DOES MORE EQUAL LESS?

EMPIRICAL EVIDENCE OF THE IMPACT OF CSR DISCLOSURE LEVELS ON THE COST OF EQUITY CAPITAL AMONG SWEDISH LISTED FIRMS

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Does more equal less? - Empirical evidence of the impact of CSR disclosure levels on the cost of equity capital among Swedish listed firms.

Abstract:

The purpose of this study is to investigate the relationship between the cost of equity capital and levels of CSR disclosure. The recent implementation of a European-level directive that established a minimum level of mandatory CSR disclosure, motivates us to further investigate the regulatory impact on the relationship. Due to its high level of reporting practices, stakeholder-friendly orientation and early CSR legislative initiatives, the study focuses on the Swedish market. To evaluate the levels of CSR disclosure we use a self-constructed CSR index, inspired by recent academic studies. The index is based on outputs from the automated content-analysis tool CFIE-FRSE. The content comes from stand-alone and integrated CSR reports of 92 companies listed on Nasdaq Stockholm Exchange, over the period 2013-2018. Our findings show two notable observations. First, an inverse association exists between the two variables, however the perceived benefits of increasing a firm's CSR disclosure levels are of minor economic significance. Second, the announcement of more extensive CSR disclosure legislation is associated with a stronger inverse relationship. We thereby contribute to existing literature by, first, providing further evidence over the value-relevance of CSR information, second, by extending the discussion of capital market implications of announced legislation and third, by contributing to the discussion over the usefulness of automated content analysis tools in economic analyses.

Keywords:

Cost of Equity Capital, CSR, Levels of Disclosure, Sustainability Reporting, Corporate Social Responsibility, CFIE-FRSE, Textual Content Analysis

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1. Introduction

"The question is no longer whether a company has a CSR program, but rather what kind of CSR program it has and how this contributes to the overall value creation" (Qvartz, 2016)

The field of Corporate Social Responsibility (CSR) has commanded increased attention in recent years, owing to the drastic growth in the number of institutes, mutual funds, large institutional investors and regulators that have encouraged corporations to improve their CSR practices (Bassen et al., 2006). Being a highly contested field, the last four decades have seen academics debating the question of whether directly promoting societal and environmental good can lead to beneficial economic outcomes for the related business entity (Brooks et al., 2018). Still, the prospect of achieving long-term firm survival and fiscal health by engaging in responsible corporate behavior, should be enough to reposition the debate from the sphere of business ethics to that of modern economics. For firms to actively pursue CSR activities, a systematic approach towards building economic, natural and human capital needs to be adopted (Visser, 2011).

The way that firms try to reap the benefits of their CSR efforts is to voluntarily disclose information over their CSR activities, such as internal processes, strategies and other performance-related information, in hopes of signaling their superior CSR performance to the market (Hummel & Schlick, 2016). CSR disclosure is defined as any information that a firm makes public, within or alongside its annual accounts, related to its performance, policies or activities under the CSR umbrella (Brooks et al., 2018). The added importance of disclosing CSR-related information can be showcased through the legislative scope. Modern legislation aims to force firms to integrate environment, social and ethical issues into their business operations and strategies. In doing so, regulators stress the economic and legal aspects as basic obligations, while considering environmental and ethical aspects as duties every legitimate organization must adopt. Directive 2014/95/EU stands out as one of the most important recent CSR initiatives on the European Union (EU) level. As of 2018, large corporations operating in the EU are legally mandated to disclose information about their social and environmental impact in their annual reports. For example, issues related to corruption, diversity, employees, environmental and social impact must be disclosed if the firm meets certain criteria related to total number of employees, annual turnover and balance sheet items.

Sweden, being a frontrunner of CSR disclosure practices, outperforms its European peers, ranking second in Europe in terms of national CSR reporting rates (KPMG, 2017). This owes to the fact that Sweden has relatively strong national institutions that encourage firms to increase their CSR disclosure efforts (Cahan et al., 2016). For example, this could be seen in Swedish regulation, with the Swedish Annual Act 1995:1554 mandating bare minimum levels of social and environmental disclosure, way ahead of global legislation.

Following the EU Directive 2014/95/EU, Sweden adopted even stricter regulation than suggested by EU, i.e. by reducing the criteria for the number of employees by half (Government Office of Sweden, 2016).

Even though CSR activities and CSR disclosure are two concepts that are thematically intertwined, the plethora of research has mainly focused on CSR activities, but failed to reach a concrete consensus over its financial implications (Waddock et al., 1997). While some argue for a positive link due to e.g. CSR efforts having reputational and corporate branding benefits (Margolis et al., 2007), others argue for a negative link as a result of CSR activities distracting managers from enhancing the value of the firm´s core business (Brooks et al., 2018). However, no matter the value implications, few studies have investigated the financial impact of CSR disclosure and, in particular, the impact on information asymmetry and the investment's perceived risk premium (Malik, 2015).

The equity cost of financing for a firm can serve as the appropriate lens through which to investigate the financial impact of CSR disclosure. The rationale stems from the fact that the cost of equity capital is used by managers to make critical decisions over the firm's financing, capital budgeting, strategy and operations, in addition to investors and analysts who use the cost of equity as the discount rate in their valuations. The few academic papers that study the association between cost of equity capital and CSR disclosure, note an inverse relationship. Finding an inverse relationship suggests that firms are highly likely to enjoy lower interest rates by engaging in CSR activities and, subsequently, providing more extensive information through their disclosure efforts. For example, Dhaliwal et al. (2011, 2014) find that the initiation of CSR reporting results in a reduction of the cost of equity capital, added levels of analyst coverage and increased likelihood of raising new capital. Plumlee et al. (2008; 2015) use an index-based approach to determine the quality of voluntary environmental disclosure, to document an inverse relationship with the cost of equity capital. Similarly, de Souza et al. (2013) suggest a negative relationship between social disclosure quality and cost of equity in a Brazilian setting. However, measuring quality infers a subjective assessment of the disclosure content, thereby introducing the risk of human errors. New quantitative and automated methods, measuring the *levels of disclosure*, could provide new perspectives on this relationship.

In addition, international regulation on CSR disclosure had up until recently been scarce, with firms being limited by broadly-issued guidelines to meet the growing demand of CSR information from stakeholders. Thus, the announcement of Directive 2014/95/EU offers a unique opportunity to further study the effect of a now mandatory and more rigorous minimum level of CSR disclosure. The Swedish market can further offer interesting insights, being prone to swiftly adjust to new regulation and to adopt a stakeholder approach. Combining these elements, we investigate the exact relationship between CSR disclosure levels and the cost of equity capital, thus formulating this study's two *research questions* to be;

"Do firms with higher levels of CSR disclosure achieve a lower cost of equity capital?"

"What impact did the announcement of EU Directive 2014/95/EU have on the relationship between CSR disclosure levels and the cost of equity capital?"

While previous studies have focused on the quality of disclosure through manual and subjective approaches to content analysis (i.e. Botosan, 1997; Plumlee, 2008; 2015, de Souza et al., 2013), we approach the field from a new angle. Inspired by upcoming papers by Athanasakou et al. (2018; 2019), we use a special-purpose textual analysis tool (CFIE-FRSE) to construct an CSR disclosure index that is based on the levels of disclosure, to study the content of integrated and stand-alone CSR reports. We investigate the first research question by initially studying the static nature of the relationship. We further examine whether this relationship holds equally across high and low CSR disclosing firms, using a quantile model. In addition, we explore their dynamic relationship. Finally, we study the second hypothesis through a post-announcement, static model.

This study contributes to existing literature in several ways. First, we introduce the aspect of disclosure levels into the relationship between CSR information and cost of equity capital by finding support of a negative, although marginal, relationship between the two. Second, we suggest that the announcement of Directive 2014/95/EU is associated with a greater reward or punishment for firms disseminating higher levels of CSR related information to the Swedish financial market. Third, we provide further empirical evidence of the academic appropriateness of using automated content analysis tools to study information asymmetry. Overall, the implications of our findings suggest that there is a financial, although marginal, incentive for firms to cater to the informational needs of a broader stakeholder base than its immediate shareholders.

This paper is segmented into eight main sections. For the second section, theories, concepts and notions relevant to our research topic will be discussed and evaluated, resulting in the development of our hypotheses. Those include voluntary disclosure theory, signaling theory, stakeholder theory, legitimacy theory and cost of equity capital. For the third section, a presentation of our research design and method will be conducted. For the fourth section, a discussion over the selection, sanitization and initial analysis of our data sample will follow. For the fifth section, we present the empirical results of our quantitative study. For the sixth section, we will conduct additional tests in order to stress our findings, in the form of robustness tests and sensitivity analysis. For the seventh section, we provide a discussion over the empirical results and the conclusions that can be drawn. For the eighth and final section, we will present our conclusions, the limitations of our study and suggestions for future research.

2. Literature review and hypothesis development

This section begins with a discussion over the topic of CSR, its value-relevance, disclosure practices and affiliation with the cost of equity capital, through the scope of multiple theoretical frameworks. We follow this discussion by stating our first hypothesis. Next, we summarize the academic field of disclosure regulation, the recent developments in international disclosure legislation and its implications on information asymmetry. We, thus, end the section by stating our second hypothesis.

2.1. Defining corporate social responsibility

The idea of social responsibility stems from the concept of *Sustainable Development,* as defined in the 1987 Brundtland Commission Report:

> *Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*" *(UN, 1987)*

Similarly, *Corporate Social Responsibility* takes on the view of a firm's impact on sustainable development, defined through the pyramid of corporate social responsibility:

> *"[CSR is] the idea that the corporation has not only economic and legal obligations, but ethical and discretionary (philanthropic) responsibilities as well" (Carroll, 1991)*

Currently, the multiple definitions for CSR used both within the legal and academic world, are a result of the inherent challenges in defining an abstract concept that evolves with time. The political sphere, acting on the increased interest in CSR, provides its own definition as "*companies taking responsibility for their impact on society*" (EU Commission, 2011). Malik (2015) denotes two major academic schools for defining CSR. The first school defines CSR as a firm´s discretionary, multidimensional activities that include social, political, environmental, economic, and ethical actions (Carroll, 1991). The second school considers CSR to be a function of a firm's behavior toward its different stakeholders, one that focuses on shared value creation in society through the means of economic development, environmental impact as well as legal and ethical compliance (Cooper, 2004). For the purpose of this study, we will follow the latter in defining CSR, considering it to be the systematic approach towards building economic, natural and human capital that firms pursue, in order to be seen as legitimate in society (Visser, 2011).

In the current market setting, *Environmental, Social and Governance* (ESG) criteria have become the main channel of evaluating CSR performance, while sustainability reports have become the channel through which firms report their CSR commitments, efforts and practices. Given that CSR, ESG and sustainability are interlinked concepts that often overlap thematically, in the following sections we will refer to all under the umbrella-term of CSR.

2.2. The value-relevance of CSR

The variety of existing methods that evaluate a firm's CSR activities and its impact on firm value have resulted in current academic consensus over their value-relevancy to remain mixed. The prevailing perspectives on CSR´s value-relevancy can broadly be separated into two opposing views; *scholars who claim it to be value-irrelevant* and *scholars who claim it to be value-relevant.*

2.2.1. Value-irrelevance

Considering CSR as value-destroying, Friedman (1970) argues that the social responsibility of businesses is solely to increase their profits and, subsequently, increase firm value for their shareholders. This view considers CSR activities to be distracting managers from generating profits, as trade-offs must be made if one simultaneously seeks to maximize the variables of shareholder and stakeholder value. Hence, the value-destroying side considers firms to be morally-neutral legal constructs with the sole purpose of maximizing returns for shareholders.

In contrast to the view expressed by Friedman, most of the empirical studies fail to denote value-destroying effects, but rather note value-irrelevancy. For example, Aupperle et al. (1985) conduct a forced-choice qualitative study where CEOs rank their own corporation's CSR efforts, but do not find any relationship between CSR efforts and profitability. Similarly, Manescu (2011) finds that community engagements could be value-relevant, but that the observed effect on firm value was rather due to mispricing, as community engagements are not efficiently incorporated into the share price. Baron et al. (2011), support these findings, further documenting profitability to be unaffected by CSR efforts. Conclusively, Lima Crisóstomo et al. (2011) find evidence of the relationship between firm value and CSR efforts to be both value-destroying and value-irrelevant. Specifically, studying the emerging market of Brazil, they find CSR efforts to reduce firm value, while also being neutral for financial performance.

2.2.2. Value-relevance

In contrast, scholars of the socio-economic literature consider CSR to be value-relevant. Frederick (1960) argues that firms should adopt an economic system approach that fulfils the expectations of the public. Thus, firms should employ their resources to enhance the total socio-economic welfare and not only that of their immediate shareholders. This perspective captures an aspect that Friedman neglects, namely, that acting ethically can be a valuable marketing proposition that fulfills the needs of the consumers, thereby also enhancing shareholder value (Levitt, 1960). Supporting this claim is the growing number of instances where shareholders actively campaign for sustainable business models, showing that investors prefer firms that do not only seek to maximize profit, but also act within the ethical constraints of society (Guay, 2004).

The growing stream of empirical findings separate the positive effects of CSR activities into three main categories. The first category relates CSR activities with beneficial effects on cash inflows. Hainmuller et al. (2015) find that CSR efforts positively affect customers' willingness to pay more for socially responsible goods, while Sen et al. (2001) find it to influence customers´ decision-making process. The second category relates CSR activities with reduced cash outflows, as CSR efforts could work as a form of insurance, value-preservative and pre-emptive action by reducing the risk of both litigation and reputational costs (Margolis et al., 2007; Godfrey et al., 2009; Krüger, 2015; Groening & Kanuri, 2016). The third and final category inversely relates CSR activities with capital market measures, such as lower cost of equity capital (Ghoul et al., 2011), lower loan interest rates (Goss & Robert, 2011) and better credit ratings (Kim & Kim, 2014).

2.2.3. Implications

The potential value-relevancy of CSR activities has resulted in a growing analyst interest in CSR disclosure. Equity analysts now use sustainability reports to gain a deeper understanding of the firm's operating and regulatory risks (Hoffmann & Fieseler, 2011). The information from the reports is used to increase transparency, reduce information asymmetry, and is seen as an indicator of the firm's overall risk and financial management efforts (Merton, 1987; Fieseler, 2011; Clarkson et al., 2011; Choi & Moon, 2016). Additional studies indicate that firms with higher CSR performance ratings have a higher degree of analyst coverage, (Hong & Kacperczyk, 2009). Subsequently, greater analyst coverage has been linked to several positive financial effects. For example, academics have reported that analysts, by incorporating environmental and CSR information into their research, are able to reduce their forecasting errors, thus, achieving superior forecasting compared to their non-CSR-using-peers (Eccles et al., 2011; Dhaliwal et al., 2012). Moreover, Ioannou et al. (2015) indicate that high CSR performing firms are more often subjected to favorable analyst recommendations, resulting in increased stock liquidity, lower stock volatility and higher valuations.

Overall, the extent to which CSR activities affect a firm financially remains a point of contention among academics. However, the observed associated benefits justify the need to better understand the underlying components of CSR that trigger said benefits. Still, value-relevant or not, the only way investors become aware of a firm's CSR efforts is through its external communication of those aspects.

2.3. CSR disclosure

Overall, findings indicate that a firm´s CSR commitments, efforts and practices are of interest to the market participants. Yet, the argument that better CSR disclosure is solely the outcome of better CSR performance is rather weak, as the former is neither strictly implied by the latter nor vice versa. Still, when assessing a firm´s CSR performance, many investors turn to information found in the firm´s annual and CSR reports. The firm, therefore, needs to ensure that it sends strong enough signals via its disclosures, to inform

its investors of the value implications of its CSR activities, as suggested by signaling theory (Spencer, 2002). Thus, on occasion, the firm will have to disclose more than legally mandatory.

Voluntary disclosure exists to bridge the gap between an investors' overall informative needs and the minimum level required by regulation. In particular, voluntary disclosure refers to the act of publishing all relevant corporate information that may influence an investment decision. This act is the outcome of a conscious effort from the firm´s management team to disclose more information than the minimum necessary, i.e. *non-voluntary disclosure* (Meek et al, 1995). Noteworthy is the fact that voluntary disclosure encapsulates both the *quality* and the *levels* of disclosure. As previous empirical studies focusing on disclosure often interrelate the terms *disclosure quality* and *levels of disclosure,* the risk of misspecification for any future study increases. To that end, it is important to disentangle the meaning behind each term.

Disclosure quality refers to the *ex-ante* commitment or policy to provide voluntary disclosure over time (Core, 2001). Empirically, older disclosure quality studies (i.e. Botosan, 1997; Richardson & Welker, 2001) often use *manual content analysi*s methods, further described in section 3.1. These studies manually and subjectively measure the quality of disclosure, using characteristic terms to indicate forward-looking, non-financial and non-quantitative information (Grüning, 2011). On the other hand, *levels of disclosure* are determined using a quantity measure, i.e. by counting the frequency of certain words. Therefore, more recent studies on disclosure levels (i.e. Athanasakou et al., 2018; 2019) use *automated computer-based content analysis* methods, further described in section 3.1.

In conclusion, one can infer that levels and quality of disclosure both identify disclosure-relevant terms in a text and that the only difference is in the method with which they reach that outcome (Grüning, 2011). The distinction between levels and quality measures of disclosure is therefore arbitrary. Going forth, we follow Grüning´s stance and do not draw on the arbitrary difference between the two. However, we use the two terms as a means of indicating the referenced paper's chosen method of content analysis.

