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The Relationship Between CSR and Stock Price Crash Risk and the Impact of Mandatory Sustainability Disclosure Regulation

A Study on Listed Nordic Companies

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Abstract

This study examines the association between corporate social responsibility (CSR) and stock price crash risk in listed Nordic companies using data from 2014-2019, and if mandatory sustainability disclosure regulation has an impact on this association in Sweden and Finland. A CSR based model explaining stock price crash risk is employed to test the aforementioned. We find no association between CSR and stock price crash risk, which supports neither the view that CSR mitigates stock price crash risk nor that it increases it but is consistent with prior studies on Japanese firms. Our findings might potentially be attributable to the high overall accounting transparency, good corporate governance and high overall CSR level in the Nordics. Moreover, we find no evidence that the implementation of mandatory sustainability disclosure regulation has an impact on the association in Sweden and Finland potentially due to high overall financial reporting transparency, effective corporate governance, high overall CSR level, no need for amendments in CSR disclosure patterns and reduced signalling effect.

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1. Introduction

In the last decade, corporate social responsibility (CSR) gained more importance and became the prevalent narrative when discussing the future of business. Due to the increased external pressure from society and institutions, organisations have started to divert more effort towards CSR. Many companies today release complementary CSR reports to their regular financial reports and engage in CSR activities related to their business. The increased attention given to CSR among businesses has sparked curiosity in researchers globally on what effects CSR has on organisations. Among factors that have been examined in relation to CSR include financial performance (e.g., Margolis et al., 2007; Roman et al., 1999), premiums in M&A transactions (e.g., Gomes & Marsat, 2018) and financial reporting (e.g., Gelb & Strawser, 2001; Prior et al., 2008).

Meanwhile, a field that has also gained large attention among academics is firm-specific information's impact on stock pricing dynamics. Among the research topics of interest are predictors of stock price crashes, i.e. instant major share price declines, that has resulted in studies examining for example earnings management (Kim et al., 2012) and corporate tax avoidance (Kim et al., 2011) in relation to stock price crash risk. Building on the information asymmetry that prevails between management and investors, a central part in the phenomenon of stock price crashing is the *bad news hoarding* behaviour. Jin and Myers (2006), Hutton et al. (2009) and Kothari et al. (2009) claim that managers tend to temporarily conceal bad news that might hurt the firm from outside investors and hence prevent investors from accurately valuing the company. The hoarding of bad news results in an overvalued stock price. However, there is a limit to the volume of bad news that insiders are willing or able to absorb. Long sequences of bad news thus lead to the insiders "giving up" and releasing it in large bulk resulting in a stock price crash.

Linking these two phenomena (CSR and stock price crash risk) together, Kim et al. (2014) show that CSR is negatively correlated with stock price crash risk. However, subsequent studies made by other researchers have yielded contradictory results where some studies find a negative relationship between CSR and stock price crash risk in line with Kim et al. (2014) (e.g., Khajavai et al., 2018; Utz, 2017; Wu & Hu, 2019), whereas others find a positive relationship (Utz, 2017) and no relationship at all (Jie & Nakajima, 2015; Utz, 2017). Conflicting results in prior literature may arise due to there being two views on the relationship between CSR and

stock price crash risk. On the one hand, a higher level of CSR could be associated with more transparent financial reporting and less bad news hoarding, and consequently a lower stock price crash risk. On the other hand, a higher level of CSR could be associated with managers pursuing personal benefits and more opaque reporting, and hence a higher stock price crash risk. In this study we test the two conflicting views by examining the relationship between CSR and stock price crash risk in listed Nordic[1] companies.

Furthermore, CSR disclosure can be both voluntary and mandatory depending on e.g. country and firm size. A few studies have examined the impact of mandatory sustainability disclosure regulation on the relationship between CSR and stock price crash risk which has also resulted in contradictory results. The contradictory results here are a consequence of there being three possible outcomes of mandatory sustainability disclosure regulation. The result of an introduction of such regulation could either be a transition to a positive relationship between CSR and stock price crash risk, a transition to a negative relationship or no change in the relationship pre- and post-regulation. Two Nordic countries, Sweden and Finland, made sustainability disclosure mandatory from fiscal year 2017 following an EU Directive from 2014. As a consequence of the enactment of mandatory CSR disclosure regulation in Sweden and Finland, we also aim to examine the potential impact on the association between CSR and stock price crash risk of such regulation.

The aim of this paper is hence twofold. First, we examine the relationship between CSR and stock price crash risk in our Nordic setting. Second, we explore if the enactment of mandatory sustainability disclosure regulation in Sweden and Finland in 2017, has had an impact on the association between CSR and stock price crash risk in these two countries.

1.1 Purpose and Contribution

As mentioned, the relationship between CSR and stock price crash risk is disputed with contradictory findings such as a negative relationship for U.S. firms (Kim et al., 2014), Chinese energy firms (Wu & Hu, 2019), Taiwanese firms (Lee, 2016), Iranian firms (Khajavai et al., 2018) and a European sample (Utz, 2017), a positive relationship for Asia-Pacific (Utz, 2017), and no relationship at all among Japanese firms (Jie & Nakajima, 2015; Utz, 2017). Moreover, contradictory results have also been found among studies that have taken mandatory CSR

[1] The Nordics comprises Denmark, Finland, Iceland, Norway and Sweden.

disclosure regulation into account. Dai et al. (2019) find an inverted U-shaped nonlinear relationship, i.e. the crash risk first becomes higher with higher CSR level and then decreases with time, for Chinese firms when CSR disclosure is mandatory and no relationship at all when CSR disclosure is voluntary. Tang and Zhong (2019), in turn, find a negative relationship for an international sample when CSR disclosure is mandatory.

The ambition of this study is to fill a gap in prior research by examining the relationship between CSR and stock price crash risk in a Nordic setting. To the best of our knowledge this study is the first to focus on this region. Focusing on the Nordics is interesting for at least two reasons.

First, the Nordic countries are consistently among the highest performing countries in CSR issues and top several sustainability rankings. In 2018 for example, Sweden ranked as number one, Denmark as number two, Finland as number four and Norway as number five in RobecoSAM's biannual Country Sustainability Ranking (RobecoSAM, 2018). Thus, we take this geographical and societal perspective regarding CSR and the stock market reaction to CSR information into account.

Second, the introduction of mandatory sustainability disclosure regulation from fiscal year 2017 in Sweden and Finland enables us to examine not only the relationship between CSR and stock price crash risk per se, but also to investigate the relationship both when sustainability disclosure is mandatory and not. To the best of our knowledge, this study is also the first one to examine a possible impact of the EU Directive from 2014 as well as the first that examines the possible effect of mandatory sustainability disclosure regulation using the same set of firms across the whole sample period.

In addition to contributing to existing literature by adding a new geographical and societal aspect as well as examining a potential effect of the Directive, this study also contributes to the growing literature that aims to predict stock price crash risk. New evidence on accounting information that could be used to estimate firm-specific future stock price crash risk might be obtained from examining the relationship between CSR and stock price crash risk. Investors take skewness into account in stock pricing by requiring a larger expected return for stocks that exhibit a larger negative skewness as a compensation for taking this risk (Harvey & Siddique, 2000). Skewness in risk is captured by stock price crash risk meaning that crash risk is therefore a useful factor in risk management and investment decisions.

1.2 Delimitation

The scope of this study is limited to listed Nordic companies using data from 2014 to 2019. The timeframe of our sample is restricted by the availability of CSR data in the Resility database. However, scarce availability of CSR data that stretches back several years is a common limitation among studies examining CSR related topics.

When examining the relationship between CSR and stock price crash risk in listed Nordic companies all Nordic countries except Iceland are included. Further, when examining a potential impact of the introduction of mandatory sustainability disclosure regulation, through the enactment of the EU Directive from 2014, we focus on Swedish and Finnish companies in this study and include Danish and Norwegian companies as a control group. This is because Denmark has had a form of mandatory CSR reporting regulation since 2009 for among others large and listed companies (Danish Commerce and Companies Agency, 2010) and the EU Directive was adopted by Denmark on 21 May 2015, coming into effect in 2016 for the largest listed companies and in 2018 for all large companies (GRI, 2015). Norway has had a form of mandatory CSR disclosure regulation from 2013 (SANDS, n.d.) and has furthermore not enacted the EU Directive from 2014 (CSR Europe & GRI, 2017). Icelandic companies are excluded since a mandatory CSR disclosure legislation, following the EU Directive from 2014, came into effect in 1 January 2016 in Iceland (Icelandic Parliament, 2016) and since data on Icelandic companies is highly constrained in Resility, hence not meaningful to include as a control group.

Our delimitation has at least two benefits. First, examining the possible effect of the introduction of mandatory sustainability disclosure regulation using the sample firms both before and after such regulation enables us to avoid companies not disclosing before the regulation to drive the effect on our results when examining the transition from voluntary to mandatory CSR disclosure. Second, almost all companies included in Resility are very liquid meaning that the probability of a possible bad news hoarding behaviour to be captured in the stock prices is large since stocks are assumed to have a more or less correct price based on all information that is available to investors.

1.3 Structure of the Study

The remainder of this study is structured as follows. In section 2 we discuss theories and review the literature. Section 3 discusses the research design and variables whereas section 4 presents

the sample. Section 5 presents the empirical results. We discuss the results in section 6, present suggestions for future research in section 7 and conclude in section 8.

