Value as dependent variable. *Market value* is the number of shares outstanding multiplied by the share price. The *ESG disclosure, ESG, environmental, social and governance performance scores* all range between 0 and 100. *Shareholder dispersion* indicates the percentage of available shares to investors. *CSR Committee* indicates whether a firm has a CSR committee available. *Firm size* is total assets. *Advertising expense* is the natural logarithm of the Selling, General & Administrative Expenses. *Leverage* is the debt-to-equity ratio. *Risk* is equal to the firms' beta. All variables, except Governance Score, are taken as the natural logarithm. Standard errors are clustered at the firm-level.

	(2)	(3)	(4)	(5)	(6)
	Market Value	Market Value	Market Value	Market Value	Market Value
ESG Disclosure Score	0.942*** (.081)	-1.271** (.570)	0.479* (.288)	-1.405*** (.320)	0.711*** (.204)
ESG Performance Score	-0.097*** (.016)	-1.988*** (.460)			
Environmental Performance Score			-0.561** (.254)		
Social Performance Score				-1.757*** (.237)	
Governance Performance Score					-0.020** (.01)
ESG Discl * ESG Performance		0.540*** (.129)			
ESG Discl* Env Performance				0.526*** (.069)	
ESG Discl* Social Performance			. 0.526***		
ESG Discl* Governance Perf.					0.004 (.003)
Firm Size	0.578*** (.014)	0.573*** (.015)	0.580*** (.013)	0.572*** (.017)	0.582*** (.016)
Advertising Expenses	0.237*** (.011)	0.238*** (.011)	0.238*** (.014)	0.217*** (.009)	0.236*** (.012)
Leverage	-0.002 (.002)	-0.002 (.002)	-0.002 (.002)	-0.002 (.002)	-0.002 (.002)
Profitability	1.277*** (.089)	1.278*** (.090)	1.337*** (.096)	1.287*** (.099)	1.333*** (.095)
Risk	-1.765*** (.271)	-1.745*** (.275)	-1.688*** (.265)	-1.731*** (.285)	-1.756*** (.274)
Industry	included	included	included	Included	included
Years	included	included	included	included	included
Constant	-7.621 (.663)	.136 (3.660)	6.603 (3.660)	.186 (3.419)	-7.107 (1.137)
Adj. R^2	.755	.756	.757	.756	.758

Note: *, **, and *** indicate the 10%, 5% and 1% significance levels. Standard errors are in parentheses.

can be concluded that the outcomes from the main analyses are robust. It is important to mention, however, that the adjusted R-squared for all models are much higher than the original models. For each model, 76% of the variance of Market Value is explained by the model. Thus, the models for the robustness check perform much better than the models used to answer the hypotheses in the main analyses.

To further understand the relation between ESG disclosure and ESG performance on financial performance, each firm has been identified with a level of disclosure and performance. For ESG disclosure, firms can be identified with a 'high disclosure score' or 'low disclosure score', where a high disclosure score indicates a score above median and low disclosure score indicates a score below median. Similarly, this has been done for ESG performance score, where companies with a score above median have a 'high score' and companies with a performance score below median have a 'low score'. Finally, the disclosure and performance strategy has been combined, resulting in four ESG strategies: high disclosure, high performance; high disclosure, low performance; low disclosure, high performance; low disclosure, low performance. This 'ESG strategy' variable has been regressed on financial performance, in order to understand whether these different types of companies differ in their financial performance. The results can be found in Table 6.

Table 6: Additional regression of ESG strategies on financial performance

This table depicts the OLS regression for Model 7, with Tobin's Q as the dependent variable. *ESG Strategy* depicts one of the four strategies, with Discl High-Perf High as baseline. *Tobin's Q* is measured as the total market value divided by the total asset value. The *ESG disclosure, ESG, environmental, social and governance performance scores* all range between 0 and 100. *Shareholder dispersion* indicates the percentage of available shares to investors. *CSR Committee* indicates whether a firm has a CSR committee available. *Firm size* is total assets. *Advertising expense* is the natural logarithm of the Selling, General & Administrative Expenses. *Leverage* is the debt-to-equity ratio. *Risk* is equal to the firms' beta. All variables, except Governance Score, are taken as the natural logarithm. Standard errors are clustered at the firm-level.

	(7)
	Tobin's Q
ESG Strategy: Discl high – Perf low	-.102*** (.017)
ESG Strategy: Discl Low – Perf High	-.186*** (.016)
ESG Strategy: Discl Low – Perf Low	-.122*** (.021)
Firm Size	-.286*** (.017)
Advertising Expenses	.188*** (.007)
Leverage	-.002*** (.001)
Profitability (ROA)	.847*** (.116)
Risk	-.639*** (.196)
Industry	Included
Constant	3.276 (.143)
Adj. R^2	.378

Note: *, **, and *** indicate the 10%, 5% and 1% significance levels. Standard errors are in parentheses.