2.3.1. CSR disclosure – Theoretical foundations

Returning to voluntary disclosure theory, multiple frameworks work together to give a holistic understanding of how disclosure could potentially hold financial implications for a firm. As such, by combining agency, signaling, stakeholder and legitimacy theory, academics have been able to explain how a firm effectively disseminates relevant information to key stakeholders, and at the same time builds organizational legitimacy. One concern for a business entity is mitigating the conflicts arising from the separation of ownership and control as described by *agency theory* (Eisenhardt, 1989). These conflicts originate from the information gap and conflicts of interest that exist between the firm's agents, the firm itself and the external market participants. This is further explained by the notion of *asymmetric information*. Specifically, asymmetric information

occurs when one party in a relationship (*the agent*) is more informed than the other party (*the principle*) (Akerlof, 1970). Also supporting the idea of asymmetric information, *signaling theory* describes the method the agent uses to credibly convey information about itself to the principle, thereby, reducing the information asymmetry between the parties (Spence, 2002).

Information asymmetry creates a power imbalance in transactions, relationships and communication alike, through issues related to adverse selection, moral hazard and monopolies of knowledge. To reduce information asymmetry, companies and their managers attempt to disseminate information to the market, shareholders and stakeholders through the means of signaling (Spencer, 2002). Specifically, firms try to distinguish themselves from their peers and signal their superiority in certain areas by disclosing relevant information, in excess of what might be the minimum necessary (Connelly et al., 2011). However, to reliably distinguish themselves, superior firms are required to send signals that are costly enough to fend off imitations by less superior firms. For example, through the external validation via auditing of the report content or through superior quality or levels of disclosure. In the context of CSR, auditing enables firms to credibly convey the legitimacy of the information disclosed, as otherwise CSR disclosure can represent non-verifiable and non-binding information, referred to as 'cheap talk' (Crawford & Sobel, 1982).

When tackling the intuition behind signaling theory, one must consider the receiver´s end in the communication loop. Specifically, when designing the signal, its content and purpose, the firm must determine the intended recipients as well as the desired outcome of the communication loop. The most immediate recipients of signaling effects are the firm´s shareholders and stakeholders. *Shareholder theory* originated from the works of Friedman (1962; 1970) and states that the single duty of a corporation is to maximize the profits accruing to its shareholders, implying that voluntary disclosure should also cater only to the informational needs of shareholders. Instead, highlighting the need to build trust and transparency with its surrounding communities, *stakeholder theory* adopts the opposing view and dictates that corporations disclose voluntary information with the aim of being viewed as licit by key stakeholders (Pistoni et al., 2013). Building on the importance of recognizing the needs of stakeholders, *legitimacy theory*, as defined by Mathews (1993), explains the state a firm reaches when it acts in accordance to social norms and values. If the firm steps outside these boundaries, it could face the risk of reputational damage. Thus, through their disclosure, firms construct legitimacy by improving their perceived image in society (Dowling & Pfeffer, 1975; Lindblom, 1994). The existence of CSR disclosure could then be seen through the scope of a firm's need to be viewed as a legitimate contributor to society (Pistoni et al, 2013). The pressure of legitimacy, coupled with an ongoing process of isomorphism, which is the process under which practices and structures between organizations converge, could be the rationale

behind the increasingly similar disclosure practices found today (Holder-Webb et al., 2009).

Overall, the theoretical mechanics driving CSR disclosure point towards it fulfilling the needs of both the firm and its immediate and broader stakeholders, by functioning as a mitigator of information asymmetry. Still, the theoretical frameworks underpinning the notion of CSR disclosure need to be observed in an empirical setting for the theories to be explanatory and to indicate CSR disclosure's value-relevancy. Hence, the following section focuses on empirical findings.

2.3.2. CSR disclosure – Empirical evidence

Prior empirical research within the field of disclosure theory has mainly focused on overall firm disclosure, with only a few studies on CSR disclosure. The empirical findings indicate that both the *quality* and the *level* of disclosure are value-relevant.

Disclosure quality studies have found that higher quality reduces analyst forecast errors and dispersion (Barron et al., 1999) as well as reduces future betas (Lambert et al., 2007). Disclosure quality also refers to the firm's ability to explain its earning and accounting practices, where both earnings' transparency (Bhattacharya et al., 2003) and accounting conservatism (Li, 2008) have been found to positively affect the firm's financing cost. Report readability is also an important aspect of quality. Lee (2010), hence, examines the effect of quarterly reports' readability on information asymmetry and concludes that less readable annual reports are associated with greater uncertainty. Thus, the less readable the report, the more it hinders investors´ ability to accurately forecast the stock's future return. Finally, quality also captures the content's forward-looking and predictive nature. As such, Vanstraelen et al. (2003) observe that higher levels of forward-looking disclosures lead to increased analyst forecast accuracy.

On the other hand, increased levels of strategic disclosure have been found to be positively associated with greater stock returns (Gu & Li, 2007) and negatively associated with investor uncertainty as measured by earnings forecast dispersion (Athanasakou et al., 2018). Yet, higher levels of disclosure are of ambiguous character. As indicated by Miller (2010), smaller investors reduce their trading consensus the longer the annual report. Similarly, the post-announcement return drift has is higher for above-median reports (You & Zhang, 2009). These contradicting results are explained by Athanasakou et al. (2019), documenting a U-shaped relationship between general disclosure levels and investor uncertainty. Their results suggest that, overall, general annual disclosure is useful to investors, but that there is a trade-off. In the end, lengthy and excessive disclosure spawn confusion and information overload.

Empirical findings on the value-relevance of CSR disclosure provide mixed results. Hessel et al. (2005), studying environmental disclosure quality in a Swedish setting, find it to be negatively associated with firm value. Other studies find no association between

CSR and environmental disclosure and their impact on firm value within UK, European and Chinese markets respectively (Murray et al., 2006; Carnevale et al., 2012; Xu et al., 2012). Finally, only a few studies find a positive relationship between CSR disclosure quality and firm value (Carnevale & Mazzuca, 2014; Cahan et al., 2016; De Villers & Marques, 2016). For example, Verbeeten et al. (2016) utilize an automated computer-based content analysis approach to examine the narrative levels of CSR disclosure among German firms. They suggest that CSR information is indeed value-relevant, but while the levels of social disclosure are positively associated with firm value, higher levels of environmental disclosure is not.

Nevertheless, a straightforward generalization of all the similarities between general disclosure and CSR disclosure is less appropriate. As described earlier, detailed CSR reporting offers valuable information to the market participants, useful in determining the value for as well as risk profile of the firm in question, thus, implying some similarities. At the very least, disclosing the firm´s CSR efforts demonstrates the firm´s confidence in its superior performance, while also enabling the firm to provide an explanation for its bad performance (Dhaliwal et al, 2011). Likewise, CSR reports reveal the firm´s willingness to be transparent about its long-term performance and risk management. Therefore, consistent with voluntary disclosure theory, superior CSR performers are prone to choose high-quality CSR disclosure to signal their superior performance to the market. The opposite is then true for poor CSR performers, who, consistent with legitimacy theory, would prefer low-quality CSR disclosure to hide their true performance, in an attempt to protect their legitimacy (Hummel & Schlick, 2016). Ultimately, as equity analysts use CSR reports to understand the firm´s CSR related risk factors, the cost of equity capital and its risk factors become an important counterpart when considering the benefits of CSR disclosure, a field we review next.

2.4. CSR disclosure and cost of equity capital

A firm´s cost of equity capital can be defined as the minimum rate of return equity investors require for providing capital to the firm (Botosan, 2006; Berk & DeMarzo, 2017). In its basic form, it is comprised of the *risk-free interest rate* and a *risk premium* for the firm's non-diversifiable risk. Therefore, the cost of equity capital is also the *risk-adjusted discount rate* that equity investors use to discount the expected future cash flows in order to arrive at the firm´s current market value.

Because the cost of equity is a forward-looking concept and not directly observable in the marketplace, it is sometimes also referred to as the *'expected'* cost of equity (Botosan, 2006). Given the absence of a directly observable measure, the cost of equity capital must be estimated. However, due to the discount rate being difficult to capture entirely, academics focus on two main approaches for estimation (Reverte, 2012). The first class uses predetermined priced risk factors to yield explicit estimates of the cost of equity capital, i.e. the *ex-post realized returns approach*, for example through the *Capital Asset*

Pricing Model (CAPM) or the French Three-Factor-Model (Fama & French, 1993; Berk & DeMarzo, 2017). Yet, the CAPM approach has been criticized for failing to take into consideration the link between disclosure and cost of equity capital (Botosan, 2006). Specifically, without a priced *disclosure-related risk factor*, the question becomes whether disclosure is related to any of the factors incorporated in the CAPM model.

The second class of methods, therefore, attempts to estimate the cost of equity by looking into what is *implied* by the current market price, i.e. the *ex-ante implied approach* (Reverte, 2012). This is done by calculating the internal rate of return that equals the market's expectation of future cash flows as implied by the current stock price, for example, by utilizing the *Dividend Discount Model* (DDM), the current stock price and a proxy for future cash flows. Gode and Mohanram (2003) argue that since the expected future cash flows are not directly observable, analysts' earnings forecasts work as reasonable proxies for the market's expectation of future cash flows. Therefore, given the availability of earnings forecasts and the explicit assumption of the implied approach, most studies within the field of disclosure theory follow this approach of calculating the cost of equity capital (i.e. Dhaliwal et al., 2011; Plumlee et al., 2015).

Previous studies of the relationship between CSR disclosure and the cost of equity capital are scarce (Brooks et al., 2018; Malik, 2015). Dhaliwal et al. (2011) document that high CSR performers, by initiating CSR reporting, are able to reduce their future cost of equity capital. These firms have historically had a higher cost of equity capital and the reduction was primarily caused by the attraction of institutional investors and the subsequently increased analyst coverage. Interestingly, these firms were also more likely to go on to raise public equity. In their later study, Dhaliwal et al. (2014) also found that this relationship is stronger in stakeholder-oriented countries. Firms, therefore, seem to have an opportunistic agenda with their CSR disclosure. However, only a hand full of studies have investigated the content of CSR reports through so-called content analysis tools and its relationship with cost of equity capital. Richardson and Welker (2001) manually construct a social disclosure quality index to study the relationship between social disclosure and cost of equity in a Canadian setting. The results indicate that when having a low number of following analysts, increased financial disclosure reduces the firm's cost of equity capital, while greater social disclosure increases it. Still, the firm is less penalized for its social disclosure if the firm generates an above industry median return on equity. In contrast, de Souza et al. (2013) document the opposite in a Brazilian setting. By manually constructing a social disclosure quality index, they show a negative relationship between social disclosure quality and cost of equity capital. Plumlee et al. (2008; 2015) expand these findings to environmental disclosure in a US setting. By manually creating their own environmental disclosure quality index, Plumlee et al. (2008) document a negative relationship for firms operating in environmentally sensitive or electric industries. Later revisiting their research, Plumlee et al. (2015) further document that high environmental disclosure quality results in a higher expected future cash flow

and a lower cost of equity capital. Taking into consideration if the quality of CSR disclosure is good, neutral or bad, they show that the nature of the disclosure is important, suggesting that good news reduced cost of capital, while bad news increased it.

Ultimately, the previous studies use a manual approach to infer a complex inter-relationship between cost of equity capital, cash flows and disclosure quality. However, to the best of our knowledge, no studies have investigated the relationship between CSR disclosure *levels* and the cost of equity capital through the means of automated computer-based content analysis, thus raising the question whether the volume matters?

2.4.1. Hypothesis 1

While previous studies have employed manual content analysis tools and approximations in a North and South American setting, this study aims to investigate the effect of CSR disclosure levels among Swedish listed firms and its implications on the cost of equity capital using an automated computer-based content analysis tool. Considering the theoretical background and empirical studies, we intend to explore whether higher levels of CSR disclosure provide value-relevant information useful in reducing the information asymmetry between the market and the firm, thus, leading to a lower perceived incremental risk of the investment. It is, thereby, hypothesized that firms, seeking to both reduce their costs of equity financing as well as raise their legitimacy, engage in increased CSR disclosure levels. By doing so, the firm enjoys the positive benefits of signaling its superiority to its different stakeholders. As such, both legitimacy and stakeholder theory predict a negative association between the cost of equity capital and levels of CSR disclosure. On a similar note, by increasing their levels of disclosure, firms are also predicted to see a dynamic and incremental reduction in their cost of equity capital. These arguments lead us to formulate our first hypothesis as;

Hypothesis 1: Firms with higher levels of CSR disclosure have a lower implied cost of equity compared to firms with lower levels of CSR disclosure.

2.5. Legislative development within CSR disclosure

For many larger firms around the globe, CSR disclosure is today a standard practice, with 93% of the world´s 250 largest firms reporting on their CSR performance (KPMG, 2017). Sweden, in particular, is at the forefront of CSR reporting practices, with 88% of large listed firms reporting on their CSR practices (ibid) and 90% of large-cap firms having defined CSR targets (Lerpold et al., 2017).

The high level of reporting practices in Sweden relates to the fact that CSR reporting for larger firms in Sweden has been to some extent mandatory since 1995. This is most likely an outcome of Sweden being a more stakeholder-orientated country than for example the U.S., where CSR disclosure is still voluntary (Dhaliwal et al., 2014). As such, within their management report, Swedish firms have to disclose non-financial information related to environmental and social aspects (Swedish Annual Act 1995:1554). In addition, Swedish

national pension funds are further required to disclose both the environmental and ethical considerations of their investments (Swedish Public Pension Funds Act 2000:192), while all state-owned companies have been required to publish audited sustainability reports since 2008 (Government Office of Sweden, 2007). To provide adequate information, these reports have to comply with the guidelines issued by the Global Reporting Initiative (GRI), an international independent standards organization that has since 1997 provided standards for guidance on how firms should report on their CSR activities.

It is often argued that mandatory and stricter disclosure requirements lead to more liquid and efficient financial markets, which ultimately reduces the firm´s cost of equity capital (Admati & Pfleiderer, 2000). The underlying notion of regulation is to redistribute the wealth of information between informed and uninformed investors, through the means of minimum levels of disclosure, standardization, and comparability (Healy et al., 1999). The existence of regulation strengthens the disclosure's credibility, as the binding regulation ensures compliance or repercussion (Al-Htaybat et al., 2006). The outcome is that the risk of agency conflicts is reduced, bringing both benefits and costs to the firm (Healy & Palepu, 2001). For example, Bushee and Leuz (2005) document that increased reporting requirements under the 1934 Securities Exchange Act (SEC) resulted in smaller firms delisting due to increased compliance costs. In contrast, they also observe positive benefits for the remaining firms. Both newly listed and experienced firms saw positive stock returns, increased liquidity and that subsequently improving their disclosure lead to reduced information asymmetry. As such, mandatory disclosure forces firms to reveal both good and bad information, which ultimately helps the market to better price and assess the riskiness of the firm (Kothari, 2001; Verrecchia, 2001).

However, starting with Directive 2014/95/EU, which came into effect in 2018, larger firms within the EU are legally obliged to report certain CSR-related information on an annual basis. This change in regulation now puts emphasis on firms to provide at least a bare minimum level of CSR disclosure. The new legislation is therefore expected to draw more attention to non-financial disclosure and create further incentive for investors to examine the impact of CSR performance on shareholder value. In combination with the rising focus on stakeholders and organizational legitimacy, the new regulation thereby provides an interesting setting in which to study the relationship between the now non-voluntary CSR disclosure and the cost of equity capital.

Directive 2014/95/EU ensures that large entities disclose "*the sustainability information necessary for understanding the company's development, position and results, and the implications of its activities* […] "(EU Commission, 2014). For example, this includes information related to environment, social conditions, personnel, compliance with human rights and anti-corruption. For the stricter Swedish implementation, which took place as of financial year 2017, public firms need to disclose CSR information if it fulfills at least two out of three criteria (Government Office of Sweden, 2016). First, if the firm has an average number of employees amounting to more than 250. Second, if the firm reported

total assets amounting to more than SEK 175 million. Finally, if the firm reported net sales amounting to more than SEK 350 million. Without any adjustments to the original EU directive, it was estimated that only 100 firms would have been affected, compared to 1.600 after the stricter Swedish interpretation (Swedish Justice Department, 2016). However, the new amendments are still open for interpretation and firms are thereby allowed to, at least to some extent, apply the regulation in the manner they deem most appropriate. In the end, the new amendment mainly dictates additional CSR aspects that previously was subject of firm discretion.

Previous regulation has mainly focused on financial information, while, to a large extent neglecting CSR disclosure regulation. Thus, extrapolating previous studies of mandatory financial disclosure effects to CSR disclosure regulation, is difficult. Instead, one must combine the empirical findings with a theoretical framework to hypothesize on the implications. For example, past studies on the effect of the announcement of an upcoming derivative disclosure regulation dictate that firms progressively increase the levels of disclosure leading up to the implementation date (Chalmers & Godfrey, 2004; Taylor & Darus, 2006). Therefore, considering the signaling effect of CSR disclosure, the announcement of upcoming disclosure regulation would imply that firms try to signal their high performance and future compliance by being early adopters. Similarly, stakeholder theory would imply that external stakeholders now impose expectations for increased disclosure of CSR information, while legitimacy theory suggests that firms now voluntarily start disclosing certain information as a result of social pressure.