2. Theory and Literature Review

2.1 Corporate Social Responsibility

There is no clear-cut definition of corporate social responsibility and the variety of definitions provided by researchers and practitioners are broad. Early mentions of corporate social responsibility were made by Bowen already in 1953 with the book *Social Responsibilities of the Businessman*. However, it would only find traction almost 40 years later when Carroll (1991) launched his concept "the pyramid of corporate social responsibility". Carroll's idea is that CSR is a pyramid built on economic, legal, ethical and philanthropic responsibilities that as a unit constitutes a corporation's full obligations towards its stakeholders. Friedman (1962) gives another picture of corporate social responsibility by stating that a company's sole social responsibility is to utilise its resources and engage in activities that give rise to increased profits. Excessive engagement in CSR activities that shift focus from core operations might thus, from this view, be unbeneficial for a firm. A more modern definition of CSR is provided by the European Commission (2020) that describes CSR as "the responsibility of enterprises for their impact on society and, therefore, it should be company led. Companies can become socially responsible by: (1) integrating social, environmental, ethical, consumer, and human rights concerns into their business strategy and operations, (2) following the law". In this study, we adopt the definition provided by the European Commission. We also use the collection of environmental, social and governmental factors, ESG, as an interchangeable term for CSR. Moreover, we focus on CSR behaviour in our study.

The increased attention given to CSR is not only reflected in businesses but also in the academic world. Several studies have been made in order to examine for example the motives for CSR engagement and the financial effects of CSR. In particular, the question if companies that "do good" also perform better has gained much focus among academics resulting in various studies that link CSR to financial firm performance (e.g., Habaragoda, 2018; Margolis et al., 2007; Roman et al., 1999). Many studies have also examined the relationship between CSR and other dimensions than financial firm performance such as cost of capital (e.g., Dhaliwal et al., 2011; El Ghoul et al., 2011; Goss & Roberts, 2011), premiums in M&A transactions (e.g., Gomes & Marsat, 2018) as well as financial reporting (e.g., Gelb & Strawser, 2001; Kim et al., 2012;

Prior et al., 2008). Specifically, Gelb and Strawser (2001) show that firms with a high CSR level are more likely to provide more financial disclosure. CSR is therefore used as a measure of transparency in this study. Earlier studies examining the relationship between CSR and financial reporting quality are thus closely linked to our study.

2.2 Stock Price Crash Risk

Studies made on stock price crashing often refer to the information asymmetry that prevails on financial markets. The markets are regulated in a way that only the firms themselves have the firm-specific knowledge not disclosed in their financial statements. Thus, there is an information asymmetry between the company itself and investors (Leland & Pyle, 1977; Ross, 1977). The phenomenon of stock price crashing has traditionally been attributed to the behaviour called bad news hoarding. The theory behind this behaviour was first developed by Jin and Myers (2006), but also discussed by e.g. Hutton et al. (2009) and Kothari et al. (2009), who claimed that companies tend to hoard information that could potentially hurt the firm and release this hoard all at once rather than continuously. Bad news hoarding behaviour is highly dependent on the transparency in the firm and builds on the asymmetric information between the inside managers of the firm and the outside investors. Since investors pay for a conceived value, they expect a certain amount of cash flows from the firm that they are entitled to. If the inside managers know that the actual cash flows are higher than the expected cash flows, they can collect a larger amount of these cash flows for themselves. Conversely, if they know that the actual cash flows are lower than expected they can only collect a smaller amount for themselves. Thus, the increased possibility of lower future cash flows, i.e. bad news, is to the detriment of the inside managers. This creates a tendency to absorb bad news inside the firm. Another incentive for concealing bad news includes for example career concerns among managers (Kothari et al., 2009). The propensity of temporarily disguising bad news results in the company's share price being overvalued. However, there is a limit to the volume of bad news that insiders are willing or able to absorb. Long sequences of bad news, therefore, leads to the insiders "giving up" and releasing it in large bulk. Such releases are a significant reason for stock price crashes.

2.3 Corporate Social Responsibility and Stock Price Crash Risk

The essence of examining a relationship between CSR and stock price crash risk is based on whether CSR has an impact on the availability of firm-specific information that affects stock returns. In other words, does firm-specific transparency measured by CSR enable investors to

predict future stock returns in a more precise way? The discussion concerning the relationship between CSR and stock price crash risk is whether a higher level of CSR is associated with more transparent financial reporting and less bad news hoarding or whether it is associated with managers pursuing personal benefits and less transparent reporting.

On the one hand, higher levels of CSR could be seen as leading to lower stock price crash risk. Central in this view is thus that CSR can be used as means to reduce firm-specific stock price crash risk. This view can be understood by higher ethical standards within a firm resulting in increased accounting transparency. High CSR firms behave in a more responsible manner when it comes to financial reporting and also engage less in earnings management, suggesting that higher ethical standards lead to improved reporting quality provided by a company (Kim et al., 2012). Similarly, Gelb and Strawser (2001) find that socially responsible firms provide more financial disclosure. Lopatta et al. (2016), in turn, show that companies can lower information asymmetry between management and shareholders through a signalling effect by comprehensive CSR activity increasing the trustworthiness of companies and reducing investor scrutiny. If it is the case that high CSR firms maintain the same higher levels of ethical standards when presenting accounting information, the expectation would be that these firms exhibit higher levels of transparency and are less inclined to engage in bad news hoarding leading to a lower stock price crash risk. Indeed, several studies suggest that higher CSR leads to lower stock price crash risk and lower information asymmetry between management and investors, and that high CSR firms are less likely to conceal bad news (e.g., Khajavai et al., 2018; Kim et al., 2014; Lee, 2016; Utz, 2017; Wu & Hu, 2019).

On the other hand, CSR could be regarded as a tool to increase the information asymmetry and the principal-agent problem between management and shareholders. From this point of view, CSR could thus be used as a tool to pursue personal benefits among managers (e.g., Friedman, 1962; Goss & Roberts, 2011). For example, in order to enhance their image as good citizens, managers try to improve the CSR rating of their firm by over-investing in CSR activities thereby harming shareholder value (Barnea & Rubin, 2010). Managers that have a tendency to pursue personal benefits are less prone to have incentives of providing transparent accounting information (Kim et al., 2014). Furthermore, CSR can also be used as means to conceal corporate misbehaviour (Hemingway & Maclagan, 2004). In this vein, CSR is used as a sort of reputation insurance that diverts public scrutiny of potential misbehaviour. Enron, for instance, had a good CSR reputation leading to several awards for its engagement in environmental and

community issues while concurrently manipulating its accounting reports which eventually resulted in bankruptcy in 2001 (Bradley, 2009). In this line of thought, certain prior studies suggest that CSR is associated with opaque and less reliable financial information. For example, Petrovits (2006) finds that firms strategically use CSR in order to achieve financial reporting objectives. Prior et al. (2008) as well find a positive relationship between CSR score and earnings management. If managers invest in CSR and use it as a means to conceal bad news and divert investor scrutiny, in order to improve the management's reputation at the expense of the shareholders, the result would be a higher stock price crash risk (Barnea & Rubin, 2010; Kim et al., 2014). Indeed, Utz (2017) finds a positive relationship between CSR and stock price crash risk in Asia-Pacific.

2.4 Views on the Effect of the Introduction of Mandatory CSR Disclosure Regulation

The impact of the transition from voluntary to mandatory CSR disclosure could be discussed from three aspects. One aspect is that the enactment of mandatory sustainability reporting regulation leads to a positive relationship between CSR and stock price crash risk. Regulatory constraints and public supervision can make managers more careful when disclosing mandatory sustainability information which in turn increases the motivation to hoard bad news and lowers the quality of the CSR information provided (Dai et al., 2019). It could also be that firms superficially follow the regulation (Tang & Zhong, 2019). Furthermore, another possibility is that mandatory CSR disclosure regulation increases the principal-agent problem between management and investors. In order to increase profits of the firm while at the same time complying with the mandatory CSR regulation, managers might hide profitable but CSR unfriendly investments through accounting manipulation leading to higher stock price crash risk (Tang & Zhong, 2019). In line with the discussion in section 2.3, CSR can also be used as a tool to pursue personal benefits among managers and conceal improper corporate behaviour and divert investor scrutiny resulting in an increased risk of a stock price crash.

Another aspect, following the reasoning of Tang and Zhong (2019), is that even though the aim of mandatory sustainability disclosure is to improve the transparency of sustainability information provided by firms, there might be no impact of such regulation on the association between CSR and stock price crash risk. This might be due to several firms choosing not to disclose much more than before the introduction of the regulation. For example, companies that have voluntarily disclosed CSR information prior to CSR disclosure being compulsory might not need to make large or any amendments in their disclosure pattern.

The third aspect is consistent with the aim of the introduction of mandatory CSR disclosure regulation, i.e. that mandatory CSR reporting improves a firm's CSR reporting quality. Tang and Zhong (2019) claim that firms may disclose bad news in a timelier fashion after the introduction of mandatory sustainability disclosure regulation. Ioannou and Serafeim (2017) find that mandatory CSR disclosure regulation increases CSR scores. The improvement signals a higher level of ethical standards thereby reducing the manager's inclination to conceal bad news (Tang & Zhong, 2019). Tang and Zhong (2019) further argue that firms in compliance with CSR policies might face less public pressure and thereby reduce the risk for government sanction or litigation, which both have an impact on stock price crash risk. Firms may also amend their CSR policies and undertake projects that decrease CSR risk, resulting in lower stock price crash risk. In other words, this aspect suggests a negative relationship between CSR and stock price crash risk in line with the discussion presented in section 2.3.