Table 6 shows the result for the effect of ESG strategy on Tobin's Q, controlled by firm size, advertising expenses, leverage, profitability and risk. The results show that firms with a high disclosure score and a low ESG performance score, score lower then companies with a high disclosure and high performance ($p < .01$). Thus, when companies actively disclose but not perform according to it, this is penalized on their financial performance. This could be either signs of greenwashing, or efforts to justify poor performance. However, if a company's disclosure and ESG performance scores are both low, its financial performance suffers even more, as the coefficient is significant at the 1% significance level. Companies that show a low disclosure score but high performance score have the most negative effect on Tobin's Q ($p < .01$), in comparison with high disclosure and high performance companies. Doing well in ESG performance, while not informing stakeholders about this performance, leads to information asymmetry as stakeholders may not understand expenses or policy decisions related to this. This could be a possible explanation for the penalization in financial performance.

From these additional results, it can be concluded that a CSR strategy of high ESG disclosure and high ESG performance has the most beneficial effect on financial performance, which is in line with the voluntary disclosure theory. The results also indicate that a high ESG disclosure is more fruitful than low disclosure, as both CSR strategies with high ESG disclosure result in the most optimal financial performance. Finally, the model performs in a similar fashion as Models 2-6, as the R-Squared is 38%.

5.2 Hypothesis 2

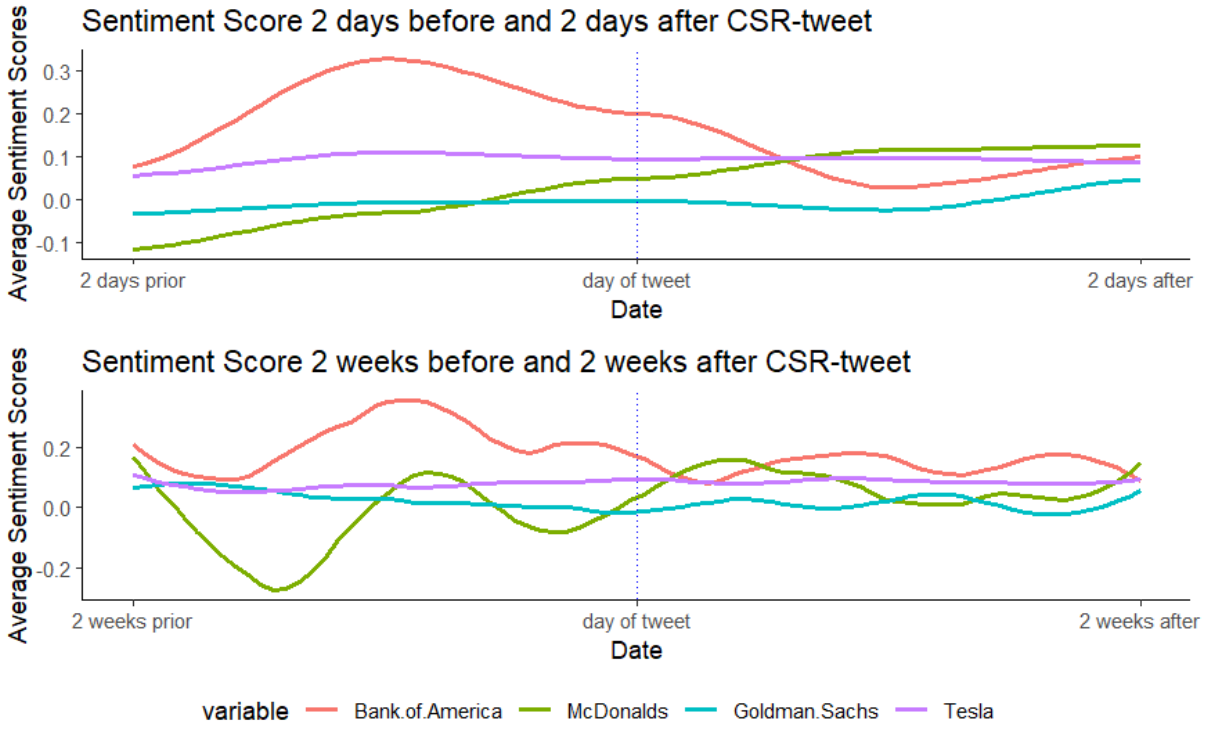
The result for the sentiment analysis are presented in this section. After the data was cleaned for the sentiment analysis, as explained in the data section, the sentiment analysis is performed using SentimentR in R Studio. The companies are divided in 2 figures to make the visualization of the sentiment score more clear, which results in each figure containing 4 companies. Figure 4 shows the sentiment scores for both two days and weeks before until 2 days and weeks after the CSR-Tweet for Bank of America, McDonald's Goldman Sachs and Tesla. Figure 5 shows the sentiment scores two days and weeks before until two days and weeks after the CSR-Tweet for the remaining companies, namely Coca-Cola, Microsoft, Nike and Shell. Section 5.2.2. presents a further insight into the reaction of Twitter users towards the CSR-Tweets of companies.