2.5.1. Hypothesis 2

Assuming that market participants have the same expectations on upcoming CSR disclosure regulation as they have on derivative regulation, one can anticipate a similar progressive effect. We believe the effects of the new directive to be particularly interesting from a Swedish perspective, given its stakeholder-oriented preset (Dhaliwal et al., 2014). Therefore, the expectation of upcoming regulation following its announcement is theorized to result in shifting confidence in levels of CSR disclosure. As such, it is anticipated to raise Swedish investors´ and other stakeholders´ expectations toward requesting more extensive disclosure of CSR activities. Hence, we expect the announcement to further strengthen the inverse relationship due to increased levels of CSR disclosure, prompting us to formulate our second hypothesis as;

Hypothesis 2: *The announcement of Directive 2014/95/EU resulted in a greater inverse relationship between CSR disclosure levels and implied cost of equity capital.*

3. Method

This section begins with a description of our research design, followed by a description of the approach taken to calculate our main independent variable; levels of CSR disclosure. Next, we explain our dependent variable; the implied cost of equity capital and follow with a presentation of the control variables and the regression models used.

3.1. Research design

To investigate whether high levels of CSR disclosure is associated with a lower cost of equity capital, we conduct a quantitative study, utilizing the method of *content analysis*. Content analysis refers to the method of reducing text data into frequencies by categorizing it based on paragraphs, sentences, phrases or words (Weber, 1990). One can further distinguish between two lines of research within the field of content analysis; *manual content analysis* and *automated computer-based content analysis*.

Manual content analysis involves humans manually coding and labeling the content of, i.e., CSR reports. By manually reading through the text and following a checklist, the coder categorizes the content of and its occurrence within the report. Prior disclosure content analysis studies include, among others, Botosan (1997), Sengupta (1998), Richardson and Welker (2001) and Plumlee et al. (2008; 2015). However, this method has two main drawbacks. The first being the inherited subjectivity that is involved when a manual coder interprets the content, thus making it harder to replicate. The second being its labor-intensive nature and thereby smaller sample size (Core, 2001).

An *automated computer-based content analysis* approach is based on word frequency counts, which are extracted using automated software applications. Not only does this approach reduce the risk of both ambiguity and subjectivity that makes replication difficult, it also enables the generalization of larger samples. Under the assumption that word count frequencies capture texts with similar key terms dealing with similar topics, then the higher the word frequency, the more important the words are for the contents of the texts (Grüning, 2011). For example, the higher the frequency of the phrase "Corporate Social Responsibility", the more important the topic of CSR. Prior disclosure content analysis studies utilizing the automated approach include, among others, Kothari et al. (2009), Verbeeten et al. (2016) and Athanasakou et al. (2018; 2019).

Due to the objectivity, efficiency and minimization of human errors of the automated computer-based content analysis approach, we choose to use such a method in this study. However, we recognize the limitations of this approach. By relying on external software, we are subjected to latent and potential errors in the conception, design and application of the software.

3.1.1. Measuring levels of CSR disclosure

Inspired by the works of El-Haj et al (2018) and the upcoming research papers by Athanasakou et al (2018; 2019), we employ the textual analysis tool *Corporate Financial Information Environment Final Report Structure Extractor* (*CFIE-FRSE*) software to score firms annual and CSR reports, based on word count frequencies, readability and other quality metrics.[1] The software automatically reads, categorizes, calculates and extracts the content of the annual report based on a number of predetermined sections, by using the table of content (*TOC*). It was developed by U.K. scholars El-Haj et al. (2018) in an attempt to solve the issue of large-sample annual report disclosure research, involving automatic batch-processing and content analysis of unstructured PDF files.

Apart from identifying the report structure using the TOC, the software distinguishes between narrative sections (*Narratives*) and the mandatory financial statements (*Financials*). Subsequently, the tool calculates the word frequency count of all words in each section, e.g. frequency of forward-looking words, the section's readability as scored by the Gunning´s (1968) *Fog* index, and the frequency of specific words contained in the *User Keywords Word List*. In the paper by Athanasakou et al. (2018), the tool was used to score annual reports based on their strategic narrative to generate a *StratScore*. They found robust evidence that the proxy provides a valid measure of strategy-related annual report commentary and that a higher *StratScore* was linked to reduced investor uncertainty, as measured by the dispersion of analyst forecasts. In their second upcoming paper, Athanasakou et al. (2019) utilize the CFIE software to construct an overall disclosure levels index, named *Discindex*. Their results indicate both an inverse and U-shaped relationship between overall disclosure levels and the cost of equity capital. Inspired by the robustness of the CFIE software and the explanatory value of *Discindex* (ibid), we construct our own proxy for CSR disclosure levels.[2]

Our indexed measure of CSR disclosure levels, *CSRindex*, aggregates five CFIE-based measures, see Table 1. It is calculated by searching the content of the firm´s integrated sustainability report (incorporated into the annual report) or stand-alone CSR report. If the firm issues a stand-alone CSR report, while also providing commentary in their annual report, only the CSR report is chosen on its own as it often provides more rigorous information. If it is integrated, we exploit the annual report´s TOC to identify the CSR commentary sections (S'). Henceforth, we use the term *report* interchangeably for either an integrated or stand-alone CSR report, unless otherwise stated.

Running the report through the CFIE software, we subsequently rank each CFIE-based measure individually. The score is then aggregated into an overall index, the *CSRindex*. When constructing the proxy, we draw on the works of Athanasakou et al. (2019) to choose which CFIE measures are of interest. Due to the absence of any prior evidence about each measure's relative importance, the *CSRindex* is calculated by assigning an

[1] For access and further readings, please refer to http://ucrel.lancs.ac.uk/cfie/cfie-frse-software.php
[2] The similarities and differences are commented on throughout the following sections.

equal weight to the five measures, described in Table 1, as this is deemed the least subjective weighting scheme. The equal weighting is achieved by separately ranking each of the five variables, calculating their equally weighted sum and subsequently creating a new index based on the sum. The variable *CSRindex* thereby takes a value of between 0 and 1. We test for the impact of our initial equal weighting in section 6.1.2 and find minor implications. In the following paragraphs we further explain the definition of, and reason for, each variable included in the *CSRindex*.

Table 1. Description of CSRindex

CSRScore	Defined as a measure of CSR-focused commentary in the j^{th} report during year t and interpreted as the probability weighted frequency count of CSR focused commentary, further described in section 3.1.1.
CSRFog	Defined by Grunning´s (1968) Fog readability index and is calculated as the negative average of the report's CSR commentary sections.
CSRSections	Defined as the total word frequency count in sections identified as CSR commentary sections (S').
CSRRest	Defined as the total word frequency count in sections identified as neither CSR commentary sections nor overall annual report sections. It thereby captures the effect of the report being a stand-alone CSR report.
CSRForward	Defined as the frequency count of forward-looking keywords, as defined by the CFIE project (El-Haj et al., 2018), in CSR commentary sections (S').

Note: The table describes the method of calculating the variables included in the calculation of the main independent variable, *CSRindex.*

CSRScore

CSRScore is calculated following the method in the paper by Athanasakou et al. (2018). Initially, we derive an external preliminary list of unique CSR-related words and n-grams from the following sources; UNC Sustainability Advisory Committee (2012), Vracheva et al. (2015) and D'Amato et al. (2019). We further adapt the list to a Swedish context by conducting a brief review of 50 Swedish CSR reports, and then adding additional n-grams not found in the previous sources. The initial pooled list is comprised of 295 words and phrases. The list was then curated manually and individually to: (1) remove generic words that were unlikely to discriminate between CSR-specific content and other management-related commentaries, (2) generalize n-grams and (3) expand the list to include alternative spellings, inflexions and plurals. Disagreements were reviewed and reconciled. The final list of CSR-related n-grams comprises of 349 words and phrases (see Appendix 1), henceforth called *Wordlist*.

Following the construction of the *Wordlist*, we replicate the approach of Athanasakou et al. (2018) to address the issue of disambiguating context and meaning when conducting a computer-based content analysis. Initially, the CFIE software is utilized to exploit headings in the TOC to identify report sections that explicitly contain CSR-related content. By specifically searching the TOC section headers (s) for the keywords;

"sustainable", "sustainability", "CSR", "environment", "environmental", "social", "socially", "responsible", "responsibility" and "responsibilities", we distinguish between CSR sections (S') and general sections (S). Sections focused on the financial statements, corporate governance statements and remuneration reports are thereby excluded.

Following this content categorization, we go on to weight the frequency count of all n-grams (K) by the conditional probability that they are predictive of CSR-related commentary as seen in equation 1 below. However, due to the limitation of the software, this metric approximates the original method[3].

$$CSRScore_{jt} = Frequency_{Kj} \times Pr(S'|Wordlist_K) \quad (1)$$

Where *CSRScore* is the probability weighted measure of CSR-focused commentary in the j^{th} report during year t, Frequency is the frequency count of all 349 n-grams (K) in the *Wordlist* and $Pr(S'|Wordlist_K)$ is the *Wordlist*-specific conditional probability that any n-gram in the *Wordlist* is associated with commentaries that unambiguously contain CSR-related content. The *Wordlist*-specific conditional probability is derived using a corpus-based application of Bayes rule, inspired by Athanasakou et al. (2018). By creating a corpus of general report narrative commentary across all (S) sections across the whole report sample, we can apply the Bayes rule to derive the conditional probability that the n-grams in the *Wordlist* are found in CSR sections (S'):

$$Pr(S'|WordList_K) = \frac{Pr(Wordlist_K|S') \times Pr(S')}{Pr(WordList_K)} \quad (2)$$

Where;

$$Pr(Wordlist_K) = \sum_{s \in S} Wordlist_{sK} \Big/ \sum_{s \in S} \sum_{w=1}^{W} General_{sW} \quad (2a)$$

$$Pr(Wordlist_K|S') = \sum_{s \in S'} Wordlist_{sK} \Big/ \sum_{s \in S'} \sum_{w=1}^{W} General_{sW} \quad (2b)$$

$$Pr(S') = \sum_{s \in S'} \sum_{w=1}^{W} General_{sW} \Big/ \sum_{s \in S} \sum_{w=1}^{W} General_{sW} \quad (2c)$$

First, $Pr(Wordlist_k)$ is the probability that n-grams contained in the *Wordlist* occur in the corpus of general report narratives (*General*). It is calculated as the frequency count of all the 349 n-grams in the *Wordlist* in all sections of the report corpus (S) divided by the word count in all sections of the general report corpus (S). Second, $Pr(Wordlist_K|S')$ is the probability that any n-gram contained in the *Wordlist* appears

[3] Athanasakou et al. (2018) calculate the frequency count of the k^{th} n-gram per report section using a software which we have not been able to access nor replicate. Thus, the calculated conditional probability is not for the k^{th} n-gram (individual n-gram in the *Wordlist*), but rather for the K n-gram (all words in the *Wordlist*). This limits our method of calculating *CSRScore* to approximations of the original variable. Whereas Athanasakou et al. report a mean probability weight of 10.3% of each n-gram in *StratScore*, we report a probability weight of 8.24% for the whole sustainability *Wordlist* in *CSRScore.*

in the corpus of CSR-related commentary (S'). It is calculated as the frequency count of all the 349 n-grams in the *Wordlist* in all CSR sections (S') of the report corpus divided by the word count in all general sections (S) of the report corpus. Third, $Pr(S')$ is the probability of the section being CSR-related when at least one n-gram in the *Wordlist* is present. It is calculated as the frequency count of all the 349 n-grams contained in the *Wordlist* in all CSR sections of the report corpus (S') divided by the frequency count of all the 349 n-grams in the *Wordlist* in all general sections of the report corpus (S).

Specifically, the formulas 2a-2c are calculated by summarizing the word frequency counts of different sections in the report corpus given from the CFIE software. First, $\sum_{s\in S}\sum General_{sW}$ equals the *General* word count in all sections (S) of the report corpus, where W is the set of all words in the report corpus. Second, $\sum_{s\in S} Wordlist_{sK}$ is the frequency count of the all 349 n-grams in the *Wordlist* in all general sections (S) of the report corpus. Third, $\sum_{s\in S'}\sum Wordlist_{sK}$ is the frequency count of all the 349 n-gram in the *Wordlist* in all CSR sections (S') of the report corpus. Finally, $\sum_{s\in S'} General_{sW}$ equals the *General* word count of all words in all CSR sections (S') of the report corpus. Furthermore, the conditional probability for the *Wordlist* given (S') is invariant over time and across firms, because both (S') and (S) are created by pooling the content across all reports in the sample. The value of *CSRScore* from equation (1) is a proxy for the level of CSR-related content in a given report, equal to the probability weighted sum of the 349 n-grams. Thus, *CSRScore* is a weighted measure of CSR focused commentary in the j^{th} report during year *t*. The higher the *CSRScore*, the more CSR-focused the report´s commentary, thus more CSR-specific information is deemed to be provided. We, therefore, expect this variable to be negatively associated with the cost of equity capital.

CSRFog

CSRFog is based on the predefined calculations of the Fog Index by the CFIE project (El-Haj et al., 2018). In this setting, it is calculated as the negative average of the report´s CSR sections (S'). Prior literature has shown that investors find more readable reports more useful (Li, 2008; Lee, 2010; Lehavy et al., 2011). We, thus, include this measure in our *CSRindex*, as we believe a higher value means a more readable report section and the indexed variable to be negatively associated with the cost of equity capital.

CSRSections

CSRSections is calculated as the sum of the word frequency counts in the report´s CSR sections (S'). According to disclosure theory, the higher the *CSRSections*, the more the firm discloses, leading to reduced information asymmetry between investors and the firm. Thus, we expect this variable to be negatively associated with the cost of equity capital.

CSRRest

CSRRest is calculated as the sum of the word frequency counts in the report´s general sections (S) not being part of the overall annual report disclosure. Specifically, it summarizes the total word frequency count of the stand-alone CSR report by

distinguishing between the report being an integrated or a stand-alone report. If the report is an integrated CSR report, it takes a value of zero, while in combination with *CSRSections*, it aggregates the total word count in the stand-alone CSR report. We include *CSRRest* since previous empirical studies have shown it to be associated with the cost of equity capital (Athanasakou et al., 2019). Similarly, we expect the variable to be negatively associated with the cost of equity capital.

CSRForward

CSRForward is based on the predefined frequency count of forward-looking words in the CSR section (S'), as defined by the CFIE project (2018), and thus calculated as the sum of all frequencies in the report´s CSR sections (S'). Prior literature has shown that investors use forward-looking information to incorporate earnings-relevant information into the valuation of the firm (Kothari & Sloan, 1992; Hussainey et al., 2003). We thus include this measure, as we believe a higher frequency of forward-looking words in the CSR sections (S') of the CSR reports helps investors identify value-relevant information. Therefore, we expect the variable to negatively associated with the cost of equity capital.

In combination, these five variables constitute our proxy for the levels of CSR disclosure. *CSRindex* is, therefore, an equally weighted and ranked score encapsulating the levels of CSR disclosure, the readability and the probability weighted frequency count of CSR-related commentary. Hence, *CSRindex* is deemed to capture the most important elements to investigate the relationship between levels of CSR disclosure and the cost of equity capital. Given that each variable is expected to be negatively associated with the cost of equity capital, we therefore expect *CSRindex* to display the same relationship.

3.1.2. Estimating the cost of equity capital

Given the short sample period and panel data approach, the cost of equity capital is estimated using the implied approach, as it has been proven to be a better method to capture the time-variation in expected returns (Pástor et al., 2008). Moreover, the implied approach makes an explicit attempt to isolate cost of equity capital effects from growth and cash flow effects (Chen et al, 2009), two variables that are considered fundamental in valuation. Hence, following the often-cited method of Hail and Leuz (2006), the average *ex ante* or implied cost of equity capital (r_{AVG}) is estimated using the four models developed by Claus and Thomas (2001, *CT*), Gebhardt et al. (2001, *GLS*), Ohlson and Juettner-Nauroth (2005, *OJ*) and Easton (2004, *ES*). All models require current stock prices and analyst forecasts, which are gathered from the *Thomson Reuter Datastream* database. While *OJ* and *GLS* are residual income valuation models (RIV), *OJ* and *ES* are earnings growth models. The resulting implied cost of equity are further denoted r_{GLS}, r_{CT}, r_{OJ} and r_{ES}. While r_{OJ} is estimated in a closed form, r_{GLS}, r_{CT} and r_{ES} are estimated by backing out the implied cost of equity capital from the equation using the excel *Solver* function. Therefore, for the three latter, the solution is restricted to values 0% to 100%.

The firm-specific cost of equity capital is expected to be relatively volatile in its nature, given the use of the implied approach. As a result, the study follows the method of calculating the implied cost of equity capital as the average of four models. Therefore, the average implied cost of equity capital (r_{AVG}), serves as our proxy for the cost of equity capital. Given the relative smaller investor base on Nasdaq Stockholm, compared to US studies, we require at least two out of four estimates to calculate the average. Sensitivity tests are carried out in section 7.1.1 to further stress our assumptions made. Appendix 2 presents further details on the calculation of the four models used to calculate our dependent variable; the average implied cost of equity capital.

3.1.3. Control variables

The following section provides an overview and the theoretical justification for the control variables used in the forthcoming regression models. All variables for our multivariate analysis are chosen due to previous studies indicating their importance when analyzing the risk factors associated with the cost of equity capital (e.g. Gebhardt et al., 2001; Hail and Leuz, 2006; El Ghoul et al., 2011; Athanasakou et al., 2019).

3.1.3.1 DiscIndex

The control variable *DiscIndex* is based on the same principles as *CSRindex*, although focused on the overall levels of disclosure in the annual report and is inspired by *Discindex* developed by Athanasakou et al. (2019). It is calculated as an indexed variable featuring seven CFIE-based measurements; *StratScore, Performance, PerfFog, Gov, Forward, Rearend* and *RestFront* seen in Table 2. Thus, in addition to integrated or stand-alone CSR reports for each firm, we have also collected the corresponding annual report. If the firm issues multiple annual and financial reports (excluding CSR reports), the reports have been aggregated into one reporting package.