2.5 Hypotheses

In constructing our first hypothesis we balance the two views presented in section 2.3 and consider first and foremost the results found by Utz (2017) who finds a negative relationship between CSR and stock price crash for a European cluster sample with companies from 19 European countries, where certain Nordic companies are included. Moreover, in a second step we consider the large number of studies that have found this relationship in other parts of the world (e.g., Khajavai et al., 2018; Kim et al., 2014; Lee, 2016; Wu & Hu, 2019) and that only one study, that in Asia-Pacific by Utz (2017), finds a positive relationship. This leads us to hypothesise that there is a negative relationship between CSR and stock price crash risk among listed Nordic companies. In other words, we expect that a higher level of CSR has a mitigating effect on stock price crash risk through high levels of ethical standards leading to increased accounting transparency and thereby lower tendency of bad news hoarding. Consequently, we construct our first hypothesis as follows:

Hypothesis 1:

H0: There is no relationship between CSR and stock price crash risk among listed Nordic companies

H1: There is a negative relationship between CSR and stock price crash risk among listed Nordic companies

As there are three possible effects of mandatory sustainability disclosure regulation, we furthermore test if such regulation has an impact on the association in Sweden and Finland. The second hypothesis is therefore:

Hypothesis 2:

H0: The introduction of mandatory sustainability disclosure regulation has no impact on the relationship between CSR and stock price crash among listed Swedish and Finnish companies

H1: The introduction of mandatory sustainability disclosure regulation has an impact on the relationship between CSR and stock price crash among listed Swedish and Finnish companies

3. Empirical Methodology

3.1 Design and Model

This study aims to examine the relationship between CSR and stock price crash risk in listed Nordic companies. Further, it also aims to uncover potential effects that newly accepted regulation on mandatory non-financial disclosure has on this relationship in the Swedish and Finnish companies. Similar studies have been made before by Kim et al. (2014) that used a regression model to explore the association in an American setting. This model explains stock price crash risk with CSR and a series of control variables, displayed in equation 1. Following Kim et al. (2014), the model has served as foundation for several studies in other regions (e.g., Khajavai et al., 2018; Utz, 2017; Wu & Hu, 2019). Since we perform similar tests as the abovementioned studies, the model will be applied in a Nordic context to test our first hypothesis. Our second hypothesis will be tested using the same model, but the sample will be separated into two clusters for 2015-2016 and 2017-2018 for the Swedish and Finnish firms to examine differences in the relationship between the clusters. A sample of Danish and Norwegian companies, where stricter regulation was effective during the whole time period, will be used as a control group to validate the robustness of our results when examining the second hypothesis.

$$CRASH_{RISK\,t} = \beta_0 + \beta_1\left(CSR_{SCORE\,t-1}\right) + \beta_2\left(CRASH_{RISK\,t-1}\right) + \beta_3(DTURNOVER_{t-1}) + \beta_4(RET_{t-1}) + \beta_5(MB_{t-1}) + \beta_6(SIZE_{t-1}) + \beta_7(SIGMA_{t-1}) + \beta_8(LEV_{t-1}) + \beta_9(ROA_{t-1}) + \beta_{10}(ABACC_{t-1}) + \varepsilon_t$$

Equation 1

3.2 Variables

The variables included in equation 1 are discussed below with their origin and expected sign following prior studies. All independent variables have been imposed with a one-year lag to examine if CSR in period *t-1* can function as a predictor for future stock price crash risk in period *t*.

3.2.1 Dependent Variable

Serving as the dependent variable, stock price crash risk is proxied using two different measures that were first derived by Chen et al. (2001). Two measures allow for controlling of the model with both a conservative and an aggressive option. Common for both measures is that they consider the firm-specific weekly returns, $W_{j,t}$. Contrary to regular weekly-returns, i.e. calculating the change in the adjusted close stock price during a week, the firm-specific returns are derived from a regression of the regular returns on the return of the overall market. We explain the stock return for company *j* during week *t* by the two-week, and one-week, leading and lagging market returns combined with the market return for week *t*. The residual obtained from equation 2 is then considered the *firm-specific* return as it is adjusted for the general return of the market, creating a less biased and *market inflated* return. In equation 2, the firm-specific return for firm *j* is explained by the market, *m*.

$$r_{j,t} = \alpha_j + \beta_{1,j} r_{m,t-2} + \beta_{2,j} r_{m,t-1} + \beta_{3,j} r_{m,t} + \beta_{4,j} r_{m,t+1} + \beta_{5,j} r_{m,t+2} + \varepsilon_{j,t}$$

Equation 2

Following Chen et al. (2001) the firm-specific returns, i.e. the residuals from equation 2, are then log-transformed. The reason for this is that a lognormally distributed crash risk measure should have a mean of zero which facilitates controlling of our scores. Hence, the distribution of the firm-specific returns will be more symmetrical (Kim et al., 2011). This results in the firm-specific weekly return ($W_{j,t}$) being defined as the logarithm of one plus the firm-specific residual return, disclosed in equation *3*.

$$W_{j,t} = \ln (1 + \varepsilon_{j,t})$$

Equation 3

In equation 2 we proxy the market return with Nasdaq OMX 120 GI, which is a value-weighted gross index that is constructed "by the 120 largest of the 150 most traded shares" on Nasdaq's stock exchanges in Stockholm, Copenhagen, Oslo and Helsinki (Nasdaq, n.d.). This index is

used since we use adjusted close prices for the sample firms. Contrary to the price index, the gross index accounts for dividends by reinvesting them in the portfolio. Thus, no adjustment for stock price decreases in relation to dividend payments has to be made. Further, both lagging and leading returns are included in the model in order to account for nonsynchronous trading (Dimson, 1979).

Following the derivation of the weekly firm-specific returns, we use them to create our stock price crash risk measures. The first proxy for stock price crash risk, and the main crash risk measure in this study, is negative conditional skewness (*NCSKEW*) in the firm-specific returns. *NCSKEW* in year *t* for firm *j* is defined as:

$$NCSKEW_{j,t} = -\frac{\left[n(n-1)^{\frac{3}{2}}\sum W_{j,t}^{3}\right]}{\left[(n-1)(n-2)(\sum W_{j,t}^{2})^{\frac{3}{2}}\right]}$$

Equation 4

where $W_{j,t}$ is the weekly firm-specific return from equation 3 and *n* represents the number of weekly returns observed during year *t*. *NCSKEW* is a measure of the negative third moment of the weekly returns in a firm year, scaled by the standard deviation of the returns over the same period. By adjusting the weekly returns with the negative sign, companies with negatively skewed returns will have a higher crash risk. Also, scaling the returns by the standard deviation allows for comparison between companies that show different levels of variance (Chen et al., 2001).

We also use a second measure to provide robustness to our stock price crash risk results, down-to-up volatility (*DUVOL*) which is defined as:

$$DUVOL_{j,t} = log\left\{(n_u - 1)\sum_{Down} W_{j,t}^{2} / (n_d - 1)\sum_{Up} W_{j,t}^{2}\right\}$$

Equation 5

where $W_{j,t}$ is the weekly firm-specific return and n_d and n_u is the number of "down"/"up" weeks (returns below and above the annual mean respectively). This measure categorises firm-specific weekly returns into "down"-weeks and "up"-weeks and then determines the logarithmic ratio of the down-week standard deviation to the up-week standard deviation. The down-returns are

accounted for in the numerator to obtain a higher crash risk when the returns are negatively skewed, similar to the negation of *NCSKEW*. As *DUVOL* uses second moments rather than third moments, it is less likely to suffer from bias attributed to extreme weekly returns (Chen et al., 2001). Thus, it is a conservative alternative to *NCSKEW*.

3.2.2 Corporate Social Responsibility Score

CSR_SCORE is the measure of a firm's CSR level based on data from Resility. The measure is constructed by 53 different measures adhering to environment, social and government factors. The data for the measures is either absolute values or text regarding inclusion of the metric in their annual accounts. If the measure is regarded as *Not Applicable* for some companies, the measure is excluded from their total points. For absolute values, the value for a company is scaled by revenues for relevant supersectors, compared to supersector[2] average, and graded as 0 for *Not Disclosed*, 1 for value *above supersector mean/median*, and 2 for value *below supersector mean/median*.[3] The scoring from supersector comparisons differ depending on if above or below average is deemed to be preferable. For text, company performance is graded as 0 for *Not Disclosed*, 1 for *No*, and 2 for *Yes*.[4] Appendix provides detailed explanation of how every CSR metric used in this paper is calculated. The reasoning behind the grading system is twofold. First, it is better for a company to disclose its performance, even though it is poor, than to not disclose its performance. Second, it is better for a company to perform well in a category than badly. *CSR_SCORE* is then defined as 100 times the ratio of the sum of company *j*'s points in every category to its potential maximum points. Thereby, the CSR score is between 0 and 100 for all companies.

$$CSR_SCORE_{j,t} = \frac{\sum company\ j's\ points}{potential\ maximum\ points} * 100$$

Equation 6

[2] Supersector is a subcategory to industry in the Industry Classification Benchmark, *ICB*.

[3] As an example, consider the CSR metric "Total GHG Emissions (kilotonnes)". This metric is first and foremost used for relevant supersectors. If a company in a relevant supersector has not disclosed its total GHG emissions (kilotonnes) it receives 0 points. If it has disclosed a value, this value will be divided by its revenues and then compared to the supersector average (where all values are revenue-scaled). Since low GHG emissions are preferable compared to high, companies with revenue-scaled values above the average receive 1 point and those below 2 points.

[4] For example, consider the CSR metric "Pandemics Policy". *Not Disclosed* yields 0 points, *No* yields 1 point and *Yes* yields 2 points.

After finding high correlation and ultimately, multicollinearity between *CSR_SCORE* and *SIZE*, we redefine the CSR variable to remove this effect. This is done by defining an adjusted CSR variable, *AdjCSR*, as the firm-specific residual from the *ordinary least squares* estimation of equation 7. The new size-adjusted variable, *AdjCSR*, will be used as our test variable to include firm size in the model without multicollinearity. Since *AdjCSR* is a residual it will take on both positive and negative values compared to *CSR_SCORE* that takes on values between 0 and 100. However, the relationship between the firm-specific observations remains the same as companies with high *CSR_SCORE* also obtain a high, positive *AdjCSR* while companies with low *CSR_SCORE* obtain a low, negative *AdjCSR*.

$$CSR_SCORE_{j,t} = \beta_0 + \beta_1 SIZE_{j,t} + \varepsilon_{j,t}$$

Equation 7

3.2.3 Control Variables

Following prior studies that have examined different factors influencing future stock price crash risk (e.g., Chen et al., 2001; Kim et al., 2014), we use the following control variables in this study: *CRASH_RISK*, *DTURNOVER*, *RET*, *MB*, *SIZE*, *SIGMA*, *LEV*, *ROA* and *ABACC.* These will be described below along with the expected signs of the estimated coefficients in our regression model.