5.2.1 Hypothesis test

Figure 2 displays the sentiment for Bank of America, which shows that the average sentiment scores decreased after the CSR-Tweet. Specifically, Table 7 shows that the average sentiment score 2 weeks after the CSR-Tweet significantly differs from the average sentiment 2 weeks before at the 10% significance level. Even though the average sentiment score changed two days after Bank of

America's Earth Day Tweet, the difference in mean score is not significant. As there is no significant change in mean score 2 days after the CSR-Tweet, the hypothesis cannot be rejected. As a result, there is no evidence that Bank of America's Tweet positively impacts the sentiment on the short term. Even though the sentiment towards Bank of America positively changes over a longer period, it is only on a 10% significance level and it cannot be certain this is due to the CSR-Tweet. For example, another announcement, event or Tweet could have impacted the Tweets towards Bank of America.

Figure 4: Sentiment Scores for firms 1-4



The average sentiment towards McDonald's positively changed in the short term, in contrast to Bank of America, at a 10% significance level. The average sentiment towards McDonald's was negative two days prior to the CSR-Tweet, as the polarity sentiment score was -0.07, but positively changed to 0.1 two days after McDonald's Tweet. Moreover, the change in mean sentiment score is also significant when focusing on a 2-week period before and after the Tweet ($p < .10$). Again, there is a positive change, as it changes from -.04 to .07. This indicates that the sentiment towards McDonald's is significantly higher after the CSR-Tweet in comparison to before, in both the two-day period and two-week period, however only at a 10% significance level. So, McDonald's Tweet on Earth Day can be a possible contribution to the positive sentiment score.

Focusing on the sentiment towards Goldman Sachs, it appears that the average sentiment score does not differ significantly before and after the firm posted their CSR report announcement, neither for the two-day and two-week period. Figure 2 shows that the level of sentiment remains rather

constant. In the same figure, the sentiment towards Tesla was also quite stable over both the two-day and two-week period. Again, the average sentiment score did not significantly differ two days before and after Tesla's CSR Tweet. However, the mean sentiment score from two weeks after the CSR-Tweet does differ significantly from the mean sentiment score two weeks before the Tesla's Tweet. It should be noted, however, that the increase is only small from 0.08 to 0.09 and on the 10% significance level.

Table 7: Welch's t-test results for each firm before and after the CSR tweet

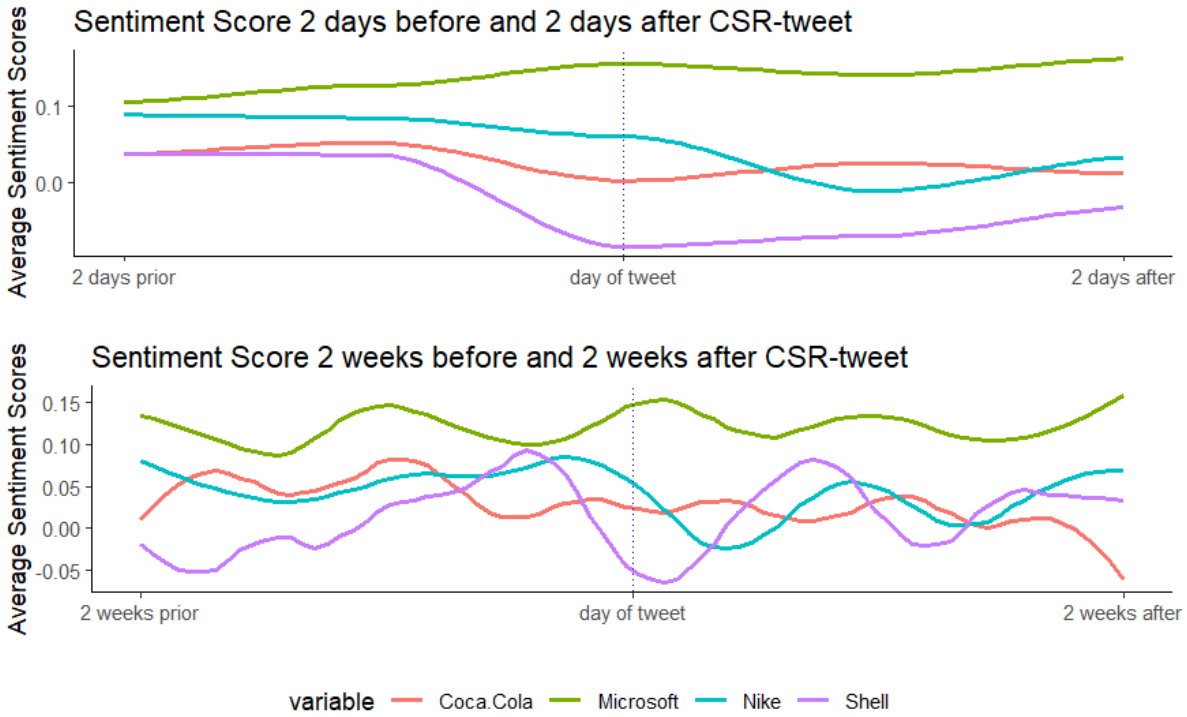
This table depicts welch's t-test to compare the average sentiment before and after the CSR-Tweet. The first 4 columns depict the t-test to compare the average sentiment two days before and two days after the Tweet. The last 4 columns depict the t-test to compare the average sentiment two weeks before and two weeks after the CSR-Tweet.