Running the annual report packages (*annual reports*) through the CFIE software, we exploit the annual report´s TOC to identify strategic, performance, governance, rear- and front-end sections, which are used to calculate the word frequency counts for each indexed measurement. Due to the absence of any prior evidence about each measure's relative importance, the indexed measure is calculated by assigning an equal weight to the seven measures as it the least subjective weighting scheme. The equal weighting is initially achieved by ranking each of the seven variables, summarizing them and then creating a new index, based on the sum. The *DiscIndex* variable takes a value between 0 and 1. Table 2 below describes the variables used in the calculation of DiscIndex.

Table 2. Description of DiscIndex

StratScore	Defined as a measure of strategy-focused commentary in the j^{th} report during year t and interpreted as the probability weighted frequency count of strategy-focused commentary in the annual report, further described below.
PerfFog	Defined by Grunning´s (1968) Fog readability index and calculated as the negative average of the annual report's management commentary sections, as identified by the CFIE software.
Forward	Defined as the total frequency count of forward-looking words in the annual report as defined by the CFIE project (El-Haj et al., 2018) excluding those attributed to CSR sections identified in section 3.1.1.
Performance	Defined as the total word frequency count in management performance commentary sections, as identified by the CFIE software.
Gov	Defined as the total word frequency count in the remuneration and corporate governance commentary sections in the annual report, as identified by the CFIE software.
Rearend	Defined as the total word frequency count in the *Financials* section of the annual report, as identified by the CFIE software.
RestFront	Defined as the total word frequency count in the residual sections of the annual report, as identified by the CFIE software, excluding sections included in the *CSRindex*.

Note: The table describes the method of calculating the variables included in the calculation of the control variable for overall disclosure volume in the annual report, *DiscIndex.*

StratScore approximates the *StratScore* measure as conceptualized by Athanasakou et al. (2018) and is a proxy for the probability weighted measure of strategy-focused commentary in the annual report *j* of firm *i* in year [4]. Using the original wordlist of 709 strategy- and business-related words (Athanasakou et al., 2018b), we calculate the measure using the same method as described for *CSRScore* in section 3.1.1, with the only difference being that we search for strategy-focused sections. In their paper, Athanasakou et al. found that the variable reduced investor uncertainty and we therefore expect the measure to be negatively associated with the cost of equity capital.

Next, we include the additional six measures defined in Table 2. The logic of the inclusion of the variables is as follows: The variable *PerfFog* captures the aspect of the readability of the management performance section, which has been shown by previous research to help investors to better interpret the information presented (Li, 2008; Lee, 2010; Lehavy et al, 2011). The *Performance* variable is included as both Botosan (1997) and Athanasakou et al. (2019) show that greater management performance disclosure help investors to better understand the risk factors associated with the firm. Similarly, the variable *Forward* helps capturing the forward-looking aspects of the whole annual report

[4] Athanasakou et al (2018) calculate the frequency count of the k^{th} n-gram per report section using a software which we have not been able to access nor replicate. Thus, the calculated conditional probability is not for the k^{th} n-gram (individual n-gram in the *Wordlist*), but rather for the *K* n-gram (all words in the *Wordlist*). Thus, our calculation of *StratScore* is an approximation. Whereas Athanasakou et al. report a mean probability weight of 10.3% of each n-gram in *StratScore*, we report probability weights of 3.26% for the strategic wordlist in *StratScore*.

and is included as it has been shown to help investors incorporate earnings-relevant information into the valuation of firms (Kothari & Sloan, 1992; Hussainey et al., 2003). *Gov* has been included as it, according to theory, is associated with reduced investor uncertainty. For example, both stakeholder and legitimacy theory suggest that greater levels of governance disclosure help support the notion of the firm being transparent about its remuneration packages and corporate governance processes. Finally, *Rearend* and *RestFront* are included as they empirically have shown to be associated with the cost of equity capital (Athanasakou et al., 2019), but also as they help capture the overall length of the annual report not covered by the other variables. In combination, the seven variables constituting the *DiscIndex* capture both the total word frequency count and the readability of the annual report. As all variables are expected to be negatively associated with the cost of equity capital, the aggregate control variable is assumed to have a similar relation, namely, to be negatively associated with the cost of equity capital.

3.1.3.2 ESG

ESG is defined as a proxy for ESG performance for firm *i* during year *t* and based on ratings from the sustainability analytics firm Arabesque. Using big data from public firm´s annual reports, public news and NGO campaign activities, the score combines 200 financially material ESG metrics to rank firms on their sustainability performance.[5] Previous research has found that firms with better ESG performance have a lower cost of equity capital (e.g. Dhaliwal et al., 2011; Ghoul et al., 2011; Plumlee et al., 2015). Thus, we expect the variable to be negatively associated with the cost of equity capital.

3.1.3.3 MV

MV is defined as the natural logarithm of the lagged market value of common equity in year *t* for firm *i*. Previous research has found that size captures the fact that larger firms are able to attract more analyst coverage, which affects the dissemination of the information to the market. In the end, larger firms thereby are perceived to have lower perceived risk (Gebhardt et al., 2001). Therefore, we expect the variable to be negatively associated with the cost of equity capital.

3.1.3.4 TA

TA is defined as the natural logarithm of the lagged book value of total assets in year *t* for firm *i*. Previous disclosure literature incorporates this variable due to its tendency to be inversely associated with the cost of equity capital (Athanasakou et al., 2019). Therefore, we expect the variable to be negatively associated with the cost of equity capital.

3.1.3.5 ROA

ROA is defined as income before extraordinary items year *t* over total assets at the beginning of year *t* for firm *i*. Previous researchers have suggested that firms with better

[5] While many researchers use the ratings from *MSCI* (former *KLD*) or *Sustainalytics* (former *GES Investment Services*), we choose Arabesque for the sake of data access, as the other databases were not made available for this study. The Arabesque rating system has been used in previous studies and found to be negatively associated with the cost of equity capital (i.e. Clark et al, 2015).

financial performance are likely to have more resources to practice CSR activities and to produce CSR reports (Dhaliwal et al., 2011). Therefore, we expect the variable to be negatively associated with the cost of equity capital.

3.1.3.6 Leverage

Leverage is defined as the ratio of total debt divided by market value of equity for firm *i* at the beginning of year *t*. Previous research has found that cost of equity capital increases as the degree of leverage increases (Leftwich et al., 1981; Fama & French, 1992). Thus, we expect the variable to be positively associated with the cost of equity capital.

3.1.3.7 Growth

Growth is defined as the firm´s long-term growth rate and is calculated as the difference between the two-year-ahead consensus EPS forecast and the one-year-ahead consensus EPS forecast divided by the one-year-ahead consensus EPS forecast for firm *i* in year *t*. Previous research has found that the implied cost of equity capital is positively associated with the long-term growth rate (Gebhardt et al., 2001; Gode & Mohanram, 2003). Hence, we expect the variable to be positively associated with the cost of equity capital.

3.1.3.8 BTM

BTM is defined as the lagged book value of equity over the lagged market value of equity for firm *i* in year *t*. Previous research has shown the BTM to positively affect the cost of equity capital (Gebhardt et al, 2001; Hail & Leuz, 2006; Ghoul et al, 2011). Therefore, we expect the variable to be positively associated with the cost of equity capital.

3.1.3.9 Beta

Beta is defined as the firm's estimated variance with the market in year *t*, estimated using the market model. Previous research have shown that beta positively affects the cost of equity capital (Hail & Leuz, 2006; Athanasakou et al., 2019). Therefore, we expect the variable to be positively associated with the cost of equity capital.

3.1.3.10 Fixed effects

Finally, we include the two dummy control variables *Year* and *Industry* that correct for year and industry-specific effects respectively, a method commonly used in statistics in an attempt to control for unobservable characteristics (Wooldridge, 2012).. The year-fixed control variable, *Year*, aims to capture phenomena unique for each year *t*. The industry-fixed control variable, *Industry*, is used to capture time-constant, industry-specific characteristics, otherwise unobservable or omitted. For example, firms belonging to "sin" industries are required by law to have higher disclosure levels. The contrary approach would be to use a time-constant, firm-specific control variable that would capture unobservable firm-specific characteristics. For example, CSR-oriented management, corporate disclosure culture or firm age. However, due to the unbalanced number of firm-year observations in our panel data set, we refrain from using firm-fixed effects in our main regressions. Instead, we control for industry-specific effects.

3.2. Regression models

3.2.1. Hypothesis 1

For determining the set of control variables to be included in the regression models below, we follow practices consistent with previous academic research on the relationship of CSR disclosure and the cost of equity capital (i.e. Dhaliwal et al., 2011; Athanasakou et al., 2019). The economic relationship of the control variables with the dependent variable is elaborated in the previous section 3.1.3.

3.2.1.1 Static model unbalanced

We employ the following *ordinary least squared (OLS)* regression model to test the H1:

$$r_{AVG;it} = \beta_{0t} + \beta_1 CSRindex_{it} + \beta_2 DiscIndex_{it} + \beta_3 ESG_{it} + \beta_4 MV_{it} + \beta_5 TA_{it} + \beta_6 Leverage_{it} + \beta_7 Growth_{it} + \beta_8 ROA_{it} + \beta_9 BTM_{it} + \beta_{10} Beta_{it} + \beta_{11} Year + \beta_{12} Industry + \varepsilon_{it} \quad (1)$$

The dependent variable, $r_{AVG;it}$, is defined as the average implied cost of equity estimate for firm *i* at year *t* using the four models explained above in section 3.1.2. The main independent variable, $CSRindex_{it}$, is our measure of levels of CSR disclosure and is further described in section 3.1.1. The control variables are defined in section 3.1.3 above, while ε_{it} is the error term. The hypothesized negative relationship between the cost of equity and the levels of CSR disclosure implies the prediction of a negative coefficient (β_1) for $CSRindex_{it}$.

3.2.1.2 Static model balanced

Next, to allow for the inclusion of unobserved firm-specific characteristics and to control for the risk of endogeneity we create a balanced panel data set from the original sample. Specifically, a balanced panel data set ensures the highest degree of consistency between firm-specific observations, by adjusting for firms that have data for the whole sample period. Since many firms within our sample do not have the same amount of firm-year observations, we adjust by reducing our sample to include only firms with all firm-year observations. Even though this adjustment increases standard errors and limits the explanatory power of our model, it moderates the risk of the independent variable to be correlated with the error term. We employ the following regression model to test H1:

$$r_{AVG;it} = \beta_{0t} + \beta_1 CSRindex_{it} + \beta_2 DiscIndex_{it} + \beta_3 ESG_{it} + \beta_4 MV_{it} + \beta_5 TA_{it} + \beta_6 Leverage_{it} + \beta_7 Growth_{it} + \beta_8 ROA_{it} + \beta_9 BTM_{it} + \beta_{10} Beta_{it} + \beta_{11} Year + \beta_{12} Firm + \varepsilon_{it} \quad (2)$$

Where the dependent variable, $r_{AVG;it}$, the independent variable $CSRindex_{it}$ and the control variables are defined as above. The new control variable *Firm* is a dummy variable for each firm, thus replacing the previous industry-specific variable *Industry*. The hypothesized negative relationship between the cost of equity and the levels CSR disclosure implies the prediction of a negative coefficient (β_1) for $CSRindex_{it}$.

3.2.1.3 Static quantile model

Inspired by the quantile regression method by Koenker and Bassett (1978), we investigate whether the market reacts with a different magnitude towards firms, depending on the relative CSR disclosure performance. We employ the following regression model to test H1:

$$r_{AVG;it} = \gamma_{0t} + \gamma_1 CSRindex_{it} + \gamma_2 DiscIndex_{it} + \gamma_3 ESG_{it} + \gamma_4 MV_{it} + \gamma_5 TA_{it} + \gamma_6 Leverage_{it} + \gamma_7 Growth_{it} + \gamma_8 ROA_{it} + \gamma_9 BTM_{it} + \gamma_{10} Beta_{it} + \gamma_{11} Year + \gamma_{12} Industry + \varepsilon_{it} \quad (3)$$

Where the dependent variable, $r_{AVG;it}$, the independent variable $CSRindex_{it}$ and the control variables are defined in section 3.1. The difference is the coefficient term γ, which is a substitution for the term $(\beta_{0.9} - \beta_{0.1})$, representing the difference between the 90th quantile and the 10th quantile of *CSRindex.* The aim is to capture the relative difference between high versus low disclosing firms, thus helping us to further understand the relationship between CSR disclosure levels and the cost of equity capital. The hypothesized greater reward for high levels of CSR reporting dictates a negative coefficient (γ_1) of $CSRindex_{it}$.

3.2.1.4. Dynamic model

Next, the static model is refined to examine the dynamic and incremental relationship, as defined by Wooldridge (2012), between CSR disclosure levels and the cost of equity capital. We employ the following regression model to further test H1:

$$\Delta r_{AVG;it} = \beta_{0t} + \beta_1 \Delta CSRindex_{it} + \beta_2 \Delta DiscIndex_{it} + \beta_3 \Delta ESG_{it} + \beta_4 \Delta MV_{it} + \beta_5 \Delta TA_{it} + \beta_6 \Delta Leverage_{it} + \beta_7 \Delta Growth_{it} + \beta_8 \Delta ROA_{it} + \beta_9 \Delta BTM_{it} + \beta_{10} \Delta Beta_{it} + \beta_{11} Year + \beta_{12} Industry + \varepsilon_{it} \quad (4)$$

Where the model estimates the percentage change in in the dependent variable $\Delta r_{AVG;it}$ for a firm between year *t*-1 to year *t* as explained by the percentage change in $\Delta CSRindex_{it}$ between year *t*-1 to year *t*. The control variables, defined in section 3.1.3, take the same dynamic form (Δ). The approach is inspired by the method of Dhaliwal et al. (2011), who use the method to infer future incremental change. Our approach is thus aiming to determine the association between the incremental CSR disclosure efforts and the incremental effect on the relationship. The hypothesized negative relationship between the change in cost of equity and the change in levels of CSR disclosure implies a negative dynamic coefficient (β_1) for $\Delta CSRindex_{it}$.

3.2.2. Hypothesis 2

Following the testing of the first hypothesis, we investigate the implications that the announcement of Directive 2014/95/EU in 2014 brought upon the relationship between cost of equity capital and levels of CSR disclosure. However, due to insufficient sample size for the quantile and dynamic models, we limit the tests under H2 to only the unbalanced and balanced static model.

3.2.2.1 Static model unbalanced

Initially, we employ the following static OLS regression model to test H2:

$$\begin{aligned} r_{AVG;it} = {} & \beta_{0t} + \beta_1 CSRindex_{it} + \beta_2 Post_{it} + \beta_3 CSRindex_{it} * Post_{it} + \beta_4 DiscIndex_{it} \\ & + \beta_5 ESG_{it} + \beta_6 MV_{it} + \beta_7 TA_{it} + \beta_8 Leverage_{it} + \beta_9 Growth_{it} \\ & + \beta_{10} ROA_{it} + \beta_{11} BTM_{it} + \beta_{12} Beta_{it} + \beta_{13} Year + \beta_{14} Industry \\ & + \varepsilon_{it} \end{aligned} \quad (5)$$

Where the dependent variable, $r_{AVG;it}$, the independent variable $CSRindex_{it}$ and the control variables are defined as under the static model (1). The new variable $Post_{it}$ is a dummy variable that takes the value of 1 for the years 2015-2018 and 0 otherwise, thus, capturing the post-announcement period. $CSRindex_{it} * Post_{it}$ is an interaction variable which is the product of the $Post_{it}$ dummy variable and the $CSRindex_{it}$. The hypothesized effect that the announcement of Directive 2014/95/EU had on the relationship between the cost of equity and the CSR disclosure levels implies the prediction of a negative coefficient (β_3) on the interaction variable $CSRindex_{it} * Post_{it}$.

3.2.2.1 Static model balanced

Next, we use a balanced data set to adjust for unobserved firm-specific characteristics, similar to that in model (2). We employ the following model to further test H2:

$$\begin{aligned} r_{AVG;it} = {} & \beta_{0t} + \beta_1 CSRindex_{it} + \beta_2 Post_{it} + \beta_3 CSRindex_{it} Post_{it} + \beta_4 DiscIndex_{it} \\ & + \beta_5 ESG_{it} + \beta_6 MV_{it} + \beta_7 TA_{it} + \beta_8 Leverage_{it} + \beta_9 Growth_{it} \\ & + \beta_{10} ROA_{it} + \beta_{11} BTM_{it} + \beta_{12} Beta_{it} + \beta_{13} Year + \beta_{14} Firm \\ & + \varepsilon_{it} \end{aligned} \quad (6)$$

Where the dependent variable, $r_{AVG;it}$, the independent variable $CSRindex_{it}$ and the control variables are defined as above. The only difference is that we control for firm-specific characteristics ($Firm_{it}$) instead of industry-specific ($Industry$). The hypothesized effect the announcement of Directive 2014/95/EU had on the relationship between the cost of equity and the CSR disclosure volumes implies the prediction of a negative coefficient (β_3) on the interaction variable $CSRindex_{it} * Post_{it}$.

4. Empirics

The purpose of this section is to provide an overview of our sample and outline the results from our univariate analyses. We begin with a description of the sample selection, data collection and data quality validation process. Then, we present the sample´s descriptive statistics and Pearson correlation for the variables in our regression models.

4.1. Sample selection and collection

To calculate our main independent variable, we manually collect annual and CSR reports for Swedish-listed firms on the Nasdaq Stockholm, across all Industry Classification Benchmark (ICB) codes and capitalization indexes.[6] We collect data for the period 2012-2018, being bound by the inherent difficulties of getting consistent CSR data, without minimizing the firm sample size. In addition, data for share prices, returns and company accounting data are collected from Thomson Reuters Datastream. Initially, our preliminary sample consists of 330 firms to which we apply seven filters to reach our final sample, as shown in Table 3.