Our first control variable is the lagging value of *CRASH_RISK* in order to take into account a possible serial correlation of *NCSKEW* or *DUVOL* for the firms. The lagged crash risk variables are expected to have a positive effect on stock price crash risk following prior studies conducted by e.g. Lee (2016) and Utz (2017).

DTURNOVER represents the difference in the average monthly share turnover of the current year from the previous year. The monthly share turnover is determined by dividing the monthly trade volume with total shares outstanding during the same period. Shown by Chen et al. (2001), *DTURNOVER* can predict stock price crash risk due to its proxy of opinion differences among investors which is why we control for this variable. The expected sign of the coefficient is positive following the study by Chen et al. (2001).

The control variable *RET* is the mean of firm-specific weekly returns over the fiscal year, times 100. *RET* is controlled for in order to explain the effect of stocks converging to its fundamentals through a large price decline after a bubble build-up. This variable's relationship with stock price crash risk is also found significant by Chen et al. (2001) suggesting a positive sign of the coefficient.

MB represents the market-to-book ratio, i.e. the equity market value over its book value. *MB* is examined since stocks with higher market-to-book ratio are more prone to experience a stock price crash (Chen et al., 2001; Hutton et al., 2009). Following prior research by aforementioned authors, we expect a positive sign on the coefficient for *MB*.

Determined as the natural logarithm of the equity market value is our next variable *SIZE*. Chen et al. (2001), Harvey and Siddique (2000), and Hutton et al. (2009) have found *SIZE* to be a predictor of stock price crash risk where the expected coefficient is positive.

SIGMA refers to the standard deviation of the full-year firm-specific weekly returns. This is used because more volatile companies are more likely to experience a stock price crash (Chen et al, 2001). Chen et al. (2001) suggests that *SIGMA* has a positive effect on stock price crash risk. Thus, the expected sign of the coefficient is positive.

LEV is the financial leverage of a company calculated by dividing long-term debt by total assets. Higher financial leverage is expected to lead to lower stock price crash risk as a result of managerial opportunism being inhibited (Hutton et al., 2009). This means that the expected sign of the estimated coefficient is negative.

ROA is the return on the opening balance assets with income before extraordinary items used as the profitability measure. Prior studies have found different results regarding this variable. On the one hand, stronger financial performance could be seen as leading to lower stock price crash risk (Hutton et al., 2009; Kim et al. 2011). However, e.g. Callen and Fang (2013) and Kim et al. (2014) find a positive relationship between higher ROA and higher stock price crash risk.

Lastly, since earnings management is closely linked with financial reporting opacity and managerial opportunism, which are expected to lead to higher stock price crash risk, we account

for earnings management by using *ABACC*. *ABACC* is the absolute value of discretionary accruals where the estimation of discretionary accruals is derived from the modified Jones model (Dechow et al., 1995). An option to using absolute values of discretionary accruals is to use non-absolute values. However, in this paper, we are more interested in capturing any kind of earnings management even though we will not be able to capture the direction. Using non-absolute values would take the direction into account but there would be a risk of the two possible directions offsetting each other leading to a detection of earnings management to be difficult. We expect a positive sign on the coefficient for *ABACC* following results from Hutton et al. (2009) who find a positive relationship between abnormal accruals and stock price crash risk.

4. Sample

Section 3 describes the model that will be used to test the hypotheses formulated for this study. In this section we provide the background to our sample selection following our focus on the Nordic countries and the enactment of mandatory sustainability disclosure regulation in Sweden and Finland.

4.1 Mandatory Sustainability Disclosure in Sweden and Finland

In October 2014, an EU Directive was presented and concerns requirements for non-financial disclosure in annual reports for companies in the European Union. The regulation was directed at "large public interest entities" that was defined as companies with 500 or more employees during a fiscal year and was required to be transferred to national legislation by the end of 2016. Sweden adopted the EU Directive on 1 December 2016, with a stricter definition of "large public interest entities", making sustainability disclosure mandatory from fiscal year 2017 for companies meeting at least two out of three following criteria (Swedish Parliament, 2016):

- The company has 250 employees or more
- The company has revenues of EUR 40 million or more
- The company has total assets of EUR 20 million or more

Finland was the other Nordic country where the EU Directive came into effect in fiscal year 2017, making sustainability disclosure mandatory, following its enactment of the Directive on 29 December 2016. In Finland, the criteria are the following (Ministry of Economic Affairs and Employment of Finland, n.d.):

- The company has an average of more than 500 employees during the fiscal year

- And the company has a turnover that is larger than EUR 40 million or a balance sheet total that is larger than EUR 20 million

As a result of this only Swedish and Finnish firms affected by this regulation are included to examine the association pre- and post-regulation, with Danish and Norwegian firms serving as a control group as a result of these countries having a form of mandatory CSR disclosure from 2009 (Danish Commerce and Companies Agency, 2010) and 2013 (SANDS, n.d.) respectively.

4.2 Data Sample

The data sample collected for this study is based on Resility's data on CSR disclosure in Nordic companies. Resility contains CSR information for several Nordic companies from 2014 to 2018. We require the sample firms to have CSR data for all years between 2015–2018. We choose the time period of 2015 to 2018 in order to include as many firms as possible in our study while at the same time having a long enough time period. This timeframe also yields the largest number of observations.

The sample first consists of 241 companies as this is the amount of companies included in Resility in for all years between 2015-2018. However, this number is adjusted in several ways in order to arrive at the final sample of 171 companies which is presented in the table below:

Factor	**Adjustment**	**Number of firms after adjustment**
Data for all years between 2015 and 2018 in Resility		241
Swedish and Finnish companies unaffected by mandatory CSR disclosure regulation	4	237
Icelandic companies	3	234
Financial and real estate companies	40	194
Missing values not available to hand collect	3	191
Year-end share prices lower than SEK 10 or equivalent	3	188
Not listed before 2014-12-01	15	173
Delisted between 2014 and 2019	2	171
Final sample		**171**

Table 1 – Sample derivation

We start with excluding Swedish and Finnish companies not affected by the mandatory CSR disclosure regulation effective from fiscal year 2017 as part of this study aims to investigate the potential impact of such a regulation. We also exclude the Icelandic companies. Financial and

real estate companies are excluded since the operations of these companies are not comparable to other industries. Working capital serves a different role for these companies as it is used as a cash source which is different from how cash is used among companies not included in the financial and real estate sectors. Moreover, certain items needed to calculate specific control variables, such as current liabilities, are not discernible in many of the financial companies' accounts. We also exclude companies where missing values are not available to hand collect. Companies with year-end share prices of lower than SEK 10 or equivalent are also omitted to avoid our results being affected by low liquidity stocks. Finally, we omit companies not listed before 2014-12-01 as *DTURNOVER* for 2015 is not possible to calculate for these firms. Finally, we also exclude companies delisted between 2014 and 2019.

The final sample contains companies from the following 10 industries as defined by Resility: Industrials, Basic Materials, Consumer Services, Health Care, Consumer Goods, Technology, Telecommunications, Utilities and Oil & Gas across Sweden, Finland, Denmark and Norway. A more comprehensive view of the sample is illustrated in the table below:

Industry	***Sweden***	***Finland***	***Denmark***	***Norway***	**Total**
Industrials	29	15	14	4	62
Basic Materials	6	6		2	14
Consumer Services	9	5		1	15
Health Care	9	2	12		23
Consumer Goods	16	7	5	3	31
Technology	4	5	1	2	12
Telecommunications	3	1		1	5
Utilities		1			1
Oil & Gas	2	1	1	4	8
Total	78	43	33	17	171

Table 2 – Overview of sample firms sorted based on country and industry

The financial data needed for the control variables except for market capitalisation is collected through Compustat and, if not available, the companies' respective annual accounts. Since data for market capitalisation is not available in Compustat or in the annual accounts, it is retrieved from Thomson Reuters' database and, if not available, from FinBas. Thus, no company is omitted as a result of missing values provided that the missing values are available to hand collect.

Stock and market returns as well as other stock data are taken from the Nasdaq Nordic database. The reason for this is that, compared to Compustat, data in Nasdaq Nordic is adjusted for repurchases and splits which improves accuracy and comparability over longer time periods.

We obtain CSR data from Resility from 2015 to 2018 and link this with the stock return data from Nasdaq Nordic for the 2016-2019 period to calculate the firm-specific future stock price crash risk.

5. Empirical Results

Using our sample and the model derived by Kim et al. (2014), we test our two hypotheses and present the results in this section. We start by discussing the sample, proceed with testing of *hypothesis 1* and thereafter with testing of *hypothesis 2*. Lastly, our model is modified to examine if the results are robust.