	2 days before and after Tweet				2 weeks before and after Tweet			
	t	*p*-value	mean before	mean after	*t*	*p*-value	mean before	mean after
Bank of America	.689	.592	.201	.108	2.029*	.057	.222	.146
McDonald's	-3.479*	.096	-.074	.096	-1.932*	.066	-.040	.067
Goldman Sachs	-1.091	.356	-.021	.005	1.615	.119	.035	.01
Tesla	-.037	.775	.082	.092	-1.795*	.089	.076	.088
Coca-Cola	3.111*	.07	.045	.014	2.068*	.051	.048	.02
Microsoft	-2.884	.129	.116	.152	-.891	.381	.117	.125
Nike	2.842	.103	.087	.028	2.602**	.018	.059	.026
Shell	6.53**	.023	.037	-.061	.029	.977	.010	.01

*Note: *, **, and *** indicate the 10%, 5% and 1% significance level.*

The average sentiment score towards Microsoft remains around the same level, both two days as two weeks before and after the Tweet. Welch's t-test in Table 7 also shows no signs of a significant difference in mean sentiment score two days before and after, or two weeks before and after. Therefore, Microsoft's Tweet does not impact a change in sentiment. In comparison to Microsoft, the average sentiment score for Nike changes after the Tweet, as visible in Figure 3. The average sentiment score for Nike clearly decreases two days after the Tweet. However, the change in average sentiment two days before and two days after is not significant. The decrease in average sentiment is also visible two weeks after the Tweet. The lower figure in Figure 3 shows that the sentiment increases again after a few days, however the average sentiment remains on a lower level than before the CSR-Tweet. Moreover, the t-test indicates that the difference in means between the sentiment score two weeks before and two weeks average is significant at the 5% level. As there is no short-term significant change in average sentiment, however, it cannot be certain that the change in the two-week period is due to the CSR-Tweet, or another event or Tweet.

Figure 5: Sentiment scores for firms 5-8



The average sentiment towards Coca-Cola is visualized on Figure 3. There is a significant difference in the average sentiment towards Coca-Cola before and after their Tweet regarding their Coca-Cola Life launch at a 10% significance level. The average sentiment towards Coca-Cola was at 0.05 both two days and two weeks before their Tweet. The average sentiment score for the two-day period after the Tweet decreased to 0.01, and the two-week average sentiment score decreased to 0.02. Thus, on a 10% significance level the mean sentiment score decreased after Coca-Cola's Tweet about their newest drink. On Figure 3, the negative change in average sentiment scores is more visible on the lower figure than the upper figure. One possible explanation for the relatively late change in sentiment, is that either consumers only replied to Coca-Cola after tasting the drink, which can take several days. Another explanation is that it took more time for consumers to understand the new product was not as healthy as the company promoting.

Finally, it is visible on Figure 3 that the sentiment towards Shell changed after the day of their Tweet. It is visible that the average sentiment increased two days after the Tweet. According to the t-test in Table 7, it is visible that the average sentiment score two days after the Tweet significantly differs from the average score two days before the Tweet on the 5% significance level. After those two days, the lower figure in Figure 3 shows that the sentiment continued to increase a few days longer, followed by a slight decrease in sentiment. Even though the figure shows a difference in average sentiment, there is no evidence that the average sentiment two weeks after Shell's Tweet

significantly differs from the average sentiment two weeks before. Thus, it appears that the sentiment positively increased two days after Shell's Tweet.

It is worth noting that the only Tweets that shown a significant difference on a 5% significance level, namely Coca-Cola and Shell, were both more meant to engage with the customer than the other Tweets. Furthermore, Shell being in the oil industry, which is a more sensitive industry, may explain why individuals are more likely to respond to CSR-related Tweets from a company like Shell. As most cases did not show a significant change in sentiment after CSR-Tweets, the null hypothesis cannot be rejected.

5.2.2 Sentiment scores

The t-tests in Table 7 only showed evidence for a significant change in mean sentiment score for McDonald's, Coca-Cola and Shell. Even though Bank of America, Tesla and Nike also showed evidence for a significant change in average sentiment score, it is only when comparing the two-week average sentiments. As these companies showed no evidence for a significant change in average sentiment score two-days after, it is not possible to tell whether this long-term effect is due to the studied Tweets, or another reason. Therefore, this study will only draw conclusions for companies that at least have a significantly different mean within 2 days after the CSR-Tweet, which are McDonald's, Coca-Cola and Shell.

To illustrate specific responses to firms' Tweets, Tweets with different sentiment scores are depicted in Table 8. As the amount of words in a Tweet impact the sentiment score, it shows that Tweets with few words receive higher absolute sentiment scores. For example, the Tweet '@McDonaldsCorp This is a great endeavour'[15] has a positive sentiment score of .22. On the other hand, a score with much more words received a score of -.04; '@McDonaldsCorp I'm definitely NOT impressed by your attempts at environmental protection. What about animal welfare? It's sad that doesn't matter to @McDonalds #ImNotLovinIt #ScaleForGood[15]'.