Table 3. Sample selection

Panel A

Criteria	**Adjustments**	**No. Firms**
Initial delimitation		330
1. Annual reports in English	-69	261
2. At least two years of public annual reports	-49	212
3. At least one year of CSR reporting	-9	203
4. Fiscal year ends in December	-13	190
Potential Sample	**-140**	**190**

Panel B

	Adjustments	**No, Observations**
Initial No. firm-year observations		878
5. Readable in the CFIE software	-96	782
6. Average cost of equity capital calculated	-153	629
7. All control variables calculated	-308	321
No. firm year observations	**-557**	**321**

Note: The table shows adjustments of our initial delimitation to derive our main sample as part of the sample selection process.

The adjustments made were only carried out if they were deemed important to allow us to conduct our empirical study in an unbiased way. Still, some filters might reduce our ability to generalize our findings, as a result of limiting ourselves to larger firms issuing reports in English. This, in particular, was deemed essential due to the CFIE software being calibrated to process English text, which cannot be corrected without a substantial redesign of the tool. Similarly, having fiscal years ending in December was deemed necessary for the comparability between firms when calculating the implied cost of equity

[6] Publicly listed firms on Nasdaq Stockholm as of 1st of March 2019.

capital. Applying the first four filters, seen in Panel A, results in a total loss of 140 firms as a consequence of them (1) not reporting in English, (2) having fewer than two publicly available annual reports, (3) not having issued any CSR reports or commentaries and (4) having a fiscal year that does not end in December. This resulted in our potential sample of 190 firms for which we manually collected 878 CSR and annual reports.

Applying the three final filters, as seen in Panel B, results in an additional loss of 557 observations as a consequence of (5) CSR reports being unreadable by the CFIE software[7], (6) being unable to calculate at least two measures for the average implied cost of equity capital and (7) being unable to calculate all of the control variables for each firm-year observation. The main variable responsible for the significant loss in observations is the Arabesque ESG score, which is used to control for the overall ESG performance of the firm and was deemed a vital control variable to include in our testing.

Our final sample consists of 92 firms across nine industries equivalent to 321 firm-year observations, see Table 4, which is further reduced in the testing of dynamic and balanced changes. Note that all firms do not have equally distributed observations across the years, which is the reason for our original unbalanced panel data set. In addition, the mean number of year observations per industry is 6 and varies across the sample, with a minimum of 1 observation in *Consumer Services, Oil & Gas* and *Technology* and a maximum of 24 observations in *Industrials*. This can skew our control variable *Industry* to capture the aspects of a single firm, instead of controlling according to the systematic characteristics of a business sector. However, the exclusion of those observations would reduce the diversity of our sample and thus reduce the power of our findings.

Table 4. Firm-year observations per industry

Industries	2013	2014	2015	2016	2017	2018	Total
Basic Material	3	3	3	3	5	5	22
Consumer Goods	5	6	6	6	12	11	46
Consumer Services	2	2	4	4	6	8	26
Financials	9	9	10	13	20	19	80
Health Care	1	1	1	2	5	7	17
Industrials	10	11	11	12	24	22	90
Oil & Gas	1	2	2	2	2	2	11
Technology	1	1	1	2	3	3	11
Telecommunications	3	3	3	3	3	3	18
Total	**35**	**38**	**41**	**47**	**80**	**80**	**321**

Note: The table shows the number of firm observations per industry and year as a result of our sample selection process. Firms are classified according to the Industry Classification Benchmark (ICB), with 9 out of 10 Industries represented in the sample.

[7] Examples include the PDF being an image-based file or the software being unable to identify the table of content. These issues have been previously identified by El-Haj et al. (2018).

4.2. Data quality

To ensure the integrity of our empirics we conduct multiple data quality tests. First, we manually go through all collected annual and CSR reports to ensure they have a CSR section. Second, having calculated the *CSRindex* variables, we pick 50 random reports and subjectively compare with the scores set by the program. For example, we ensure that the table of content has been correctly identified, that the word count is correct and that the Fog index score appropriately reflects the readability. Third, we pick 100 random data points of the share price, returns and company accounting data collected from Datastream and compare with hand collected data from the respective annual report. These quality tests reveal seemingly random, yet minor discrepancies in less than six percent for Datastream data points, thus indicating high quality of the data set.

4.3. Descriptive statistics

Appendix 3 reports the descriptive statistics for the final sample of the 321 firm-year observations. Panel A presents the descriptive statistics for the *CSRindex* and the underlying ranked disclosure measures. We observe reasonably similar results across the variables, given their indexed nature. *CSRRest* displays a high mean, owing to the fact that the majority of CSR reports are integrated as part of the annual report. Next, Panel B presents descriptive statistics for all of our cost of equity estimations. We observe that there is some variation in the mean, median and standard deviation of the variables across the four models. Specifically, the two earnings growth models (r_{OJ} and r_{ES}) provide the higher values compared to the two RIV models (r_{GLS} and r_{CT}). This is expected given that RIV models correct for the accounting bias in their valuation. Finally, the control variables are presented in Panel C. We can further observe that the mean firm in our sample has a Beta of 1.00, a ROA of 7% and a Book-to-Market of 0.71.

4.4. Pearson correlation

The correlation coefficients of the variables used in our regression models are presented in Appendix 4. Panel A displays the correlation between the variables comprising the *CSRindex*, Panel B displays the correlation of the variables comprising the *DiscIndex* and Panel C the correlation between the variables of our baseline Static Model (1). Further definitions for the table´s contents are provided beneath each panel. In Panel A we expect the variables comprising our independent variable *CSRindex* to be highly correlated with *CSRindex* itself, given that they all capture different aspects of the same sections of text. This expectation is confirmed, with all variables being significant at the 1% level. To control for this, we conduct a sensitivity test in section 6.1.2.

In Panel B we expect the variables comprising our control variable *DiscIndex* to be highly correlated with the *DiscIndex* itself. This expectation is confirmed. Furthermore, correlation between the variables is expected to be smaller compared to the *CSRindex* measure, as each *DiscIndex* subvariable captures different aspects of the report. This is confirmed by the varying degree of significance, with most variables displaying no

significance at all. Our results indicate that the measure of overall disclosure volume captures a broader scope of qualitative aspects, further supporting the use of *DiscIndex*.

Finally, in Panel C, we expect our independent and control variables to be correlated with predicted signs. Our findings are mixed, with all variables showing relevant significance, with the exceptions of *CSRindex, DiscIndex* and *ESG*. Contrary to our predictions, there is a weak, negative and insignificant correlation between the average cost of equity capital and the *CSRindex*. Correlation relates to the linear relationship between the two variables, inferring that, when positive, an increase in one variable correlates with the increase in the other (Wooldridge, 2012). In the case of *CSRindex*, this implies that we cannot make inferences of a linear relationship between *CSRindex* and cost of equity capital. The possibility of a non-linear relationship suggests that, for our upcoming regression models, this variable will contribute to higher standard deviation and a reduced explanatory power of the model. Similarly, both *CSRindex* and *DiscIndex* display correlation that stand in contrast to previous findings of Athanasakou et al. (2019), upon which the variables are based. In their paper, Athanasakou finds a strong, negative and highly significant correlation between their *Discindex* and the cost of equity capital, thus raising the question whether the Swedish market differs, or if there are measurement errors introduced to the variables. The results are further discussed in section 7.

Furthermore, all control variables for the average cost of equity show correlation coefficients in line with our previous expectations, except for *DiscIndex* and *TA,* both showing a surprisingly positive coefficient, while *Growth* shows a surprisingly negative coefficient. Overall, higher growth rates (*Growth*) would imply a high-risk firm, thus driving the cost of equity upwards. We interpret a negative correlation with the cost of equity to imply a higher risk appetite amongst investors of the Swedish market. In addition, higher total assets (*TA*) would imply a larger and more stable firm, resulting in a lower firm-specific risk. We interpret a positive correlation to imply the existence of firms with inflated balance sheets, resulting in inefficiencies of managing their resources.

We also expect *CSRindex* to be correlated with *DiscIndex* and *ESG*. This is confirmed as both display significance at the 1% level of significance with correlations of 0.2549 and 0.2304 respectively. Finally, we expect limited correlation between the control variables, as it otherwise would indicate multi-collinearity. However, the results indicate significant correlation between the control variables, particularly between *Leverage* and *TA, MV* and *TA* as well as *Leverage and BTM*. We, therefore, conduct a robustness test, testing for multi-collinearity in section 6.2.2. The results imply that the interference of significant multi-collinearity does not affect our empirical results.

5. Results

The purpose of this section is to outline the results of our multivariate empirical tests as well as the logical intuition that drives them. We comment respectively on the results from our two hypotheses; *CSR disclosure levels* and *Regulatory effects.* A more thorough discussion will be provided in section 7.

5.1. H1: Levels of CSR disclosure

In Table 5 below, we present the results of the regression models under hypothesis 1 where we test whether higher CSR disclosure levels reduce the cost of equity capital. In the static model (1) the coefficient of *CSRindex* is negative (-0,0144) at a 5% level of significance, implying that a percentage unit increase in *CSRindex* reduces cost of equity capital by 1,44%, *ceteris paribus*. While we regard the negative coefficient of *CSRindex* statistically significant, we find the coefficient to be of marginal economic significance.

The results for the control variables present mixed findings, with all control variables but *BTM* displaying varying degrees of statistical significance. In addition, *Leverage, Growth* and *TA* have coefficients not in line with expectations. An explanation for the contradicting signs of the control variables *Growth* and *TA* were discussed in section 4.4. We interpret the negative coefficient of *Leverage* to suggest that investors perceive increased debt levels as a sign management´s confidence in future prospects, in line with signaling theory. The adjusted R^2 indicates a decent goodness-of-fit of the statistical model by indicating that 45,8% of the sample variation in the implied cost of equity capital can be explained by the regression model variables. This is in line with previous similar studies, for example Botosan (1997) who finds an adjusted R^2 of 13.5%, Ghoul et al (2011) of 33% and Athanasakou et al (2019) of 43%. Notably, while *DiscIndex* is statistically significant, it shows a positive coefficient (0.0199), implying that a one percentage unit increase in *DiscIndex* increases the implied cost of equity by 1.99%. The positive coefficient stands in contrast to previous research done on UK annual reports (Athanasakou et al., 2019). One possible explanation for the positive sign could be that Swedish firms are disclosing too much general information, which could drown useful and value-relevant information contained in the annual report. In addition, *ESG* displays a marginally weak and negative coefficient (-0.0004) at a 10% level. When compared to *CSRindex*, we infer that CSR disclosure is more strongly associated with higher market rewards than actual CSR performance. In all, under the static model (1), the null hypothesis of H1 is rejected at a 5% level of significance, implying that firms with higher levels of CSR disclosure are associated with lower implied cost of equity capital, *vice versa*. We further discuss these findings in section 7.

By subsequently creating a balanced panel data set, we can see the results of the balanced static model (2) in Table 5 below. We consider a data set to be balanced when it contains all elements, observed in all time frames, resulting in a loss of 62 firm observations. The

effects of the reduced sample can be seen in the lower explanatory power of the test, seen by the adjusted R^2 (0.413). In contrast to model (1), the coefficient of *CSRindex* becomes positive (0.0106), however, not statistically significant. Under the second test, we can therefore not reject the null-hypothesis. Similarly, both *DiscIndex* and *ESG* display coefficients that stand in contrast to expectations, with values of 0.0109 and 0.0353 respectively, further being not statistically significant.

Table 5. Hypothesis 1 Regressions

	Static Model Unbalanced (1)	**Static Model Balanced (2)**	**Static Quantile Model Unbalanced (3)**	**Dynamic Model Unbalanced (4)**
	r_{AVG}	r_{AVG}	r_{AVG}	Δr_{AVG}
CSRindex (-)	-0.0144**	0.0106	-0.0411**	-0.0213
	(-2.06)	(1.12)	(-2.23)	(-0.73)
DiscIndex (-)	0.0199**	0.0109	0.005	0.1183
	(2.49)	(0.87)	-0.25	(1.50)
ESG (-)	-0.0004*	0.0353	-0.0912**	0.4837*
	(-1.87)	(0.84)	(-2.17)	(1.69)
MV (-)	-0.0199***	-0.0304***	-0.0055	0.9634
	(-7.00)	(-3.35)	(-0.64)	(0.63)
BTM (+)	-0.0020	0.0174*	-0.0009	0.0806
	(-0.95)	(1.77)	(-0.20)	(1.49)
Leverage (+)	-0.0053***	-0.0080**	-0.0055*	-0.0682
	(-3.12)	(-2.30)	(-1.68)	(-1.11)
Beta (+)	0.0121***	-0.0057	0.007	-0.0825
	(2.73)	(-0.75)	-0.76	(-0.64)
Growth (+)	-0.0126***	0.0699***	-0.0169	0.0120***
	(-5.40)	(3.98)	(-1.21)	(2.66)
ROA (-)	-0.0557**	-0.0355	-0.0721	0.0030
	(-2.57)	(-1.27)	(-1.41)	(0.28)
TA (-)	0.0189***	0.0337***	0.0037	-0.3415
	(7.47)	(2.73)	-0.51	(-0.09)
Constant	-0.0346	-0.2206	0.1386***	0.5076***
	(-1.37)	(-1.13)	-2.68	(3.00)
Industry Effects	Yes	No	Yes	Yes
Firm Effects	No	Yes	No	No
Year Effects	Yes	Yes	Yes	Yes
Observations	321	180	321	247
No. Firms	92	30	92	84
Adj. R^2	0.458	0.413	-	0.065
Adj. R^2 90th Quantile	-	-	0.353	-
Adj. R^2 10th Quantile	-	-	0.339	-

Note: The table shows the results from an OLS regression of the implied cost of equity capital on CSR disclosure levels (*CSRindex*) and control variables across the years 2013-2018. The variables are defined in section 3.1. Under (3), the models compare the difference between the 90th and the 10th quantile through an inter-quantile OLS regression, with the adjusted R^2 reported separately for each quantile. Under the Δr_{AVG} test (4), the independent variable (*CSRindex*) and the control variables are calculated as the percentage change between year *t*-1 to *t*. Firms are categorized by the Industry Classification Benchmark (ICB) Industries. The expected sign for each coefficient is shown in the parenthesis next to the variable name. Robust standard errors clustered at the firm level are shown in parenthesis. ***, **, * indicate significance at 1%, 5% and 10% levels respectively.

Next, we review the results from our unbalanced static quantile model (3), which displays a negative coefficient of *CSRindex* (-0.0411) at a 5% level of significance, implying that a percentage unit increase in *CSRindex* for the 90th quantile sees a 4.01% greater reduction in cost of equity capital compared to the 10th quantile, *ceteris paribus*. High-level disclosure firms are thus associated with a higher coefficient than low-level disclosure firms, implying that high-level disclosure firms are rewarded more, although marginally, for improving their disclosure levels than low-level disclosure firms.

The results for the control variables for test (3) show few statistically significant outcomes. Out of nine control variables, only two show a statistically significant result. This lack of statistical significance could potentially be explained by the relatively smaller sample size. Moreover, only *ESG* displays a coefficient in line with expectations at a 5% level. An interesting outcome is that the results indicate that the coefficient of ESG performance differs between observations in the 90th and 10th quantile and that its negative coefficient (-0.0912) is greater than that of *CSRindex*. Furthermore, the adjusted R^2 indicates a decent goodness-of-fit of the statistical model for the two quantiles. For the 90th quantile, the Adjusted R^2 is 35.30% compared to 33.91% for the 10th quantile. This reduced explanatory power is in line with a test that focuses on a sub-set of the initial data set. Therefore, while we regard the findings as statistically significant and reject the null-hypothesis under H1 at a 5% level of significance, we still deem the economic significance of the difference to be marginal. We further discuss the results in section 7.

Finally, in the dynamic model (4) the coefficient of *ΔCSRScore* is negative (-0,0213), however not statistically significant. Notably, the regression model fails to capture the sample variation in the implied cost of equity capital, given that the Adjusted R^2 is only 6.5% compared to the 45.8% in test (1). Still, an Adjusted R^2 of 6.5% is comparable to 6.4% in the study by Dhaliwal et al. (2011). The dynamic model (4), thereby, fails to reject the null-hypothesis at any level of significance and we cannot determine a dynamic relationship between an increase in CSR disclosure levels and the implied cost of equity capital. As such, the dynamic model does not enable us to infer association between levels of CSR disclosure and the cost of equity. We further discuss the results in section 7.

In conclusion, while we are able to determine a static negative association between the implied cost of equity capital and levels of CSR disclosure, we fail to determine their dynamic relationship. We speculate that a firm-specific omitted variable that affects the relationship between the cost of equity capital and levels of CSR disclosure could be an explanation of these contradicting results. For example, previous studies show that earnings quality (Francis et al., 2008) and analyst forecast dispersion (Gebhardt et al., 2001) could affect the cost of equity, while the number of following analysts and if the firm operates globally (Dhaliwal et al., 2011) could affect the levels of CSR disclosure. Such omitted variables could affect our model's goodness-of-fit and provide an explanation for the correlation, but lack of causation in our results.