5.1.1 Descriptive Statistics

Variable	**Obs**	**Mean**	**Std. Dev.**	**25%**	**Median**	**75%**
Crash risk measures						
$NCSKEW_t$	684	-0.014	0.755	-0.559	-0.053	0.537
$DUVOL_t$	684	-0.068	0.407	-0.354	-0.076	0.220
CSR measures						
CSR_{t-1}	684	69.050	9.971	62.376	69.742	76.701
$AdjCSR_{t-1}$	684	0.047	8.599	-5.043	0.616	5.974
Control variables						
$NCSKEW_{t-1}$	684	0.099	0.777	-0.492	0.150	0.732
$DUVOL_{t-1}$	684	-0.034	0.371	-0.267	0.001	0.232
$DTURNOVER_{t-1}$	684	-0.006	0.180	-0.011	-0.000	0.007
MB_{t-1}	684	3.757	4.323	1.697	2.822	4.446
$SIZE_{t-1}$	684	9.732	1.459	8.654	9.549	10.750
LEV_{t-1}	684	0.159	0.129	0.054	0.145	0.235
ROA_{t-1}	684	0.081	0.123	0.031	0.063	0.109
RET_{t-1}	684	0.213	0.337	-0.010	0.237	0.438
$SIGMA_{t-1}$	684	0.014	0.006	0.009	0.013	0.018
$ABACC_{t-1}$	684	0.038	0.069	0.006	0.017	0.039

Table 3 - Descriptive statistics for Swedish, Finnish, Danish and Norwegian data 2014-2019

In table 3, descriptive statistics for variables included in the analysis are provided. Our crash measures have similar mean values but the aggressive *NCSKEW* has a wider spread than the conservative *DUVOL*. For *NCSKEW*, the weekly firm-specific returns have, on average, a third moment return 0.014 of its standard deviation. The mean values in our sample are slightly lower than the ones generated by Kim et al. (2014) but comparable to Utz's (2017) European sample. Moreover, the standard deviations for *NCSKEW* and *DUVOL* are large compared to the mean values, signalling that the levels of stock price crash risk differ among our sample firms. The lagged crash measures follow the same pattern as the non-lagged with $DUVOL_{t-1}$ having a lower mean than $NCSKEW_{t-1}$. The *CSR* measure has a mean of 69.050 but when transformed to *AdjCSR* its mean is 0.047. Because we use a residual variable, *AdjCSR* will take on values both above and below zero yielding a lower average while *CSR*, being a percentage of max score multiplied by 100, by nature must be positive. The standard deviation for our adjusted CSR measure is high, implying a relatively large spread in adjusted CSR score for our sample firms, and comparable to those derived by e.g. Kim et al. (2014) and Utz (2017). *DTURNOVER* has a negative mean of -0.006 indicating a decreasing share turnover over time in our companies. The companies included in our study have an average market-to-book ratio of 3.757 times, close to the result in Kim et al. (2014). Further, the average sample firm has a market capitalisation of SEK 16.840bn, a leverage of 0.159 and return on assets of 8.1%. Noticeable is that the average return on assets is twice as high in our Nordic sample than in Kim et al.'s (2014) American sample, and about 3 percentage points higher than in Jie and Nakajima's (2015) Japanese sample and Dai et al.'s (2019) Chinese sample. The average firm size also varies slightly compared to related studies but could be explained by differences in currencies used to calculate the variable. The average weekly firm-specific return in our sample is 0.213%, slightly higher than e.g. Kim et al. (2014), Jie and Nakajima (2015) and Utz (2017). An explanation for this could be that these studies include the financial crisis in 2007-2008 in their samples that would lower the sample mean. The average volatility of the weekly firm-specific returns is 0.014, slightly lower than the comparable studies (Dai et al., 2019; Jie & Nakajima, 2015; Kim et al., 2014). The average firm also has similar average abnormal accruals to Jie and Nakajima (2015) at 0.038, but smaller compared to Kim et al. (2014) and Dai et al. (2015).

5.1.2 Descriptive Statistics for CSR Score

Country/Year	**Obs**	**Mean**	**Std. Dev.**	**25%**	**Median**	**75%**
Sweden						
2015	78	66.266	10.984	59.849	67.502	74.455
2016	78	70.150	10.002	63.469	70.297	78.416
2017	78	69.467	8.117	62.624	69.521	75.102
2018	78	69.208	8.160	62.871	69.637	74.917
Finland						
2015	43	68.576	12.279	60.943	72.614	78.283
2016	43	71.146	12.625	59.596	75.413	81.818
2017	43	73.561	8.916	67.178	76.304	81.188
2018	43	73.407	9.502	65.017	73.927	82.673
Denmark						
2015	33	65.860	11.131	58.586	65.32	73.267
2016	33	70.377	9.143	62.376	71.111	78.451
2017	33	67.065	9.375	62.376	67.327	73.168
2018	33	66.323	9.752	59.406	67.327	72.594
Norway						
2015	17	67.013	7.750	61.869	66.667	73.267
2016	17	67.127	8.517	62.222	67.327	73.958
2017	17	67.081	8.660	62.442	65.347	70.297
2018	17	66.287	8.047	62.376	66.337	72.277

Table 4 - Descriptive statistics for CSR Score in Sweden, Finland, Denmark and Norway

Table 4 provides descriptive statistics for the CSR scores in each country, separated into the four fiscal years that are examined in this study. The mean score does not differ considerably in any country between the years, but a small increase is seen in Sweden and Finland in year 2016. Moreover, the standard deviation is relatively constant in Norway while it decreases in 2016 in Denmark and in 2017 in Sweden and Finland. This is interesting since these countries adopted new CSR regulation in these exact years while Norway kept its mandatory CSR disclosure regulation the whole period. Nonetheless, the enactment has no apparent, lasting effect on the mean, median, and upper quartile values.

5.1.3 Correlations between Variables

	$NCSKEW_t$	$DUVOL_t$	$AdjCSR_{t-1}$	$DTURNOVER_{t-1}$	MB_{t-1}	$SIZE_{t-1}$	LEV_{t-1}
$NCSKEW_t$	1.000						
$DUVOL_t$	0.974*	1.000					
$AdjCSR_{t-1}$	0.040	0.038	1.000				
$DTURNOVER_{t-1}$	-0.029	-0.024	-0.040	1.000			
MB_{t-1}	-0.187*	-0.168*	-0.250*	0.164*	1.000		
$SIZE_{t-1}$	-0.035	-0.038	0.002	0.017	0.223*	1.000	
LEV_{t-1}	0.126*	0.127*	0.080	0.009	-0.292*	-0.047	1.000
ROA_{t-1}	-0.135*	-0.130*	-0.177*	0.238*	0.559*	0.159*	-0.301*
RET_{t-1}	-0.825*	-0.836*	-0.002	-0.010	0.127*	0.059	-0.133*
$SIGMA_{t-1}$	0.345*	0.358*	-0.087	0.103*	0.027	0.014	0.034
$ABACC_{t-1}$	-0.030	-0.017	-0.241*	0.129*	0.257*	0.008	-0.076
$NCSKEW_{t-1}$	0.267*	0.244*	0.105*	0.068	-0.148*	-0.050	0.095
$DUVOL_{t-1}$	0.232*	0.200*	0.123*	0.057	-0.156*	-0.061	0.103*

	ROA_{t-1}	RET_{t-1}	$SIGMA_{t-1}$	$ABACC_{t-1}$	$NCSKEW_{t-1}$	$DUVOL_{t-1}$
$NCSKEW_t$						
$DUVOL_t$						
$AdjCSR_{t-1}$						
$DTURNOVER_{t-1}$						
MB_{t-1}						
$SIZE_{t-1}$						
LEV_{t-1}						
ROA_{t-1}	1.000					
RET_{t-1}	0.088	1.000				
$SIGMA_{t-1}$	-0.015	-0.192*	1.000			
$ABACC_{t-1}$	0.272*	-0.017	-0.019	1.000		
$NCSKEW_{t-1}$	-0.180*	0.283*	0.347*	-0.207*	1.000	
$DUVOL_{t-1}$	-0.181*	-0.052	0.250*	-0.207*	0.955*	1.000

Notes: * significance at 1% level

Table 5 - Correlation matrix for Swedish, Finnish, Danish and Norwegian data 2014-2019

Table 5 provides the Pearson correlation values for our stock price crash risk variables, corporate social responsibility variable and our control variables. All control variables are expected to be significantly correlated with stock price crash risk, thus that they provide explanatory value to our model. To account for multicollinearity, it is also assumed that our explanatory variables do not significantly correlate with each other as the opposite would

indicate that our model suffers from multicollinearity. Specifically, if a correlation between two explanatory variables is higher than 0.8 or several correlations are larger than 0.5 (in absolute values), then that could be an indicator of a model suffering from multicollinearity (Edlund, 1997). Only one correlation, that between *ROA* and *MB*, is larger than 0.5 in our model. Our correlation matrix therefore indicates that our model does not suffer from multicollinearity.

It is apparent that market-to-book ratio, leverage, return on assets, average weekly firm-specific return, standard deviation of the weekly firm-specific returns and lagging stock price crash risk are all significantly correlated with our stock price crash risk variables. Interesting for our study, is that *AdjCSR* does not have significant correlation with our crash risk variables. This will be important when testing our model in sections 5.2 and 5.3. Furthermore, the correlation matrix does not suggest that *AdjCSR*, *DTURNOVER*, *SIZE* and *ABACC* provide explanatory value towards stock price crash risk.

5.2 Test of the Relationship between CSR and Stock Price Crash Risk

Dep. Variable =	*Expected sign*	(1) $NCSKEW_t$	(2) $DUVOL_t$
$AdjCSR_{t-1}$	-	0.002	0.001
		(0.002)	(0.010)
$DTURNOVER_{t-1}$	+	-0.218**	-0.113**
		(0.086)	(0.045)
MB_{t-1}	+	-0.014***	-0.005**
		(0.004)	(0.002)
$SIZE_{t-1}$	+	0.016	0.007
		(0.010)	(0.005)
LEV_{t-1}	-	-0.086	-0.038
		(0.123)	(0.064)
ROA_{t-1}	+/-	0.039	-0.017
		(0.152)	(0.079)
RET_{t-1}	+	-1.737***	-0.954***
		(0.045)	(0.024)
$SIGMA_{t-1}$	+	19.980***	12.650***
		(2.666)	(1.351)

$ABACC_{t-1}$	+	0.173	0.133
		(0.233)	(0.122)
$NCSKEW_{t-1}$	+	0.127***	
		(0.021)	
$DUVOL_{t-1}$	+		0.119***
			(0.022)
Constant		-0.035	-0.083
		(0.109)	(0.057)
N		684	684
Adj. R^2		0.739	0.756

Notes: Standard errors in parentheses. * statistical significance at 10% level.
** statistical significance at 5% level. *** statistical significance at 1% level.