When looking at Tweets specifically focused on Coca-Cola Life, most Tweets are customers reviewing their opinion on the new drink, such as their view on the taste, packaging and ingredients. As visible in Table 8, an example of such an opinion Tweet with a high sentiment of 0.28 is 'That coca cola life stuff is pretty goooooood!'[15]. However, the average sentiment did change negatively. The following Tweet is an example of a negative Tweet about the new product: What exactly is the point of Coca Cola Life? It's only got marginally less sugar than regular coke and slightly fewer

[11] Scraped from Twitter.com. Authors remain anonymous.

calories.'[15] In similar style, Table 8 depicts Tweets reacting to Shell's Tweet, with both positive and negative reactions.

However, as mentioned before, the algorithm is not always able to detect sarcasm within a Tweet. For example, 'Is Coca Cola actually trying to market itself as a natural product with this new 'Coke Life'? #sure'[15] even though this Tweet is clearly sarcastic, the algorithm was not able to detect the negative nature of this Tweet. As a result, the Tweet received a positive sentiment score of .19. Another example of this is visible in Table 8 for Shell, as someone Tweeted 'Some interesting marketing lessons here for @Shell. Turns out people don't take kindly to being asked about individual climate responsibility by a company responsible for 2.36% of all global CO2 and methane emissions since 1965'[15]. Again, the algorithm has not been able to properly detect the negative tone of this Tweet, as the sentiment score is .16. Even though the data has been cleaned and prepared in such a way to avoid mistakes as these, it remains difficult to assign sentiment scores faultless.

Table 8: Example of reactions to CSR-Tweets with the computed sentiment score

	Tweet	Sentiment Score
McDonald's	@McDonaldsCorp I'm definitely NOT impressed by your attempts at environmental protection. What about animal welfare? It's sad that doesn't matter to @McDonalds #ImNotLovinIt #ScaleForGood	-.043
	@McDonaldsCorp This is a great endeavour	.224
Coca-Cola	What exactly is the point of Coca Cola Life? It's only got marginally less sugar than regular coke and slightly fewer calories.	-.011
	Is Coca Cola actually trying to market itself as a natural product with this new 'Coke Life'? #sure	.185
	That coca cola life stuff is pretty goooood!	.53
Shell	@Shell I'm willing to change where my tax dollars get used to stop subsidizing fossil fuels.	-.23
	@Shell No, what are you, as the cause of the problem, willing to do? #KeepItInTheGround #Renewables #ClimateChange #ClimateCrisis #Urgent	-.265
	Some interesting marketing lessons here for @Shell. Turns out people don't take kindly to being asked about individual climate responsibility by a company responsible for 2.36% of all global CO2 and methane emissions since 1965	.159

6 Conclusion

6.1 Summary and discussion

This study focused on the effect of CSR communication on firm performance in two different ways: financial performance and public reputation. Therefore, this research was split into two parts. In the first part, the interaction effect of ESG disclosure and ESG performance on firm performance was tested. In this way, this thesis was able to find out whether ESG disclosure strengthens or weakens the effect of ESG performance on firms' financial performance. It is also tested whether the ESG disclosure score interacts the relation of the environmental, social and governance performance score on financial performance separately. The second part of this study explored how CSR communication affects firm reputation, which was measured in public sentiment. In this part, the sentiment towards 8 different firms was computed, and this study compared whether the average sentiment towards a firm changed after posting CSR-related content on Twitter.

The results for Model 1 were in line with hypothesis 1-a, indicating that ESG performance positively affects ESG disclosure. This means that when the ESG performance score of a company gets better, the firm will disclose their performance more extensively to stakeholders. This is in line with the voluntary disclosure theory, which indicates that the more successful firms' performance is, the more likely a firm is to voluntary disclose this performance (Dye, 1985; Verrecchia, 1983). However, this goes against the legitimacy theory, which indicates that disclosure is higher as ESG performance worsens, to justify the low performance (Milne & Pattern, 2002). Therefore, the results do not support this theory .

The regression results also showed that ESG disclosure positively affects financial performance, without taking the interaction effect with ESG performance into account. This follows the reasoning of reducing information asymmetry; as a firm discloses more information, stockholders are more informed, reducing information asymmetry which can be rewarded in economic performance (Healy & Palepu, 2001). Interestingly, as the disclosure effect of ESG disclosure and ESG performance is added in Model 3, the direct effect of ESG disclosure on firm performance becomes negative. However, this effect can only be interpreted on its own when ESG performance score is zero. Thus, as the ESG performance is zero, a rise in ESG disclosure will result in lower financial performance. Even though this is an extreme case, it is in line with previous studies focusing on greenwashing, indicating that empty reports lead to a worse economic performance (Bams et al., 2011).