5.2. H2: Announcement of EU Directive

In Table 6 below, we present the results for the regression models under hypothesis 2, which tests whether the announcement of Directive 2014/95/EU has affected the relationship between CSR disclosure levels and cost of equity. In the unbalanced static model (5), we denote the adjusted R^2 to be equal to 0.426. This implies that the goodness-of-fit for this test is comparable to previous tests. We further note that the coefficient of *CSRScore* is positive (0.0182), but not statistically significant. Similarly, the coefficient of the dummy variable *Post* is positive (0.0146), but not statistically significant. However, the interaction variable is negative (-0.0401) and significant at the 5% level, implying that post announcement a one percentage unit increase in *CSRindex* reduces cost of equity capital by 4.01%, *ceteris paribus*. We deem the results to be statistically significant, and therefore reject the null hypothesis at a 5%level of significance. We also denote that this result is of marginal economical significance. In comparison to the results of the static model (1) under H1, we note that in the post-announcement period, higher levels of CSR disclosure have a greater impact on the cost of equity capital. While (1) indicate a 1.44% reduction in the cost of capital for a one unit increase of *CSRindex* over the whole period, the post directive announcement period indicates that a one unit increase in *CSRindex* is associated with a 4.01% reduction in the cost of equity capital. We interpret this result as the market changing its perception over the significance of levels of CSR disclosure for firm value and strengthening the corresponding "reward" or "punishment" through the cost of equity capital.

To further study the static model, we adjust for firm-specific effects by reducing the sample to a balanced panel data set. The results of the balanced static model (6) is presented in Table 6. In contrast to the findings of model (5), none of the variables of interest show any statistical significance. Similar to model (5), the coefficient of *CSRindex* is positive (0.0076), but not statistically significant, while the coefficient of the dummy variable *Post* is instead negative (-0.0088) and not statistically significant. Similarly, the interaction variable is as expected negative (-0.0189), but not statistically significant. Noteworthy is that the adjusted R^2 in model (6) is higher (0.54) than in model (5) (0.426). This implies a better goodness-of-fit for the balanced panel data set compared to the unbalanced and a better goodness-of-fit for the tests than the previous hypothesis.

In conclusion, while we are able to show a statistically significant relationship in the unbalanced static model (5), we fail to reject the null-hypothesis in the balanced static model (6). We, therefore, speculate that a firm-specific omitted variable, similar to that under hypothesis 1, affects the relationship between the cost of equity capital and CSR disclosure levels. The results are further discussed and evaluated in section 7.

Table 6. Hypothesis 2

	Static Model Unbalanced	**Static Model Balanced**
	(5)	**(6)**
	r_{AVG}	r_{AVG}
CSRindex (-)	0.0182	0.0076
	-1.26	(0.58)
Post (+)	0.0146	-0.0088
	(1.20)	(-0.74)
CSRindex*Post (-)	-0.0401**	-0.0189
	(-2.58)	(-1.27)
DiscIndex (-)	0.0221***	0.0074
	-2.77	(0.78)
ESG (-)	-0.0449*	-0.0527
	(-1.90)	(-1.49)
MV (-)	-0.0207***	-0.0236***
	(-7.31)	(-6.06)
BTM (+)	-0.002	-0.0038*
	(-0.96)	(-1.69)
Leverage (+)	-0.0060***	-0.0077***
	(-3.56)	(-3.77)
Beta (+)	0.0128***	0.0132**
	-2.9	(2.58)
Growth (+)	-0.0126***	0.0506***
	(-5.44)	(3.99)
ROA (-)	-0.0544**	0.0082
	(-2.53)	(0.28)
TA (-)	0.0196***	0.0276***
	-7.78	(7.63)
Constant	-0.0619**	-0.0502*
	(-2.28)	(-1.96)
Observations	321	180
No. Firms	92	30
Adj. R^2	0.426	0.54
Industry Effects	Yes	Yes
Firm Effects	No	No
Year Effects	Yes	Yes

Note: The table shows the results from an OLS regression of the implied cost of equity capital on CSR disclosure levels (*CSRindex*) and on the control variables across the years 2013-2018, adjusting for the announcement of Directive 2014/95/EU. *CSRindex*Post* is an interaction variable between *CSRindex* and the dummy variable *Post*. All other variables are defined in section 3.1. Firms are categorized by the Industry Classification Benchmark (*ICB*) Industries. The expected sign for each coefficient is shown in the parenthesis by the variable name. Robust standard errors clustered at the firm level are shown in parenthesis. ***, **, * indicate significance at 1%, 5% and 10% levels respectively.

6. Additional tests

6.1. Sensitivity analysis

In the following sections, we conduct sensitivity tests on the components of our static regression model. We stress-test the variables average cost of equity *CSRindex* and utilize a different proxy for estimating levels of CSR disclosure.

6.1.1. Testing the average implied cost of equity capital

Inevitably, calculating the implied cost of equity capital based on the average of four different estimation models has the potential of giving rise to measurement errors. In line with previous research, we, therefore, conduct sequential testing of each component of the average implied cost of equity, as seen in Ghoul et al. (2011).

The results are presented in Appendix 5 and indicate that the coefficient of the independent variable *CSRindex* under each stand-alone cost of equity capital measure test is negative, however, only two out of five tests are statistically significant. In particular, the results under $\boldsymbol{r_{ES}}$ (10) and $\boldsymbol{r_{Median}}$ (11) are both negative and statistically significant at a 5% level. The $\boldsymbol{r_{ES}}$ test also produces the highest coefficient for the independent variable *CSRindex* in the regression model (-0.0308) while also showing the lowest adjusted R^2 out of the five tests (0.266). Furthermore, the existence of a positive *DiscIndex* is further solidified in the five tests, where it is only under the $\boldsymbol{r_{GLS}}$ test (8) that it takes on negative coefficient, significant the at 10% level. In conclusion, the exercise indicates that the average of the four models creates a more rigorous measure of the implied cost of equity capital as the aggregated measure smoothens out each model's extreme values.

6.1.2. Testing the CSRindex measure

Our second sensitivity test focuses on our proxy for CSR disclosure levels, the *CSRindex*. Having created this measure by drawing on previous research to estimate certain variables, we acknowledge the restrictions of *CSRindex´* to fully capture all aspects for the levels of CSR disclosure. Still, our aim was to capture aspects which we deem that public ratings and previous research might have overlooked. The index is further subjected to limitations in that it uses output from opaque quantitative content analysis tools, thus introducing the risk of measurement errors. There is also the risk that the choices we have made when creating the index and, subsequently, weighting it, introduced unintended biases towards certain aspects that otherwise would have been seen as less important. Therefore, given its rather subjective weighting of the components, the following sensitivity test re-weights the components under six different scenarios. In the first five, each component is sequentially weighted by two sixths (2/6), with the other four being given a weight of one sixth (1/6). This is then repeated for all five components. In the final test, *CSRindex* is calculated by excluding *CSRFog* as the five previous tests indicate that the variable is statistically insignificant. The results are presented in

Appendix 6 and indicate that weighting the measures differently still produces a negative coefficient, although with a varying degree of statistical significance.

We draw three interesting conclusions from the sensitivity test. First, a skewness towards *CSRScore* (12) results in the highest coefficient, indicating the measure´s potential greater explanatory value. We interpret the higher coefficient to indicate that investors find CSR-related commentary to be particularly useful in further understanding the risk factors associated with the firm, similar to that of the *StratScore* by Athanasakou et al. (2018). Second, a skewness towards the readability of the CSR content (13) produces insignificant results. We interpret the results as suggesting that readability has a weaker correlation with the cost of equity capital than previously thought and that readability possibly lacks goodness-of-fit for our *CSRindex* measure. Finally, by excluding *CSRFog* from our *CSRindex* variable (17), we achieve a negative coefficient (-2%) at a 1% level of significance, which in comparison to our test under H1 is both more statistically and economically significant, providing further evidence for the lack of goodness-of-fit for this variable used in the calculation of *CSRindex*.

6.1.3. Alternative proxy for levels of CSR disclosure

The final sensitivity test substitutes *CSRindex* for Bloomberg´s ESG Disclosure Score[8], henceforth *ESG_Index,* which is a much broader index than the self-constructed *CSRindex*. Still, having researched several databases for a CSR disclosure index published by a major institute, Bloomberg´s measure is the closest and most appropriate we have found. The method of sensitivity testing with different proxies for CSR performance is common within CSR performance and disclosure literature (i.e. Dhaliwal et al., 2011; 2014), prompting us to adopt a similar approach.

The results of substituting *ESG_Index* in all our regression models, except for the balanced panel data set, are presented in Appendix 7. The measure displays no statistical significance, except for the post announcement period. We observe a statistical significance at the 1% level for the interaction variable in test (21), with a negative value of (-0,1311), thus signaling greater economic significance. This indicates that the levels of CSR disclosure increased post-announcement and had a negative effect on the cost of equity capital. Furthermore, the control variables are comparable to the results of the previous tests. Overall, we interpret the results from the sensitivity test as the Bloomberg ESG Disclosure Index covering different aspects of CSR disclosure as it, by its definition, is a more general proxy that is based on big data.

[8] The *Bloomberg ESG Disclosure Score* rates firms annually, based on their disclosure of quantitative and policy related ESG data. By annually evaluating firms, Bloomberg collects public ESG information disclosed by firms through CSR reports, annual reports and websites, and other public sources, as well as through firm direct contact. The metric covers 120 environmental, social and governance indicators including, for example; carbon emissions, climate change effect, pollution, waste disposal, renewable energy, resource depletion, supply chain, political contributions, discrimination, diversity, community relations, human rights and shareholders' rights. (Bloomberg, 2019)

6.2. Robustness tests

The following section investigates the integrity of the Gauss-Markov assumptions of linear regression models that underlie our statistical interpretations; heteroscedasticity, multi-collinearity and serial correlation. If one or more of the assumptions are violated, biased or inconsistent coefficients will result (Newbold et al., 2010).

6.2.1. Heteroscedasticity

Heteroscedasticity is defined as the presence of non-constant variance in error terms that result in biased estimates of standard errors that invalidate conclusions on significance levels (Wooldridge, 2012). We utilize a Breusch-Pagan Cook-Weisberg to determine the existence of heteroscedasticity in our sample. The null hypothesis of the test states that all residuals have the same variance, i.e. *the case of homoscedasticity*, and the alternative hypothesis states that the variance of the error term differs among observations, i.e. *the case of heteroscedasticity*. The resulting χ^2-value of 177.74 and a p-value of 0.00 guide us to reject the null-hypothesis, thus, indicating that heteroscedasticity is present within our sample. Also, conducting a White test (1980) yields a χ^2-value of 307.73 and a p-value of 0.0015. The results yield the same outcome. Hence, to correct for heteroscedasticity, we consistently use robust standard errors in our regressions.

6.2.2. Multi-collinearity

Multi-collinearity is defined as the presence of correlation between the independent variables in a multiple regression model, which threatens to invalidate the statistical test as the independent effect of each variable cannot be separated from another. The implication is a higher variance and lower efficiency of the tests. Thus, we conduct a Variance Inflation Factor (*VIF*) test, measuring how much the variance in one coefficient is affected by correlation between other variables. VIF values below ten are considered acceptable (Wooldridge, 2012), while a conservative view dictating a value below four (O´Brien, 2007). The results indicate that our sample is always below the acceptable level. Our two measures of firm size, *MV* and *TA*, have VIF values of 5.88 and 6.64 respectively, which was expected as these variables were found highly correlated in section 4.4 (0.72). We still find that multi-collinearity does not affect our empirical results.

6.2.3. Serial correlation

Serial correlation is defined as the presence of error terms that correlate across time, a known issue sometimes present when utilizing panel data. Even though the presence of serial correlation does not lead to unbiased coefficient estimators in OLS regressions, it usually underestimates the occurred standard errors and overstates the t-statistics of the tested regressions (Wooldridge, 2012). We perform a Wooldridge test for serial correlation in panel-data models, where the presence of a significant test statistic indicates the presence of serial correlation. The results enable us to accept the null-hypothesis of no serial correlation (F-value of 2.275 and p-value of 0.14). We thus conclude that the interference of serial correlation does not affect our empirical results.

7. Discussion

The following section aims to discuss the findings of our paper, to evaluate and interpret those findings against the established theoretical and empirical framework and to highlight interesting outcomes of our testing.

7.1. Levels of CSR disclosure and the cost of equity

The purpose of the first hypothesis is to investigate and establish the nature of the relationship between the levels of CSR disclosure and the cost of equity capital. To do this, we choose to test this relationship from four different angles. First, we investigate the static relationship between the two items, in essence the relationship implied by observed data. Our findings suggest that a negative, yet economically marginal, relationship exists. Our theoretical framework can assist in explaining these results. Signaling theory suggests that firms are capable of conveying value-relevant information through the means of signaling. By signaling and providing relevant information to the market participants, firms can better portray the incremental risk of the firm, thereby, reducing the information asymmetry between the firm and the market. Therefore, it is reasonable to expect that increased levels of CSR information, which concern an increasing number of firm stakeholders, would lead market participants to reward the firm with lower interest rates, as higher levels of disclosure constitute a signal. Yet, the marginal economic significance suggests that the effort of management might actually be of worth if spent on other tasks. Our findings are in line with previous research that indicates an inverse relationship between the two items, notable examples being Dhaliwal et al. (2011), Plumlee et al. (2008; 2015) and De Souza et al. (2012)

Second, we attempt to investigate the relationship through the formulation of a balanced panel data set. The benefits of this approach would be twofold. First, we are able to address the firm-specific fixed effects that could bias our results. Second, we achieve a more holistic view of firms with a consistent and established disclosure policy, even at the expense of less observations. Unfortunately, the statistical insignificance of our results does not allow us to draw sound conclusions or contrast against the findings of literature. These insignificant results could be attributed to at least two factors; (1) our results may be an indicator of omitted variables, such as earnings quality (Francis et al., 2008), analyst forecast dispersion (Gebhardt et al., 2001) or even the separation of social and environmental disclosure levels (Verbeeten et al., 2016), and (2) that by reducing the sample size, we run the risk of introducing biases as a result of higher variability, ultimately, resulting in decreased statistical power.

Third, we explore whether this established inverse relationship is equally strong among the high- and low-volume disclosers in the market. We document a statistically significant negative relationship, indicating that high-level disclosing firms are rewarded more with a lower cost of equity capital than low-level disclosing firms. However, the weak

coefficient fails to suggest any major economic implications of the findings. It is notable that the findings come in contrast with expectations from stakeholder theory. It would suggest that the market reward the low-level disclosing firms more, due to them making a larger marginal improvement in CSR disclosure efforts when compared to the high-level disclosing firms. In contrast, the findings of Hummel and Schlick (2016) could provide an explanation. They find that superior CSR performers willingly pursue higher quality CSR disclosure to signal their superior performance to the market in order to appear legitimate. Additionally, in order to protect their legitimacy, poor CSR performers prefer low-quality CSR disclosure to disguise their true performance. The relative disclosure levels of a firm thereby seem to matter in the Swedish context. Furthermore, the concept of isomorphism, coupled with implications from legitimacy theory could infer that low-level disclosing firms will be driven to build up their disclosure levels in the future, in order to reach legitimacy in the eyes of the market participants.

Fourth, we investigate the dynamic relationship. The purpose of the test is to investigate how the incremental CSR disclosure efforts are associated with the incremental change in cost of equity capital. Unfortunately, our results are shown to be statistically insignificant. In combination with the Pearson correlation test in Appendix 4, the incremental levels of CSR disclosure do not seem to be correlated with the incremental cost of equity at any level of significance. Thus, we cannot generalize our results, nor challenge the empirical findings of similar studies, such as Dhaliwal (2011), that while the initiation of CSR disclosure results in lower cost of equity, the report content, as measured by greater levels of disclosure, does not reap the same benefits. Furthermore, our findings do not seem to support the notion of legitimacy theory, in that by increasing the levels of CSR disclosure, and thereby being more transparent about the firm´s impact on environmental and social factors, the firm does not achieve an incrementally lower cost of equity capital. Thus, the signaling effect of greater levels of disclosure does not support the claim that firms subsequently are rewarded with lower cost of equity capital.

Overall, our findings appear to support the stakeholder-oriented view that firms, by adhering to the informational needs of groups outside their immediate shareholder base, can achieve a financial benefit, albeit small. As such, the firm´s policy of timely and detailed CSR disclosure reduces investors' perception of firm risk, subsequently enabling them to reduce the cost of equity financing for the disclosing firm. The relative importance of disclosure levels is thereby stressed in situations where there is heightened market uncertainty about the firm as observed by variance of stock returns and cost of equity capital. On a final note, it is important to consider that within a linear regression setting, safe assumptions can only be made for the levels of association between the investigated variables. Given the statistical insignificance for two tests and the lack of correlation for our main variables, we cannot infer a causal relationship. It thus seems reasonable to add that CSR disclosure levels of a firm do not seem to be appropriate

proxies through which to explain movements of the cost of equity capital, and we, therefore, limit our discussion to denote the association between the two variables.

7.2. The implications of the announced EU directive

The study further investigates the impact that the announcement of the EU Directive 2014/95/EU had on the relationship of CSR disclosure levels and cost of equity capital. Based on our theoretical framework, we theorized that the expectation of upcoming regulation resulted in a shift towards greater cost of equity incentives for the anticipated higher CSR disclosure levels. This would be a result of the investors´ and stakeholders' higher expectations for more detailed disclosure of CSR activities, as a response to the increased importance of CSR disclosure.

We find that the announcement of the EU Directive 2014/95/EU had a reinforcing effect on the relationship between high volume CSR reports and the cost of equity, although still not breaching the threshold of what one could deem economically significant. We interpret the findings to suggest that capital markets rewarded firms more for higher levels of disclosure after the announcement of upcoming regulation. Our findings could be explained by revisiting the theoretical guidance of stricter regulation on voluntary disclosure. The established minimum levels of CSR disclosure could act as a way to increase the credibility of information that is assimilated in the market, and, therefore, catering to problems arising from agency conflicts due to information asymmetry. Therefore, by merely announcing the upcoming disclosure regulation, investors expect firms to adjust their disclosure to be compliant even before the implementation of the legislation. These results further support the idea of legitimacy theory, that firms, seeking to legitimize their organization, engage in higher levels of disclosure. However, without an incremental test, we fail to infer the dynamic relationship of the announcement.