Table 6 - Results from regression in the Nordic countries

Table 6 provides the results from the regression analysis for the Nordic companies between 2014-2019. *NCSKEW* and *DUVOL* generate very similar results when comparing coefficients and statistical significance. The results do not support a significant relationship between *AdjCSR* and either of *NCSKEW* and *DUVOL*. Thus, our null hypotheses cannot be rejected. Therefore, in our data, there is no evidence of an association between a company's level of CSR and its stock price crash risk among the Nordic companies when our control variables are included. Our results do not support the view that a higher level of CSR is associated with less bad news hoarding and increased accounting transparency, nor does it support the view that a higher level of CSR is associated with less transparent and less reliable financial reporting. The model itself can be validated through the significance of the control variables. *DTURNOVER* is significant at the 5% level although it has the opposite sign of what is expected. However, contrary to e.g. Kim et al. (2014), Dai et al. (2019) find *DTURNOVER* to be significant with a negative sign. Further, the results suggest that market-to-book ratio, average weekly return, standard deviation in weekly returns and lagged stock price crash risk has a significant effect on one-year-ahead stock price crash risk. Noticeable is that market-to-book ratio and average weekly return both have negative coefficients which is not in line with our expectations. Nonetheless, *RET* was found to have a negative association with stock price crash risk by Hao et al. (2018) and Utz (2017), and *MB* had a negative association with stock price crash risk in Khajavai et al. (2018).

5.3 Tests of Regulation Effects on Association

After establishing that there is no significant association between CSR and stock price crash risk in the Nordics between 2014-2019, we examine if the association in Sweden and Finland was affected by the enactment of mandatory CSR disclosure regulation in fiscal year 2017.

		Sweden & Finland			
		Pre-regulation		*Post-regulation*	
Dep. Variable =	*Expected sign*	***NCSKEW$_t$***	***DUVOL$_t$***	***NCSKEW$_t$***	***DUVOL$_t$***
AdjCSR$_{t-1}$		0.001	0.000	-0.000	0.001
		(0.003)	(0.002)	(0.003)	(0.002)
DTURNOVER$_{t-1}$	+	-0.184*	-0.094*	0.709***	0.384***
		(0.100)	(0.050)	(0.257)	(0.141)
MB$_{t-1}$	+	-0.022**	-0.010**	-0.011	-0.004
		(0.010)	(0.005)	(0.007)	(0.004)
SIZE$_{t-1}$	+	0.005	-0.001	0.013	0.006
		(0.019)	(0.009)	(0.014)	(0.008)
LEV$_{t-1}$	-	-0.120	-0.065	0.067	0.078
		(0.252)	(0.124)	(0.198)	(0.109)
ROA$_{t-1}$	+/-	-0.047	-0.061	0.054	-0.105
		(0.268)	(0.132)	(0.309)	(0.170)
RET$_{t-1}$	+	-1.870***	-1.007***	-1.706***	-0.943***
		(0.106)	(0.053)	(0.054)	(0.030)
SIGMA$_{t-1}$	+	14.390***	10.960***	40.560***	21.930***
		(4.582)	(2.119)	(4.762)	(2.610)
ABACC$_{t-1}$	+	0.271	0.043	0.044	0.209
		(0.551)	(0.272)	(0.331)	(0.182)
NCSKEW$_{t-1}$ /DUVOL$_{t-1}$	+	0.130***	0.157***	0.082***	0.0246
		(0.049)	(0.059)	(0.028)	(0.029)
Constant		0.152	0.052	-0.203	-0.175**
		(0.194)	(0.096)	(0.154)	(0.085)
N		242	242	242	242
Adj. R^2		0.686	0.725	0.844	0.848

Notes: Standard errors in parentheses. * statistical significance at 10% level. ** statistical significance at 5% level. *** statistical significance at 1% level.

Table 7 - Results from regression pre/post-regulation in Sweden and Finland

Table 7 provides the results from the regressions before and after the mandatory non-financial disclosure regulation became effective in fiscal year 2017 in Sweden and Finland. Looking at the regression with *NCSKEW* as crash measure, we cannot conclude that there is a difference in the association between CSR and stock price crash risk pre- and post-regulation in Sweden and Finland. Analysing our model, *DTURNOVER, RET*, *SIGMA*, and lagged *NCSKEW* are all significant both before and after the change while *MB* is only significant before. This is consistent with the results in section 5.2 and our comparable studies.

		Denmark & Norway			
		Pre-regulation		*Post-regulation*	
Dep. Variable =	*Expected sign*	$\boldsymbol{NCSKEW_t}$	$\boldsymbol{DUVOL_t}$	$\boldsymbol{NCSKEW_t}$	$\boldsymbol{DUVOL_t}$
$AdjCSR_{t-1}$		-0.003	-0.002	0.005	0.001
		(0.005)	(0.003)	(0.006)	(0.004)
$DTURNOVER_{t-1}$	+	-1.720***	-0.810***	1.300	1.301*
		(0.583)	(0.286)	(1.209)	(0.748)
MB_{t-1}	+	-0.004	0.000	-0.001	0.002
		(0.010)	(0.005)	(0.010)	(0.006)
$SIZE_{t-1}$	+	0.002	0.010	0.009	0.006
		(0.033)	(0.016)	(0.030)	(0.019)
LEV_{t-1}	-	-0.069	-0.120	-0.191	-0.078
		(0.288)	(0.140)	(0.274)	(0.170)
ROA_{t-1}	+/-	0.050	-0.027	0.162	0.0793
		(0.492)	(0.242)	(0.345)	(0.213)
RET_{t-1}	+	-1.599***	-0.795***	-1.491***	-0.836***
		(0.195)	(0.094)	(0.109)	(0.067)
$SIGMA_{t-1}$	+	3.276	5.720*	34.890***	19.490***
		(6.236)	(2.890)	(7.735)	(4.694)
$ABACC_{t-1}$	+	0.619	0.206	0.006	0.111
		(0.522)	(0.257)	(0.520)	(0.319)

$NCSKEW_{t-1}$ /$DUVOL_{t-1}$	+	0.342***	0.362***	0.128**	0.130**
		(0.073)	(0.079)	(0.054)	(0.061)
Constant		0.076	-0.122	-0.217	-0.234
		(0.348)	(0.170)	(0.330)	(0.205)
N		100	100	100	100
Adj. R^2		0.693	0.703	0.777	0.740

Notes: Standard errors in parentheses. * statistical significance at 10% level. ** statistical significance at 5% level. *** statistical significance at 1% level.

Table 8 - Results from regression pre/post-regulation in Denmark and Norway

The results of the tests can be validated by performing the same test in our control group in table 8. As described in sections 1.2 and 4.1, Denmark and Norway never faced a change in regulation in fiscal year 2017 and had effective regulation on non-financial reporting when our study starts. Thereby, there should be no difference in the results for the two Danish and Norwegian clusters. Indeed, we find no significance for *AdjCSR* in either case and therefore no association between CSR and stock price crash risk.

Table 7 also presents the regression results with the more conservative crash risk measure, *DUVOL,* as dependent variable instead of *NCSKEW*. With *DUVOL*, we do not find that *AdjCSR* provides explanatory value to stock price crash risk neither pre-regulation nor post-regulation in Sweden and Finland. This does not suggest that the association differ following the regulation change when using a conservative crash measure. The same result as in Sweden and Finland is observed in Denmark and Norway as shown in table 8.

From Table 7, it is evident that the model itself in the *DUVOL* regression has explanatory power for the two clusters as *DTURNOVER*, *MB*, *RET***,** *SIGMA*, and lagged *DUVOL* are significant for the first period, and *DTURNOVER*, *RET*, and *SIGMA* are significant for the second period. Although, *DTURNOVER*, *MB*, and *RET* have opposite signs from what is expected pre-regulation and *RET* has opposite sign from what is expected post-regulation. However, related studies obtain the same signs as discussed in section 5.2.

Just like the *NCSKEW* regression, the *DUVOL* regression does not provide evidence to support an association between CSR and stock price crash risk in the two clusters. The results suggest that the there is no difference in the relationship between CSR and stock price crash risk pre-

and post-regulation in the Swedish-Finnish context. Thus, from a robustness perspective, it does not appear that our choice of crash risk measure has affected the results.

Until now we have concluded that the association between CSR and stock price crash risk does not differ in Sweden and Finland before and after the enactment of mandatory CSR disclosure regulation. We now examine if the regulation had any effect on this association through an equality of coefficients test. This is performed by testing if the difference between the coefficients for *AdjCSR* pre- and post-regulation is significantly different from zero.

Sample	Crash variable	Null hypothesis	X^2-statistic	p-value	Conclusion
Sweden & Finland	*NCSKEW*	$\beta_{AdjCSR(pre)} - \beta_{AdjCSR(post)} = 0$	0.040	0.836	Don't reject H_0
Sweden & Finland	*DUVOL*	$\beta_{AdjCSR(pre)} - \beta_{AdjCSR(post)} = 0$	0.110	0.741	Don't reject H_0
Denmark & Norway	*NCSKEW*	$\beta_{AdjCSR(pre)} - \beta_{AdjCSR(post)} = 0$	1.400	0.237	Don't reject H_0
Denmark & Norway	*DUVOL*	$\beta_{AdjCSR(pre)} - \beta_{AdjCSR(post)} = 0$	0.590	0.444	Don't reject H_0

Notes: β is the estimated coefficient from the regression in 4.3.
X^2-statistic is calculated as the difference between the coefficients divided by their combined standard error.
Null hypothesis refers to the null hypothesis of the equality of coefficients test.