Model 3 showed that the interaction term of ESG disclosure and ESG is positive, indicating that a higher disclosure score weakens the negative effect of ESG performance on financial performance. These findings are similar to Fatemi et al. (2018), as they found that ESG disclosure improves the negative relation between ESG concerns and financial performance. One possible explanation for

why ESG disclosure positively affects the relationship between ESG performance and firm performance could be that firms are able to legitimate their activities in line with the legitimacy theory, as Fatemi et al also argue (Fatemi et al., 2018; Milne & Pattern, 2002). In contrast, this study found ESG performance to negatively affect financial performance. According to Fatemi et al. (2018), there is a favorable relationship between ESG strengths and financial performance. However, this study discovered that a high level of disclosure is required to ensure that ESG performance favorably affects financial performance.

This study also tested whether, and how, ESG disclosure affects the relation between the ESG sub-scores (environmental; social; governance) and financial performance. Again, ESG disclosure impacts the negative relation between both environmental and social performance with financial performance. Using the floodlight test, this study found levels of ESG disclosure for which the ESG performance negatively and positively impacts financial performance. The higher ESG disclosure, the more positive the relation between environmental performance and financial performance becomes. However, when ESG disclosure score is low, ESG performance impacts financial performance negatively. For the social sub-score, ESG disclosure also improves the relationship between social performance and financial performance. Similarly, for higher values of ESG disclosure, social performance positively affects financial performance, and vice versa.

However, the effect of social performance is already positive when ESG disclosure score equals 29, while this is only at 40 for environmental. A possible explanation for the relative importance of disclosure for the environmental pillar, could be that stakeholders are more skeptical towards firms' motives for environmental investments rather than social investments. As a result, it is important to inform more extensively on the environmental activities to avoid skepticism. As disclosure weakens the relation between both sub-scores and financial performance, these results are in line with Fatemi et al. (2018).

The interaction effect between ESG disclosure and governance performance score was the only sub-score showing different results. There was no sign of an interaction effect, or an effect of governance score on financial performance. Moreover, the disclosure score positively affected financial performance. More studies have found conflicting results for governance performance, in comparison to the environmental and social performance score (Fatemi et al., 2018; Friede et al., 2015). One explanation for this could be that corporate governance disclosure is required in firms, as governance-related decisions are often related to stakeholders, indicating that they are already aware of governance policies (Fatemi et al., 2018; Reddy et al., 2008). Therefore, ESG disclosure affects the relation between governance performance and financial performance differently than the other two sub-scores.

The second part of this study showed the reaction on Twitter towards CSR-Tweets of company. As this was more of an exploratory part, there were no specific expectations for this study, besides to test whether there is even evidence of such a reaction. However, only for Shell the results showed that there was an change in sentiment shortly after they posted a CSR Tweet. Even though this change was only on the short-term, the sentiment changed negatively. One explanation for this could be that stakeholders are more sensitive towards the communication of firms in a sensitive industry, such as Shell.

Kollat and Farache (2017) argued that asymmetric communication can be more effective, however there is little evidence for this in this study, as the sentiment did not change for most companies employing such communication styles. However, they also argue that a symmetric communication strategy can be effective when an audience is more engaged. As Shell is active in the oil industry, it could be understandable that stakeholders are more concerned about their performance, hence supporting that such a communication style is more effective. However, the sentiment score decreased after Shell posted their Tweet, meaning that even though the Tweet was effective, it did not improve Shell's reputation. This could be explained by the attribution theory, as consumers might find Shell's intention firm-serving rather than public-serving, in line with Forehand and Grier (2003).

Overall, this study showed that a high ESG, environmental and social performance has the best effect on financial performance when disclosure levels are high. This was in line with expectations, as I hypothesized a positive interaction effect for these variables. However, the interaction effect between governance performance and ESG disclosure remains ambiguous. Even though the first part of this study showed that disclosing ESG activities extensively is important, the second part of this study tried to find if specific communication strategies showed to be effective. When further analyzing the different communication styles from specific companies in the second, there were some findings of effective two-way communication, however the relation between CSR communication on twitter and firm reputation remains ambiguous. This study was able to show that Shell's communication worked effectively on the public sentiment, however the sentiment towards the company decreased rather than increased. This showed that a symmetric communication Tweet, indicating that the Tweet was aimed to engage in a two-way interaction, can impact Shell's reputation

6.2 Limitations and future research

The limitations of this study should be considered when interpreting the results. Firstly, the setup of this research is broad as it explored the effect of CSR communication in different settings; where the first setting studied ESG disclosure and financial performance, and the second setting observed

the relation between CSR-related Tweets and public reputation. To keep the broad scope, there has not been a focus on one specific industry. Even though this study contributes to the general understanding of CSR communication and the effects of it in different aspects, it also creates a limitation as there can be a deeper focus on one specific topic. Future studies could, for example, explore solely whether ESG disclosure interacts with ESG performance and financial performance for one specific industry. Or, on the other hand, perform a more in-depth sentiment analysis to understand the impact of CSR-Tweets on firm reputation better.