The conclusions are further interesting in a Swedish context. Internationally, Sweden is considered a more stakeholder-oriented country when compared to, for example, the US, who, in comparison, is more shareholder-oriented (Dhaliwal et al., 2014). Thus, observing an increase in the reward for higher disclosure levels would imply that Swedish investors find value-relevant information in CSR disclosure. Similarly, as the Swedish managers are willing to show a greater stakeholder orientation, this further implies their willingness to acknowledge the organization's role in society as a contributor of societal value instead of a strict shareholder-value maximizer.

7.3. Control variables and CFIE-FRSE

One noteworthy observation that stands in contrast to previous research is the result of the sensitivity testing on the weighting of *CSRindex*. Specifically, the results indicate that report readability, as captured by the Fog index, is not deemed value-relevant by investors. By subsequently excluding the *CSRFog* from the *CSRindex*, *CSRindex* achieve a significance level of 1% and an even greater negative coefficient. These findings are

both supported by and contradicting to previous research. On the one hand, Athanasakou et al. (2019), find that when separating their *Discindex* into its components, *Fog* is uncorrelated with the cost of equity in the UK setting. On the other hand, Lee (2012) utilizes the Fog index in a US setting and suggests that less readable annual reports are associated with greater information asymmetry. This follows the idea that investors become overloaded with extensive and difficult to interpret information. Thus, our results could indicate a similarity between the Swedish and the UK market, where the readability does not impact the market participants' ability to incorporate the information disclosed when compared to its US counterpart.

A consistent finding has been the positive coefficient of *DiscIndex*, which according to both theory and the empirical findings of Athanasakou et al. (2019) should display a negative coefficient. The results stand in contrast to other general disclosure studies, for example, Botosan's (1997) overall disclosure index, Sengupta's (1998) general disclosure quality index and Francis et al.'s (2007) voluntary disclosure score. In line with legitimacy theory, higher scoring of forward-looking and strategic discussions would imply that the firm is transparent with its business model and prospects, while higher volumes of disclosure would imply that the firm is disclosing more to further reduce the information gap between the market and the firm. However, one strand of literature has found that investors' uncertainty increases the longer the annual report (You & Zhang, 2009; Miller, 2010). Interestingly, Athanasakou et al. (2019) present disaggregated results, indicating that excessive length explains why the association between the cost of capital and *DiscIndex* turns positive for higher values. Therefore, the longer the disclosure, the greater the perceived riskiness due to information overload and overall "cheap talk". As a result, investors raise the cost of equity capital to adjust for this perceived uncertainty. Still, the question remains why higher levels of general disclosure is positively associated with cost of equity, opposite to the results of CSR disclosure. We interpret this outcome to suggest that CSR disclosure levels in Sweden have not yet reached their optimum level, which Athanasakou et al. (2019) were able to infer for overall disclosure levels in a UK setting.

Finally, the use of CFIE-FRSE holds interesting implications in its own regard. Whereas other studies (Plumlee et al., 2008; de Souza et al., 2013) manually construct their own indexes, an automated approach has the added benefit of reducing the influence of the human factor, thus decreasing the possibility of human-induced errors or biases. Still the question that prevails is whether an automated process can be employed to assess qualitative concepts such as CSR. We argue that the sole differentiation in our method is the disentanglement of the human factor from the computation and data processing part of the study. Limitations related to the use of the tool are discussed further in section 8.

8. Conclusion and final remarks

This study aims to investigate the relationship between CSR disclosure levels and the implied cost of equity capital among firms listed on Nasdaq OMX Stockholm throughout the period 2013-2018. Applying the content analysis tool CFIE-FRSE on both integrated and stand-alone CSR reports, we rank firms based on their levels of CSR reporting through our novel, yet theoretically grounded, *CSRindex* variable. The variable scores firms' yearly CSR reporting based on the content, length, readability and quality of the report. Next, we calculate each firm´s implied cost of equity capital using the *ex-ante* approach and the average of four implied models to achieve higher levels of robustness. Subsequently, we theorize that higher CSR disclosure levels reduce investor uncertainty about the incremental risk of the firm. The findings suggest that levels of CSR disclosure are negatively associated with the implied cost of equity capital, although, the financial implications are marginal. Furthermore, we theorize that the announcement of EU Directive 2014/95/EU in late 2014 resulted in shifting expectations on firms' CSR disclosure levels, being associated with a stronger relationship between CSR disclosure levels and the implied cost of equity capital. In line with our predictions, the results indicate that post announcement, firms are rewarded more for higher disclosure levels, still, with marginal economic effects.

Our contribution to current literature is threefold. First, we provide further evidence over the value-relevance of CSR disclosure. We propose that within a CSR-oriented capital market, the relationship between CSR disclosure levels and the cost of equity capital is inverse and that firms with higher levels of CSR disclosure are associated with a stronger reward from the capital market. Second, we contribute to the discussion over the capital market implications of disclosure legislation. We indicate that the announcement of the EU directive is associated with a stronger inverse relationship, implying that the directive resulted in a change in perception of the importance of CSR disclosure levels. Third, we contribute to the discussion over the usefulness of automated content analysis tools in economic analyses. We denote that within the CSR disclosure setting, automated content analysis has the potential of reducing objectivity and human biases found in previous research, thus amplifying the robustness of measuring disclosure levels. Apart from the academic implications, our findings could be of interest for practitioners that employ the cost of equity in their valuations. Those could be members of management, CSR-oriented analysts, regulators or the broader investor base of a listed firm.

However, we acknowledge the limitations of our study. First, our results are based on a sample of Swedish firms listed on the Nasdaq OMX Stockholm throughout the period 2013-2018. Our findings are hence not directly comparable to studies on, for example, US data, as these firms are subject to different and more lax CSR disclosure regulation and are more shareholder-oriented (Dhaliwal et al., 2014). Second, because of our small sample size of 92 Swedish firms being an outcome of the applied filters in section 4.1,

we are also limited in generalizing the results to the whole of the Swedish market. Instead, our results are representative of larger, international and publicly listed Swedish corporations issuing annual reports in English. Third, we acknowledge the limitations of the chosen method of the ex-ante approach in calculating the cost of equity capital. For example, even though the stock price is the main input, it can be manipulated by management. Fourth, we limit the study to CSR disclosure levels in integrated annual and stand-alone CSR reports and do not consider other sources of information, such as news, social media outlets or NGO campaigns. Finally, while numerous ESG disclosure indices issued by large rating agencies i.e. Bloomberg, Sustainalytics or MSCI exist, our method of a report content analysis restricts us to the field of CSR information found in annual and CSR reports. We further acknowledge the inherited limitations of applying an automated computer-based approach to content analysis, as the use of the predefined CFIE tool could result in measurement errors as a result of inadequately designed software or biases in the self-constructed wordlist. Thereby, we denote that the CSR-related wordlist is not a perfect proxy, but rather an indicator of CSR-related commentary.

Beyond the scope of this study, we bring forward a number of suggestions for future research within the topic of CSR disclosure. First, further research is needed to determine the dynamic and causal relationship between levels of CSR disclosure and the cost of equity capital. Second, further insights into the value-relevancy of different aspects of CSR within a Swedish context are needed, in order to further establish what the Swedish market perceives as value-relevant ESG information. Third, this study is limited to the time period 2013-2018 with the full effect of Directive 2014/95/EU still not fully realized. Hence, further research is needed in the area of CSR legislation and its impact on the market´s expectations. Fourth, given the growing interest in CSR activities and disclosure, additional research is needed to determine the optimum level of CSR disclosure that satisfies the needs of the growing group of stakeholders. Finally, Swedish firms are currently considered to be at the forefront of CSR disclosure (KMPG, 2017). Thus, given that this study only focuses on the level of disclosure amongst Swedish firms, further studies on the cross-country difference are needed to provide evidence on the relationship between CSR disclosure and the cost of equity in an international setting.

As a final note, this paper documents that there is a material, although marginal, financial incentive for firms to invest time and resources into compiling CSR reports that abide to the informational needs of different stakeholders. However, it is highly likely that the opportunity costs of such a decision are high and that it could be more value-adding to pursue capital market benefits via other routes.

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Appendix

Appendix 1: Sustainability Wordlist

The following columns present the 349 CSR-related words and n-grams used in the CSR-related *Wordlist*, the CFIE software and finally in the calculation of the *CSRScore,* discussed in section 3.1.1. The list was initially created by pooling the words from the UNC Sustainability Advisory Committee (2012), Vracheva et al. (2015) and D'Amato et al. (2019) and further curated by adding words from 50 Swedish sustainability reports. The asterisk (*) indicates the alternative spellings, inflexions and plurals. Uppercase words indicate that the CFIE only searched for the abbreviations of the words.

accident*	cities*	cycling	electric*	fish*
activist*	citizen*	deforestation	emission*	flood*
advocat*	city*	degradation*	empower*	food*
agricultur*	civil*	degrade*	endanger*	footprint*
air pollution	clean energy*	design*	endemic	forest*
airborne	climate*	destroy*	endogeneity	fossil*
airpollution	CO2	diesel*	energies	frack*
alternative*	coast*	disaster*	energiz*	fragile
Amnesty	color*	discriminat*	energy	fuel*
animal*	colour*	disease*	entrant*	futur*
authorit*	communit*	disposabl*	entrepreneur*	gas*
aatter*	compliance*	dispose*	environment*	gender*
benefactor*	comply*	disposing*	*equalit*	genetic*
benefi*	conscious*	distribut*	eroding	geothermal
bio	conservat*	disturb*	erosion	GHG
biodivers*	conserv*	diversity	ESG	global*
biolog*	consum*	donate*	ethic*	governance
biome*	cooling*	donating	evade	green*
bribe*	cooperat*	durability	evading	green economy*
byproduct*	co-operat*	durabl*	evasion	GRI
by-product*	corporate social	earth*	externalit*	groundwater
carbon*	responsibility*	ecodesign	fair*	habitat*
carbon dioxide*	*corrupt*	eco-design	farm*	heat*
cellulose	cost benefit	ecofriend*	fatalit*	household*
certificate*	analysis	ecolog*	fauna*	human capital
chemic*	cost-benefit-	ecosystem*	female*	human right*
child*	analysis	eco-system*	fertilis*	hybrid
circling	CSR	education*	fertiliz*	hydral*
circular	culture*	efficienc*	fiber*	hydrocarbon*
economy	cycle*	efficient	fibre*	impact*

includ*
inclusion
inclusive
indigenous
inefficien*
injur*
innovat*
insect*
invasive
ISO
jurisdiction
justice*
labor
labour
land*
last longer
lasting
law
legal*
life cycle
life-cycle
local
long term
longlasting
longterm
long-term
marine
material*
milestone*
minorit*
mitigate*
modern*
movement*
multidisciplinary
multistakeholder
multi-stakeholder
nation*
native*
natural*
nature*
NGO
nonfinancial
non-financial
nongovernment
non-government
nuclear
nutrient
nutrition
offset
offset*
off-sett*
oil*
optimis
optimiz
organic*
organism*
output
outreach*
panel*
paper*
Paris agreement
personnel
pest
PETA
petroleum
photovoltaic
pioneer*
planet*
plant*
plastic
policies
policy
politic*
pollinat*
pollutant*
pollut*
population*
power*
poverty
preserv*
presidenc*
prevent*
PRI
pristine
prosperity
protect*
protester*
public
Rainforest
Alliance
recharg*
reclaim*
recover*
recycl*
Red Cross
reduc*
regenerat*
regulation*
regulatory
rehab*
remanufactur*
re-manufactur*
remedies
remedy
renew*
repair*
replac*
responsibilit*
reserve*
residual*
resilienc*
resilient
resist*
resource*
resources
responsibilit*
re-usab*
reusab*
reuse*
re-use*
reused
reusi*
right*
rival*
runoff
rural
safe*
sanitation*
sanitizing
scrap*
SDG
sea level*
security*
sensitiv*
shelf-life
smart*
sociab*
social equity
social factor
social herding
social*
legitim*
social policy
social*
social system
societ*
soil*
solar
sourcing
species
stakeholder*
steward*
substitut*
sustain*
symbios*
tax eva*
tax* plan*
tax-eva*
technolog*
threat*
toleran
tolerat
toxic
traceab
tradeoff*
transform*
transit*
transpar*
transport*
travel*
tree
triple bottom line*
triple-bottom-line*
UNICEF
United Nations
urban
usabl
use
utilize*
warm*
waste*
wasting
water*
vegetation
welfare
well-being
wind*
woman
women
wood-based
worker*
workforce
work-life
workplace
world
WWF
vulnerab*

Appendix 2: Estimation of Implied Cost of Equity Capital

The following paragraphs explains our calculation of the average implied cost of equity capital, introduced in Section 3.1.2. It follows previous literature by calculating the average of the four models developed by (i) Claus & Thomas (2001, *CT*), (ii) Gebhardt, Lee & Swaminathan (2001, *GLS*), (iii) Ohlson & Juettner-Nauroth (2005, *OJ*) and (iv) Easton (2004, *ES*), for example utilized by Dhaliwal et al. (2011), Ghoul et al. (2011) and Athanasakou et al. (2019).

The following common variables and assumptions are used;

P_t = Share price on the 30th of June of year *t;*
DPS_0 = Actual dividend per share in year *t-1*;
EPS_0 = Actual earnings per share in year *t-1*;
LTG = Long-term growth forecasted on the 30th of June year *t*;
$ae_{t+\tau}$ =Abnormal earnings for year $t+\tau$ recorded on the 30th of June year *t*;
$FEPS_{t+\tau}$ =Forecasted earnings per share for year $t+\tau$ recorded on the 30th of June year *t*;
B_t = Book value per share at the beginning of year *t*;
r_f =Yield on a 10-year Swedish government bond on the 30th of June year *t*;
Inflation = Expected long-term inflation rate set constant at 3%;
t = Valuation year;
τ = Forecast year.

i) Claus & Thomas Model (2001)

$$P_t = B_{t+\tau} + \sum_{t=1}^{5} \frac{ae_{t+\tau}}{(1+r_{CT})^{\tau}} + \frac{ae_{t+5}(1+g)}{(r_{CT}-g)(1+r_{CT})^5} \qquad (A1)$$

Where;

$$\mathrm{ae_{t+\tau}} = \mathrm{FEPS_{t+\tau}} - \mathrm{r_{CT}B_{t+\tau-1}} \quad (A1a)\,;\ \mathrm{B_{t+\tau}} = \mathrm{B_{t+\tau-1}} + \mathrm{FEPS_{t+\tau}}(1-\mathrm{DPR_{t+\tau}}) \quad (A1b)$$

The Claus and Thomas´ Model (2001) assumes that the clean surplus relation holds (Ohlson, 1995), allowing the share price (*P*) to be expressed in terms of forecasted residual earnings and book value (*B*). It uses a five-year forecasting horizon, beyond which forecasted earnings (*FEPS*) are assumed to grow at the expected inflation rate (*g*), which is the risk-free rate less inflation. We follow the implementation of Ghoul et al. (2011) and impute unavailable *FEPS* from the previous year´s forecast and the long-term growth forecast (*LTG*) as $FEPS_{t+\tau} = FEPS_{t+\tau}(1+LTG)$. Finally, following previous literature, we assume the dividend payout ratio (*DPR*) to be constant at 50% (Ghoul et al., 2011; Athanasakou et al., 2019).

ii) Gebhardt, Lee & Swaminathan Model (2001)

$$P_t = B_t + \sum_{t=1}^{11} \frac{FROE_{r+\tau} - r_{GLS}}{(1+r_{GLS})^{\tau}} B_{t+\tau-1} + \frac{FROE_{t+12} - r_{GLS}}{r_{GLS}(1+r_{GLS})^{11}} B_{t+11} \qquad (A2)$$

Where;

$$B_{t+\tau} = B_{t+\tau-1} + FEPS_{t+\tau}(1-DPR_{t+\tau}) \qquad (A2a)$$

The Gebhardt et al. Model (2001) assumes clean surplus accounting, thus allowing the share price to be expressed in terms of forecasted returns on equity (*FROE*) and book value (*B*). The explicit forecasting period is set to three years, during which $FROE_{t+\tau} = FEPS_{t+\tau}/B_{t+\tau-1}$.