Table 9 – Results from equality of coefficients test on the impact of mandatory CSR disclosure regulation on association

In table 9 the results from our equality of coefficients tests are disclosed. Note that the null hypothesis in the table refers to the null hypothesis of the equality of coefficients test. Evidently so, we cannot reject that the difference between the coefficients is zero in our Swedish and Finnish sample. Thus, our data does not suggest that the enactment of mandatory CSR disclosure regulation had an impact on the association between CSR and stock price crash risk.

Linking the results obtained from the regression and equality of coefficients test to the theoretical part in section 2.4, we do not find any supporting evidence that the introduction of mandatory sustainability disclosure regulation leads to either a positive or negative relationship between CSR and stock price crash risk. Instead, our results support the view that there is no impact on the association from mandatory CSR disclosure regulation. The fact that we obtain

the same results with both the aggressive and conservative crash measures, and in the Danish and Norwegian sample where the effect is expected to be zero provides robustness to our results. All in all, we cannot reject our second null hypothesis since we find no support that the regulation had an impact on the insignificant association between *AdjCSR* and stock price crash risk pre- and post-regulation.

5.4 Additional Robustness

In sections 5.2 and 5.3 we find that there is no association overall between CSR and stock price crash risk, that this result did not differ before and after the regulation and we also do not find that the regulation had an impact on this association. Our results are validated through analysing with two different crash measures when examining the first hypothesis as well as using control groups and conducting an equality of coefficients test when investigating the second hypothesis. Further, we want to examine if our choice of CSR variable could have an effect on our results. Therefore, we re-run our regression with a more aggressive CSR variable where we focus on the more extreme values. We reconfigure our CSR measure so that the upper 25% of companies based on CSR score gets graded as 1, the lower 25% grades -1 and the middle 50% grades 0. Thus, the CSR variable changes from a continuous scale to a discrete scale. In other words, only the top 25% and bottom 25% of companies with regards to CSR score will drive the result in this regression. The CSR variable in this regression has a low correlation with our control variables and therefore there is no need for an adjusted variable as in sections 5.2 and 5.3. We name this variable *CSRExt*.

Dep. Variable =	*Expected sign*	(1) ***NCSKEW**$_t$*	(2) ***DUVOL**$_t$*
$CSRExt_{t-1}$	-	0.000	0.009
		(0.025)	(0.013)
$DTURNOVER_{t-1}$	+	-0.215**	-0.113**
		(0.086)	(0.045)
MB_{t-1}	+	-0.015***	-0.005**
		(0.004)	(0.002)
$SIZE_{t-1}$	+	0.017	0.005
		(0.012)	(0.006)
LEV_{t-1}	-	-0.086	-0.036

		(0.123)	(0.064)
ROA_{t-1}	+/-	0.036	-0.019
		(0.152)	(0.080)
RET_{t-1}	+	-1.736***	-0.955***
		(0.045)	(0.024)
$SIGMA_{t-1}$	+	19.660***	12.450***
		(2.652)	(1.345)
$ABACC_{t-1}$	+	0.130	0.115
		(0.233)	(0.122)
$NCSKEW_{t-1}$	+	0.129***	
		(0.021)	
$DUVOL_{t-1}$	+		0.121***
			(0.022)
Constant		-0.031	-0.061
		(0.122)	(0.064)
N		684	684
Adj. R^2		0.739	0.755

Notes: Standard errors in parentheses. * statistical significance at 10% level.
** statistical significance at 5% level. *** statistical significance at 1% level.

Table 10 - Results from regression in Nordic countries with extreme CSR variable

Table 10 provides the results from the test in section 5.2 with *CSRExt* as our CSR variable. From the results it is evident that *CSRExt* is insignificant when paired with our control variables in this model. Thus, our data does not support that there is an association between firms' CSR score and stock price crash risk even when emphasising the extreme values. Thereby we do not find that a higher CSR level is associated with either more transparent financial reporting or less transparent financial reporting even when the extreme values are emphasised. The significances of our control variables in this model are comparable to those in section 5.2. Further, the choice of crash risk measure does not impact the association between CSR and stock price crash risk as the results from the tests are similar.

Dep. Variable =	*Expected sign*	Sweden & Finland			
		NCSKEW$_t$	*Pre-regulation* ***DUVOL$_t$***	***NCSKEW$_t$***	*Post-regulation* ***DUVOL$_t$***
CSRExt$_{t-1}$		-0.025	-0.012	0.008	0.015
		(0.047)	(0.023)	(0.032)	(0.017)
DTURNOVER$_{t-1}$	+	-0.178*	-0.091*	0.710***	0.382***
		(0.101)	(0.050)	(0.256)	(0.141)
MB$_{t-1}$	+	-0.023**	-0.010**	-0.010	-0.004
		(0.010)	(0.005)	(0.007)	(0.004)
SIZE$_{t-1}$	+	0.012	0.003	0.012	0.002
		(0.023)	(0.011)	(0.016)	(0.009)
LEV$_{t-1}$	-	-0.119	-0.064	0.068	0.079
		(0.252)	(0.124)	(0.198)	(0.109)
ROA$_{t-1}$	+/-	-0.039	-0.057	0.051	-0.110
		(0.267)	(0.132)	(0.310)	(0.170)
RET$_{t-1}$	+	-1.862***	-1.003***	-1.705***	-0.943***
		(0.106)	(0.053)	(0.054)	(0.030)
SIGMA$_{t-1}$	+	14.430***	10.980***	40.660***	21.900***
		(4.559)	(2.109)	(4.755)	(2.605)
ABACC$_{t-1}$	+	0.202	0.006	0.055	0.207
		(0.545)	(0.269)	(0.330)	(0.181)
NCSKEW$_{t-1}$/DUVOL$_{t-1}$	+	0.131***	0.157***	0.081***	0.025
		(0.049)	(0.059)	(0.028)	(0.029)
Constant		0.087	0.019	-0.192	-0.140
		(0.227)	(0.112)	(0.163)	(0.089)
N		242	242	242	242
Adj. R^2		0.686	0.725	0.844	0.848

Notes: Standard errors in parentheses. * statistical significance at 10% level. ** statistical significance at 5% level. *** statistical significance at 1% level.

Table 11 - Results from regression pre/post-regulation in Sweden and Finland with extreme CSR variable

Dep. Variable =	*Expected sign*	**Denmark & Norway**			
		NCSKEW$_t$	*Pre-regulation* ***DUVOL$_t$***	***NCSKEW$_t$***	*Post-regulation* ***DUVOL$_t$***
CSRExt$_{t-1}$		-0.042	-0.020	0.028	0.001
		(0.072)	(0.035)	(0.076)	(0.003)
DTURNOVER$_{t-1}$	+	-1.716***	-0.814***	1.440	1.347*
		(0.584)	(0.287)	(1.209)	(0.745)
MB$_{t-1}$	+	-0.004	0.000	-0.002	0.002
		(0.010)	(0.005)	(0.010)	(0.006)
SIZE$_{t-1}$	+	0.011	0.014	0.004	0.007
		(0.038)	(0.019)	(0.039)	(0.024)
LEV$_{t-1}$	-	-0.078	-0.122	-0.210	-0.087
		(0.289)	(0.141)	(0.277)	(0.171)
ROA$_{t-1}$	+/-	0.055	-0.013	0.163	0.077
		(0.492)	(0.242)	(0.348)	(0.214)
RET$_{t-1}$	+	-1.600***	-0.795***	-1.500***	-0.839***
		(0.195)	(0.095)	(0.109)	(0.067)
SIGMA$_{t-1}$	+	4.003	6.190**	35.190***	19.530***
		(6.114)	(2.834)	(7.773)	(4.701)
ABACC$_{t-1}$	+	0.609	0.209	-0.093	0.074
		(0.526)	(0.260)	(0.523)	(0.320)
NCSKEW$_{t-1}$ /DUVOL$_{t-1}$	+	0.340***	0.359***	0.133**	0.133**
		(0.073)	(0.079)	(0.054)	(0.061)
Constant		-0.020	-0.167	-0.173	-0.241
		(0.391)	(0.192)	(0.406)	(0.251)
N		100	100	100	100
Adj. R^2		0.693	0.702	0.775	0.740

Notes: Standard errors in parentheses. * statistical significance at 10% level. ** statistical significance at 5% level. *** statistical significance at 1% level.

Table 12 - Results from regression pre/post-regulation in Denmark and Norway with extreme CSR variable

Table 11 and Table 12 provides the results from the test in section 5.3 with *CSRExt* as our CSR variable. Evidently so, the insignificant association between CSR and stock price crash risk

remains when testing the extreme CSR variable. Also, there is still no difference in association between our pre-regulation and post-regulation sample in Sweden and Finland. When analysing our control group of companies from Denmark and Norway, no significant association between CSR and stock price crash risk is evident in any of the clusters. The significances of our control variables are comparable to those in section 5.3.

Sample	Crash variable	Null hypothesis	X^2-statistic	p-value	Conclusion
Sweden & Finland	*NCSKEW*	$\beta_{CSRExt(pre)} - \beta_{CSRExt(post)} = 0$	0.290	0.591	Don't reject H_0
Sweden & Finland	*DUVOL*	$\beta_{CSRExt(pre)} - \beta_{CSRExt(post)} = 0$	0.750	0.385	Don't reject H_0
Denmark & Norway	*NCSKEW*	$\beta_{CSRExt(pre)} - \beta_{CSRExt(post)} = 0$	0.440	0.508	Don't reject H_0
Denmark & Norway	*DUVOL*	$\beta_{CSRExt(pre)} - \beta_{CSRExt(post)} = 0$	0.130	0.721	Don't reject H_0

Notes: β is the estimated coefficient from the regression in 4.3.
X^2-statistic is calculated as the difference between the coefficients divided by their combined standard error.
Null hypothesis refers to the null hypothesis of the equality of coefficients test.