Secondly, the firms in the panel dataset are all based in the United States. This could lead to a self-selection based endogeneity bias (Clougherty, Duso, & Muck, 2016). Endogeneity occurs when an independent variable correlates with the error term, which violates one of the OLS assumptions. In this study, the Unites States is selected as there are no non-financial reporting regulations. However, this condition can also influence the independent variable of this study, namely ESG disclosure. Future research should take this bias into account, and possibly overcome it by conducting a Two-Stage Least-Squared approach, which takes instrumental variables into account. As a result, the possible endogeneity issue of ESG disclosure can be improved.

Third, the adjusted R-Squared for the models with Tobin's Q as dependent variable were all relatively low. This could indicate an omitted-variable bias. This bias occurs when variables are excluded, but are relevant for explaining the variance in Tobin's Q. Even though it is nearly impossible to perfectly explain the variance in a dependent variable, future studies should explore additional control variables to include in the model in order to improve model performance.

Moreover, the algorithm to compute the polarity sentiment scores are flawed, as it remains a difficult task for computer programs to perfectly interpret tone. This can already be difficult for humans to detect, especially written down. Even though the package used to conduct the sentiment analysis, SentimentR, takes negations and amplifiers into account, it cannot detect sarcasm, jokes, and irony. Thus, future studies could focus on improving the algorithm, so that it can better detect these elements. Additionally, using Twitter social media as a text data source, the dataset is likely to contain unknown abbreviations and spelling mistakes. Even though this study tried to detect these, future research can improve the cleaning of social media data.

Finally, as the aim of the sentiment analysis was to find out whether a CSR-Tweet impacts the overall sentiment towards firms, this study used all Tweets directed to the studies firms. As there was little evidence of significant difference in sentiment after majority of CSR-Tweets, future studies can use topic modelling to see if the sentiment changed for Tweets specifically talking about CSR. By classifying Tweets in different topics, future studies could focus on specific Tweets with specific topics.

As there is little evidence of case studies focusing on CSR communication and sentiment analysis, this study employed a multiple-case study approach to get a more concrete understanding of the effects of CSR-Tweets on firm reputation. However, with such an approach there is little external validity, meaning that it is important to not generalize the results. As this topic is still rare in existing literature, there are many opportunities in which this topic can be further explored, also to improve external validity.

6.3 Managerial implications

From the results of this study, some practical implications can be made. Firstly, the findings showed that high disclosure levels are more beneficial for financial performance. As this is in line with the stakeholder theory, the results imply that it can be fruitful for firms to inform stakeholders and thus enhance their ESG disclosure. Furthermore, this study showed that firms with a high ESG performance score and ESG disclosure had the highest financial performance. This indicates that when managers focus on enhancing ESG disclosure, it is more profitable to enhance the ESG performance too, or vice versa. However, as this study was only for US-based firms, this may be different for firms in other countries.

Moreover, the sentiment analysis showed that a symmetric communication approach is most effective, as the sentiment towards firms employing this approach changed, especially for Shell. Therefore, this can be a useful approach to implement, however, this can be different for specific companies or industries. For example, Shell is a company in a socially disputable industry, which can explain why such CSR-Tweets can impact the sentiment of a company. Therefore, it is useful to further research the effectiveness of this communication approach.

Finally, this study focused on finding the different ways in which CSR communication impacts the performance of a firm; namely in financial and non-financial performance. Not only CSR disclosure as a variable is studied, which indicated the importance of overall transparency, but CSR-communication specifically on Twitter is also studies, which helped to understand the impact of Tweets on a firm's reputation. As a result, this study can give companies more insight to help with decision-makings regarding CSR communication.

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7 Appendix

7.1 Appendix A

Definition of variables

Variable	Description	Source
ESG Disclosure	Disclosure score assesses the amount of information shared and transparency of companies, measured in annual reports, press releases and many more sources. Score ranges from 0-100.	Bloomberg
ESG score	Measures a company's CSR performance based on three sub scores: environmental, social and governance. Score ranges from 0-100.	Refinitiv
Environmental score	Sub score of ESG score that focuses on three categories: use of resources, emissions and innovation. Score ranges from 0-100.	Refinitiv
Social score	Sub score of ESG score that focuses on four categories: workforce, human rights, community and product responsibility. Score ranges from 0-100	Refinitiv
Governance score	Sub score of ESG score that focuses on three categories: management, shareholders and CSR strategy. Score ranges from 0-100.	Refinitiv
Tobin's Q	Financial ratio to measure corporate financial performance. Equals total market value of firm divided by total asset value.	Refinitiv
Market Value	Market Value of a company is calculated by multiplying the shares outstanding by the share price	ComopuStat North America
Shareholder dispersion	Percentage of available shares to investors, measured in free float. High free float indicates that there is little shareholder concentration.	Refinitiv
CSR committee	Indicates whether CSR committee is available in firm on senior management or board level.	Refinitiv
Firm size	Total assets of firm.	Refinitiv
Advertising expenses	Expenses of a firm on advertisements.	Refinitiv
Leverage	Ratio of total debt to total assets.	Refinitiv
Profitability	Return on assets.	Refinitiv
Risk	Systematic beta of firm.	Refinitiv