Beyond the three-year period, *FROE* decays to the median industry *ROE* by the twelfth year, which is calculated using the median of the annual median industry *ROE* for the past ten years, classifying firms according to the Industry Classification Benchmark (*ICB*) taxonomy and excluding loss-making firms. The forecasted earnings beyond the three-year period follows the same assumption as *FROE*. Finally, following previous literature, we assume the dividend payout ratio (*DPR*) to be constant at 50% (Ghoul et al., 2011; Athanasakou et al., 2019).

iii) Ohlson & Juettner-Nauroth Model (2005)

$$r_{OJ} = A^1 + \sqrt{A^2 + \frac{FEPS_{t+1}}{P_t}\left(g_2 - (\gamma - 1)\right)} \qquad (A3)$$

Where;

$$A^1 = \frac{1}{2}\left((\gamma - 1) + \frac{EDPS_{t+1}}{P_t}\right) \qquad (A3a) \quad ; \quad STG = \frac{FEPS_{t+2} - FEPS_{t+1}}{FEPS_{t+1}} \qquad (A3b)$$

The Ohlson and Juettner-Nauroth Model (2005) enables the cost of equity capital to be reversed-engineered from the relationship between price (*P*), next year´s forecasted earnings per share (*FEPS*) and next year´s expected dividends per share (*EDPS*), which is assumed to be equal to this year´s dividend per share. The model requires positive one-year-ahead and two-year-ahead earnings forecasts and the assumption that the dividend per share (*DPS*) is constant. Thus, if earnings per share (*EPS*) is negative, the figure has been substituted by 6% times the total assets per share of the firm as suggested by Gebhardt et al. (2001). The model uses an explicit forecast period of one year, after which the forecasted earnings are assumed to grow at a near-term rate (g_2) that decays to a perpetual rate ($\gamma - 1$), which equals the risk-free rate less inflation. The near-term earnings growth rate (g_2) is calculated as the average of both the short-term growth rate on the 30th of June year *t* (*STG*) and long-term growth forecast on the 30th of June year *t* (*LTG*).

iv) Easton Model (2004)

$$P_t = \frac{FEPS_{t+2} + r_{ES}EDPS_{t+1} - FEPS_{t+1}}{r_{ES}^2} \qquad (A4)$$

The Easton Model (2004) is a special case of the Ohlson and Juettner-Nauroth Model (2005). The current share price (*P*) is expressed in term of the next two year´s forecasted earnings per share (*FEPS*) and next years expected dividend per share (*EDPS*), where the EDPS is assumed to be equal to this year´s dividend per share. Thus, the explicit forecast horizon is merely two years, beyond which forecasted abnormal earnings grow at a constant rate into perpetuity. The model requires positive one-year-ahead and two-year-ahead earnings forecasts as well as positive change in earnings forecast.

Appendix 3. Descriptive Statistics

Variable	No. Obs.	Mean	STD	Min	Q1	Q2	Q3	Max
Panel A. Ranked CSR Disclosure Scores								
CSRindex	321	0.63	0.26	0.05	0.44	0.66	0.85	1.00
CSRScore	321	0.67	0.24	0.10	0.48	0.71	0.88	1.00
CSRFog	321	0.42	0.30	0.00	0.16	0.36	0.70	0.99
CSRSections	321	0.61	0.29	0.01	0.40	0.66	0.86	1.00
CSRRest	321	0.84	0.07	0.73	0.79	0.83	0.85	1.00
CSRForward	321	0.58	0.29	0.02	0.37	0.60	0.83	1.00
Panel B. Cost of Equity Capital Estimates								
r_{AVG}	321	0.09	0.04	0.00	0.06	0.08	0.10	0.32
r_{GLS}	319	0.08	0.04	0.00	0.06	0.08	0.10	0.32
r_{CT}	297	0.07	0.04	0.00	0.05	0.06	0.09	0.26
r_{OJ}	298	0.09	0.05	0.00	0.06	0.09	0.11	0.34
r_{ES}	300	0.10	0.06	0.01	0.07	0.09	0.13	0.48
Panel C. Control Variables								
DiscIndex	321	0.66	0.23	0.11	0.50	0.71	0.85	1.00
StratScore	321	0.67	0.24	0.03	0.50	0.72	0.88	1.00
FogPerf	321	0.50	0.30	0.00	0.23	0.51	0.75	1.00
Forward	321	0.63	0.25	0.00	0.47	0.67	0.84	1.00
Rearend	321	0.61	0.29	0.02	0.39	0.65	0.86	1.00
Performance	321	0.55	0.26	0.15	0.31	0.53	0.78	1.00
RestFront	321	0.60	0.27	0.00	0.40	0.63	0.82	1.00
ESG	321	0.55	0.08	0.30	0.49	0.55	0.62	0.73
MV	321	10.27	1.32	6.18	9.43	10.27	11.11	13.49
TA	321	17.28	1.58	13.00	16.19	17.43	18.17	21.74
Leverage	321	0.70	1.41	0.00	0.13	0.27	0.52	11.06
Growth	321	0.06	0.69	-7.88	0.04	0.08	0.14	3.32
ROA	321	0.07	0.09	-0.20	0.03	0.06	0.10	0.52
BTM	321	0.71	1.13	-0.10	0.26	0.45	0.84	2.90
Beta	321	1.00	0.40	-0.34	0.72	0.97	1.22	2.63

Note: The table shows descriptive statistics for the variables used in the main regression models, where the ranked disclosure scores, cost of equity capital and control variables are reported, respectively, in Panel A, B and C, further defined in section 3.1. All control variables are winsorized at the 99th and 1st percentile.

Appendix 4. Pearson Correlation

Panel A. Pearson correlation – Levels of CSR Disclosure Index

		(1)	(2)	(3)	(4)	(5)
(1)	CSRindex	1.00				
(2)	CSRScore	0.62***	1.00			
(3)	CSRFog	0.16***	-0.23***	1.00		
(4)	CSRSections	0.82***	0.44***	-0.24***	1.00	
(5)	CSRRest	0.26***	0.39***	-0.09*	0.14**	1.00
(6)	CSRForward	0.85***	0.40***	-0.10*	0.83***	0.13**

Note: The table reports correlations between variables of the *CSRindex*, defined in 3.1.1. ***, **, * indicates significance at 1%, 5% and 10% levels respectively. The expected sign for each coefficient is shown in parenthesis next to the variable name.

Panel B. Pearson correlation – Levels of General Disclosure Index

		(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1)	DiscIndex	1.00						
(2)	StratScore	0.72***	1.00					
(3)	FogPerf	0.34***	-0.83	1.00				
(4)	Gov	0.46***	0.03	0.27***	1.00			
(5)	Forward	0.72***	0.89***	-0.04	0.05	1.00		
(6)	Rearend	0.56***	-0.49***	0.08	0.10*	-0.51***	1.00	
(7)	Performance	0.33***	0.13**	0.01	-0.03	0.13**	-0.18***	1.00
(8)	RestFront	0.33***	0.40***	-0.11**	-0.15***	0.34***	-0.02	-0.28***

Note: The table reports correlations between variables of the *DiscIndex*, defined in 3.1.3. ***, **, * indicates significance at 1%, 5% and 10% levels respectively. The expected sign for each coefficient is shown in parenthesis next to the variable name.

Panel C. Pearson correlations - Regression Model Variables

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)	r_{AVG}	1.00									
(2)	CSRindex (-)	-0.07	1.00								
(3)	DiscIndex (-)	0.09	0.25***	1.00							
(4)	ESG (-)	-0.06	0.23***	0.15***	1.00						
(5)	MV (-)	-0.13**	0.24***	0.35***	0.29***	1.00					
(6)	BTM (+)	0.16***	0.07	0.03	0.02	-0.30***	1.00				
(7)	Leverage (+)	0.14**	0.14***	0.23***	-0.20***	-0.01	0.50***	1.00			
(8)	Beta (+)	0.16***	-0.05	0.019	0.015	-0.06	0.11*	0.14**	1.00		
(9)	Growth (+)	-0.16***	0.05	0.12**	-0.02	0.03	-0.02	0.01	0.06	1.00	
(10)	ROA (-)	-0.23***	0.04	-0.07	0.16***	0.07	-0.09	-0.20***	-0.12**	0.06	1.00
(11)	TA (-)	0.15***	0.24***	0.41***	0.12**	0.72***	0.15***	0.47***	0.10*	0.05	-0.20***

Note: The table reports correlations between regression variables. All variables are defined in 3.1. ***, **, * indicates significance at 1%, 5% and 10% levels respectively. The expected sign for each coefficient is shown in parenthesis next to the variable name.

Appendix 5. Sensitivity analysis of cost of equity capital estimates

	CT (7)	GLS (8)	OJ (9)	ES (10)	Median (11)
	r_{CT}	r_{GLS}	r_{OJ}	r_{ES}	r_{Median}
CSRindex (-)	-0.0043	-0.0011	-0.0119	-0.0308**	-0.0144**
	(-0.60)	(-0.14)	(-1.25)	(-2.26)	(-2.08)
DiscIndex (-)	0.0258***	-0.0166*	0.0273**	0.0288*	0.0226***
	(3.16)	(-1.92)	(2.50)	(1.83)	(2.85)
ESG (-)	-0.0625***	-0.0181	-0.0476	-0.0361	-0.0378
	(-2.60)	(-0.70)	(-1.46)	(-0.77)	(-1.60)
MV (-)	-0.0265***	-0.0231***	-0.0159***	-0.0210***	-0.0202***
	(-8.54)	(-7.55)	(-4.23)	(-3.84)	(-7.19)
BTM (+)	-0.0077***	0.0005	-0.0030	-0.0007	-0.0045**
	(-3.67)	(0.21)	(-1.06)	(-0.17)	(-2.15)
Leverage (+)	-0.0069***	-0.0083***	-0.0018	-0.0046	-0.0032*
	(-4.03)	(-4.61)	(-0.80)	(-1.44)	(-1.94)
Beta (+)	0.0233***	-0.0021	0.0233***	0.0174**	0.0143***
	(5.12)	(-0.44)	(3.86)	(1.99)	(3.26)
Growth (+)	-0.0047*	-0.0017	-0.0203***	-0.0288***	-0.0111***
	(-1.97)	(-0.67)	(-6.67)	(-6.50)	(-4.79)
ROA (-)	-0.0136	0.0144	-0.0685**	-0.1056**	-0.0583***
	(-0.60)	(0.61)	(-2.35)	(-2.46)	(-2.72)
TA (-)	0.0252***	0.0259***	0.0132***	0.0164***	0.0182***
	(9.03)	(9.53)	(3.98)	(3.39)	(7.30)
Constant	-0.1060***	-0.1079***	0.0119	0.0484	-0.0256
	(-3.95)	(-3.95)	(0.35)	(0.99)	(-1.03)
Industry Effects	Yes	Yes	Yes	Yes	Yes
Firm Effects	No	No	No	No	No
Year Effects	Yes	Yes	Yes	Yes	Yes
Observations	297	319	298	300	321
No. Firms	90	92	92	92	92
Adj. R^2	0.466	0.360	0.385	0.266	0.419

Note: The table shows the results from an OLS regression of the implied cost of equity capital on CSR disclosure levels (*CSRindex*) and control variables across the years 2013-2018 The regression is carried out separately on each of the variables constituting the average implied cost of equity capital (r_{AVG}). $\boldsymbol{r_{Median}}$ is the median implied cost of equity capital of the four models constituting r_{AVG}. The variables are defined in section 3.1.2 and further defined in Appendix 2. Firms are categorized by the Industry Classification Benchmark (ICB) Industries. The expected sign for each coefficient is shown in the parenthesis next to the variable name. Robust standard errors clustered at the firm level are shown in parenthesis. ***, **, * indicate significance at 1%, 5% and 10% levels respectively.

Appendix 6. Sensitivity analysis of different *CSRindex* weighting

	CSRScore Skewed (12)	**CSRFog Skewed (13)**	**CSRForward Skewed (14)**	**CSRSections Skewed (15)**	**CSRRest Skewed (16)**	**CSRindex Excl. CSRFog (17)**
	r_{AVG}	r_{AVG}	r_{AVG}	r_{AVG}	r_{AVG}	r_{AVG}
CSRindex (-)	-0.0194**	-0.0072	-0.0147**	-0.0153**	-0.0154**	-0.0200***
	(-2.51)	(-1.13)	(-2.17)	(-2.24)	(-2.19)	(-2.69)
DiscIndex (-)	0.0218***	0.0186**	0.0195**	0.0196**	0.0202**	0.0209***
	(2.70)	-2.32	-2.45	-2.46	-2.51	-2.62
ESG (-)	-0.0437*	-0.0471*	-0.0447*	-0.0447*	-0.0446*	-0.0428*
	(-1.83)	(-1.97)	(-1.87)	(-1.87)	(-1.87)	(-1.80)
MV (-)	-0.0196***	-0.0204***	-0.0199***	-0.0200***	-0.0198***	-0.0193***
	(-6.87)	(-7.16)	(-6.98)	(-7.04)	(-6.94)	(-6.76)
BTM (+)	-0.0021	-0.0018	-0.002	-0.002	-0.002	-0.0021
	(-0.98)	(-0.84)	(-0.94)	(-0.96)	(-0.96)	(-0.98)
Leverage (+)	-0.0051***	-0.0055***	-0.0052***	-0.0052***	-0.0052***	-0.0051***
	(-3.07)	(-3.27)	(-3.12)	(-3.13)	(-3.08)	(-3.01)
Beta (+)	0.0121***	0.0124***	0.0119***	0.0123***	0.0121***	0.0123***
	(2.73)	-2.78	-2.68	-2.78	-2.74	-2.8
Growth (+)	-0.0125***	-0.0126***	-0.0127***	-0.0127***	-0.0126***	-0.0127***
	(-5.35)	(-5.36)	(-5.43)	(-5.46)	(-5.39)	(-5.47)
ROA (-)	-0.0562***	-0.0557**	-0.0552**	-0.0557**	-0.0557**	-0.0571***
	(-2.60)	(-2.55)	(-2.54)	(-2.57)	(-2.57)	(-2.65)
TA (-)	0.0188***	0.0189***	0.0189***	0.0190***	0.0188***	0.0186***
	(7.46)	-7.44	-7.47	-7.52	-7.45	-7.41
Constant	-0.0343	-0.0347	-0.0342	-0.0348	-0.0347	-0.0336
	(-1.36)	(-1.37)	(-1.35)	(-1.38)	(-1.37)	(-1.33)
Industry Effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm Effects	No	No	No	No	No	No
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	321	321	321	321	321	321
No. Firms	92	92	92	92	92	92
Adj. R^2	0.42	0.41	0.42	0.42	0.42	0.42

Note: The table shows the results of re-weighting the *CSRindex* by skewing it towards certain variables at factor of two sixth (2/6), while the other four variables are weighted at one sixth (1/6) respectively under the static model. *Excl. CSRFog* equals the *CSRindex* but excluding the *CSRFog* variable, thus, only constituting four variables. The variables are defined in section 3.1.1. Firms are categorized by the Industry Classification Benchmark (ICB) Industries. The expected sign for each coefficient is shown in the parenthesis next to the variable name. Robust standard errors clustered at the firm level are shown in parenthesis. ***, **, * indicate significance at 1%, 5% and 10% levels respectively.

Appendix 7. Alternative Measure of *CSRindex*

	Static Model Unbalanced (18)	Static Quantile Model Unbalanced (19)	Dynamic Model Unbalanced (20)	Static Model Unbalanced (21)
	r_{AVG}	r_{AVG}	Δr_{AVG}	r_{AVG}
ESG_Index (-)	-0.0335	0.0529	0.0712	0.0592
	(-1.11)	(0.87)	(0.17)	(1.43)
Post (+)	-	-	-	0.0452**
	-	-	-	(2.26)
ESG_Index*Post (-)	-	-	-	-0.1311***
	-	-	-	(-3.20)
DiscIndex (-)	0.0239**	-0.0124	0.3658***	0.0288**
	(2.00)	(-0.43)	(2.85)	(2.45)
ESG (-)	-0.0260	0.1210	0.9898**	-0.0266
	(-0.70)	(1.18)	(2.52)	(-0.74)
MV (-)	-0.0195***	-0.0242**	-0.6251	-0.0195***
	(-5.18)	(-2.14)	(-0.31)	(-5.30)
BTM (+)	-0.0123**	-0.0154	0.0223	-0.0121**
	(-2.39)	(-1.04)	(0.33)	(-2.42)
Leverage (+)	0.0085	0.0135	-0.1181	0.0080
	(1.39)	(0.59)	(-1.61)	(1.35)
Beta (+)	0.0118*	0.0145	-0.1881	0.0117*
	(1.73)	(0.86)	(-1.08)	(1.75)
Growth (+)	-0.0134***	-0.0579*	0.0203	-0.0134***
	(-3.53)	(-1.94)	(1.51)	(-3.64)
ROA (-)	-0.0793**	-0.1302	-0.0105	-0.0826***
	(-2.48)	(-1.57)	(-0.43)	(-2.64)
TA (-)	0.0195***	-0.0007	-0.4441	0.0201***
	(6.36)	(-0.07)	(-0.08)	(6.71)
Constant	-0.0608*	0.2313*	0.6307***	-0.1133***
	(-1.83)	(1.81)	(3.06)	(-3.11)
Industry Effects	Yes	Yes	Yes	Yes
Firm Effects	No	No	No	No
Year Effects	Yes	Yes	Yes	Yes
Observations	208	208	159	208
No. Firms	54	54	45	54
Adj. R^2	0.454	-	0.115	0.480
Adj. R^2 90th quantile	-	0.436	-	-
Adj. R^2 10th quantile	-	0.430	-	-

Note: The table shows the results from an OLS regression of the implied cost of equity capital on CSR disclosure levels (*ESG_Index*) and control variables across the years 2013-2018. *ESG_Index* is a proxy for the Bloomberg ESG Disclosure Score, taking a ranked value between 0 to 1. The variable is further defined in the footnote under section 6.1.3. *ESG_Index*Post* is an interaction variable between *ESG Index* and the dummy variable *Post*. The other variables are defined in section 3.1.3. Under (20), the model compares the difference between the 90th and the 10th quantile through an inter-quantile OLS regression, the adjusted R^2 is reported separately for each quantile. Under the Δr_{AVG} test (21), the independent variable (*ESG Index*) and the control variables are calculated as the percentage change between year *t-1* to *t* Firms are categorized by the Industry Classification Benchmark (ICB) Industries. The expected sign for each coefficient is shown in the parenthesis next to the variable name. Robust standard errors clustered at the firm level are shown in parenthesis. ***, **, * indicate significance at 1%, 5% and 10% levels respectively.