7.2 Appendix B

Composition of the sample per industry		
Industry	*n*	%
Basic Materials	276	4.1%
Consumer Discretionary	1097	16.3%
Consumer Staples	275	4.1%
Energy	247	3.7%
Financials	1196	17.7%
Health Care	964	14.3%
Industrials	1216	18%
Real Estate	477	7.1%
Technology	669	9.9%
Telecommunications	159	2.4%
Utilities	168	2.5%

7.3 Appendix C

Descriptive statistics for the four ESG approaches

This table depicts the descriptive statistics for the different ESG approaches: high disclosure and high performance, high disclosure and low performance, low disclosure and high performance, and low disclosure and low performance. *Tobin's Q* is measured as the total market value divided by the total asset value. The *ESG disclosure, ESG, environmental, social and governance performance scores* all range between 0 and 100. *Shareholder dispersion* indicates the percentage of available shares to investors. *CSR Committee* indicates whether a firm has a CSR committee available. *Ln Firm size* is the natural logarithm of total assets. *Ln Advertising expense* is the natural logarithm of the Selling, General & Administrative Expenses. *Leverage* is the debt-to-equity ratio. *Risk* is equal to the firms' beta.

	Mean			
Main Variables	High Discl – High Perf	High Discl – Low Perf	Low Discl – High Perf	Low discl – Low perf
Tobin's Q	1.71	1.78	1.78	1.95
ESG disclosure	47.20	37.40	31.69	31.07
ESG score	58.43	28.31	44.49	25.13
Environmental score	48.19	11.98	12.93	3.71
Social score	60.41	31.94	44.14	28.99
Governance score	62.86	38.93	61.49	36.14
Shareholder dispersion	.86	.80	.8	.76
CSR Committee YES	63%	15%	13%	3%
CSR Committee NO	37%	85%	87%	97%
Ln Firm size	16.03	14.73	14.82	14.21
Ln Advertising expense	13.67	12.57	12.6	12.05
Leverage	.75	.88	.69	.68
Profitability	.05	.03	.02	-.01
Risk	1.23	1.32	1.11	1.13

7.4 Appendix D

ESG-Tweets for each firm

This table depicts the Tweets focused on for the sentiment analysis. The first column depicts the firm that posted the Tweet. The second column depicts the exact Tweet that was posted by the firm. The third column depicts the date of the Tweet. The next column depicts the total number of likes the Tweet received. The fifth column depicts the total number of quote Tweets the Tweet received, which is a ReTweet in combination with a reply. The final column shows the link of the Tweet

Firm	Tweet Text	Tweet Date	Number of Likes	Number of Quote Tweets	Link
Bank of America	We're committed to helping create a sustainable world, today and for future generations. #EarthDay	22/04/2022	51	8	https://twitter.com/BofA_News/status/1517518975239872515
McDonald's	Climate change is the biggest environmental issue of our time, which is why we've committed to decrease our greenhouse gas emissions in our restaurants, offices and supply chain. Learn more about how we're using our #ScaleForGood this #EarthDay http://McD.to/6010Eeoka	22/04/2019	45	9	https://twitter.com/McDonaldsCorp/status/1120345468691734531?s=20&t=MuZ5BHFC2bISNH5Jj8_uiw
Coca-Cola	Learn about Coca-Cola Life, our new reduced-calorie cola making its U.S. debut: http://CokeURL.com/uvcs3	31/08/2014	45	49	https://twitter.com/cocacolaco/status/505863554759925762
Microsoft	With the power of #AI, @NOAAFisheriesAK is working to save ice seals and beluga whales from extinction. Dive in: https://msft.it/6007TwCqD	19/02/2020	208	9	https://twitter.com/Microsoft/status/1230194177738182662
Nike	Nike takes a bold step to reimagine solutions for critical environmental problems. Transforming scrap material from factory floors, the Nike Space Hippie Footwear Collection has earned the brand's lowest carbon print score to date.	05/02/2020	1710	96	https://twitter.com/nike/status/1225132665470377988
Goldman Sachs	Our new sustainability report arrives at a critical time. Learn about our $750 billion commitment and explore the imperative and the opportunity of a sustainable future. #GSsustainability	01/06/2020	86	1	https://twitter.com/goldmansachs/status/1267530976722391041
Tesla	At Tesla, we support a diverse, inclusive and safe environment for all.	01/06/2019	8792	24	https://twitter.com/Tesla/status/1134841446316404736
Shell	What are you willing to change to help reduce emissions? #EnergyDebate	02/11/2020	980	7 897	https://twitter.com/Shell/status/1323184318735360001?s=20&t=RgjVugszLSpEMBD6hxKFQQ

7.5 Appendix E

Multicollinearity

This table shows the multicollinearity tests. The VIF scores are presented for the different models.

	(1)	(2-3)	(4-6)
ESG disclosure score		2.146	2.488
ESG score	1.348	1.885	
Environmental score			2.209
Social score			1.684
Governance score			1.276
Firm size	2.106	2.250	2.341
Advertising Expenses	1.924	1.946	1.984
Leverage	1.006	1.006	1.007
Profitability (ROA)	1.085	1.085	1.140
Risk	1.004	1.007	1.019