Table 13 - Results from equality of coefficients test on the impact of mandatory CSR disclosure regulation on association with an extreme CSR variable

In table 13 the results from our equality of coefficients test with an extreme CSR variable are disclosed. Just as in section 5.3 we cannot reject that the difference between the coefficients is zero in our Swedish and Finnish sample. The same results are found with both the aggressive and conservative crash measure, and in the Danish and Norwegian sample where the effect is expected to be zero. This suggests that the enactment of new CSR regulation did not affect the association between CSR and stock price crash risk, even when a CSR variable that emphasises the extreme values is used.

Thus, our data does not suggest that the introduction of mandatory CSR disclosure regulation had an impact on the association between CSR and stock price crash risk even when an extreme CSR variable is used. As in section 5.3 our results with an extreme CSR variable supports the view that mandatory CSR disclosure regulation has no impact on the association. With regard to the robustness of our test results, the results from using an extreme CSR measure validates that our initial test is reliable.

6. Discussion

In the results section it is apparent that there is a lack of effects of CSR on stock price crash risk in our Nordic setting. This suggests that a higher level of CSR is neither associated with lower bad news hoarding and more transparent reporting nor is it associated with managers pursuing personal benefits and more opaque reporting. This section aims to discuss alternative explanations for these results. First, we could not reject *null hypothesis 1* that there is no support for an association between corporate social responsibility and stock price crash risk in our sample. Our results are in line with the findings in Jie and Nakajima's (2015) Japanese sample and Utz's (2017) Japanese sample but contradictory to for example Kim et al.'s (2014) American sample. Assuming that lack of accounting transparency and bad news hoarding are the drivers for stock price crash risk to arise, our setting may have expressed particularly high transparency overall, leading to a weaker association. In fact, the Nordic region has been documented as having high accounting transparency overall as a consequence of societal emphasis on transparency and high availability of information (Iribarren, 2016; Jin and Myers, 2006; Lekvall et al., 2009; Potter, 2020; U.S. News & World Report, n.d.). This means that CSR disclosure would be a less suitable proxy for financial reporting quality than in low-transparency regions and reduce its signalling value. Further, as our results do not support either of the theories on stock price crash risk it raises the question if CSR is a fitting predictor for bad news hoarding in highly transparent countries.

Moreover, Kim et al. (2014) argue that the negative relationship between CSR and stock price crash risk is only evident in companies with less effective corporate governance (e.g. low corporate governance score on MSCI ESG and CEO being Chairman of the Board). However, the Nordic countries are associated with effective corporate governance. For example, Colin Mayer (Peter Moores Professor of Management at Saïd Business School, University of Oxford) says in the book *The Nordic Corporate Governance Model* that the "Nordic countries are … currently upheld as a model for good corporate governance around the world." (Lekvall, 2014, back cover). Further, a CEO is not able to be the Chairman of the Board in these countries (Lekvall et al., 2009). As a result of the effective corporate governance, the CSR effect should be non-prevailing, as shown in our results.

Another possible explanation for our lack of effects is that the spread in CSR quality is too low within the countries examined when compared to studies on other regions. Since the Nordic

countries are in top in global CSR reporting and performance (RobecoSAM, 2018; Potter, 2020) even companies with poor CSR rating in our sample when comprised to *CSR_SCORE* may have a relatively high performance compared to companies in regions explored in prior related studies. Thereby, the actual CSR quality (i.e. the one we try to proxy by our CSR score in this study) spread in our sample companies may not be large enough to conclude an effect on the stock price crash risk. In other words, our CSR score might overstate the spread in CSR quality across our sample. This would yield a weaker association between CSR and stock price crash risk, when proxied by our CSR scores.

Second, we could not reject *null hypothesis 2*, that the introduction of mandatory sustainability disclosure regulation has no impact on the relationship between CSR and stock price crash risk in listed Swedish and Finnish firms. This result is contradictory to Dai et al.'s (2019) Chinese sample as well as Tang and Zhong's (2019) global sample. As described above, this could be explained by the high accounting transparency, good corporate governance and high CSR level overall in Sweden and Finland. Moreover, this could be a consequence of the sample consisting of predominantly large and listed Swedish and Finnish companies disclosing CSR both pre- and post-regulation. These firms may only have to revise their non-financial statements slightly or not at all when faced with mandatory pressure, reducing the effect of the regulation on their behaviour and the association, which would be in line with Tang and Zhong's (2019) reasoning. Additionally, mandatory CSR regulation's lack of impact on the association could be explained by companies losing out on the signalling effect of CSR post regulation. Companies that were notoriously high performers in CSR pre regulation might lose their competitive edge in CSR and their transparency signalling since all companies are obliged to disclose extensive CSR information. Thus, these companies would have less incentives to keep their high performance after the regulation became effective and may therefore choose to only comply with the legislation. This effect is seen in our CSR scores as no country experiences a large, lasting increase in their upper quartile CSR scores while simultaneously the standard deviation of the sample decreases post regulation. Ergo, no positive effect on the CSR scores comes from the regulation, and the impact of the regulation on the association between CSR and stock price crash risk remains weak.

7. Future Research

In this paper, we have examined the relationship between CSR and stock price crash risk among listed Nordic firms as well as examined a potential impact of mandatory CSR disclosure

regulation on the association in Sweden and Finland. While conducting this study, we have identified certain areas connected to our study that could serve as suggestions for future research.

The timeframe of our study was restricted to 2014-2019 as a consequence of the data that was available in the Resility database. Furthermore, the majority of companies included in the Resility database are large listed Nordic firms. The increased focus on CSR as well as the mandatory CSR regulation will most likely result in more extensive CSR data for future research as time passes. This will enable one to obtain a much larger sample with smaller firms making it possible to examine a relationship between CSR and stock price crash risk with these firms included. Could it for example be that an inclusion of a much larger sample of smaller firms sheds new light on the association overall?

As time passes, the data on firm-specific CSR that is affected by the new EU Directive will also become more comprehensive which will enable one to examine potential nuances of the effect of the Directive in Sweden, Finland and Denmark. For example, Dai et al. (2019) find an inverted U-shaped nonlinear relationship between CSR and stock price crash risk in China, where CSR disclosure has been mandatory since 2008 for certain Chinese firms, when sustainability disclosure is mandatory.

Lastly, the CSR measures in prior research vary making comparison of results not entirely flawless. For researchers that have access to other CSR databases on Nordic companies than Resility, a similar study to ours could be conducted with the new database to shed further light on the association between CSR and stock price crash among Nordic companies.

8. Conclusion

This study investigates whether companies' engagement in corporate social responsibility contributes to or helps lowering their stock price crash risk in a Nordic setting. The study also examines the impact in Sweden and Finland of the mandatory sustainability disclosure regulation that came into effect in fiscal year 2017 in these countries. On the one hand, it is expected that firms with a higher level of CSR are more transparent and engage less in bad news hoarding, lowering their stock price crash risk. On the other hand, managers might use CSR as a means to pursue own agendas and hoard bad news leading to an increased stock price crash risk. Using a model derived by Kim et al. (2014), we examine the relationship between

CSR and stock price crash risk and control for predictors of stock price crash risk found in prior related studies. We find no support for an association between CSR and stock price crash risk in listed Nordic companies. Our findings are consistent with related studies in a Japanese setting (Jie & Nakajima, 2015; Utz, 2017). The results are robust to tests with both an aggressive and conservative crash risk measure, and a CSR variable that emphasises extreme levels of CSR. We further discuss that the lack of association could be attributed to the overall high level of accounting transparency, good corporate governance and high overall CSR level in our Nordic setting.

With regards to the introduction of mandatory sustainability disclosure regulation in Sweden and Finland there are three views. An introduction of such regulation could lead to a positive, negative, or no effect on the association between CSR and stock price crash risk. This is examined by using the same model, controlling for an association both pre- and post-regulation and determining if the regulation has an impact on a possible difference between the two time periods. We do not find evidence that supports that implementation of mandatory sustainability disclosure regulation has an impact on the association between CSR and stock price crash risk. These results are contradictory to prior studies in Chinese and global settings. However, our results are in line with one of the aspects, that mandatory CSR disclosure has no impact on the association, presented by Tang and Zhong (2019). The results are robust to tests with both an aggressive and conservative crash risk measure, a control group, and a CSR variable that emphasises extreme levels of CSR. Again, we argue that the lack of impact might be due to the overall high financial reporting transparency, effective corporate governance and overall high CSR level in our Swedish-Finnish setting. We furthermore reason that the lack of impact might also be due to the sample firms not having to amend their CSR disclosure patterns, in line with Tang and Zhong's (2019) reasoning, and a reduction in signalling effect from the regulation reducing the incentives for companies to perform better than required by law.

Our study is, to the best of our knowledge, the first to focus on the association between CSR and stock price crash risk in a Nordic setting, and the first to examine the impact of mandatory sustainability disclosure regulation following the EU Directive from 2014. Further, we hope that our study will shed additional light on CSR's ability to predict stock price crash risk on financial markets.

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Appendix

Table of CSR Metrics

Metric	Methodology
CEO/Chair/Executive Sustainability Statement	Standard
Environmental Policy and Assessment	Standard
Targets associated with Environmental Performance	Standard
Steps taken to reduce negative environmental impact	Standard
Board of Directors responsible for ES performance	Standard
Board compensation linked to ES performance	Standard
Senior Executives responsible for ES performance	Standard
Senior Executive compensation linked to ES performance	Standard
Senior Executive with Core Business Background in charge of ESG	Standard
ES responsibility at the divisional level	Standard
External audit of ESG reporting	Standard
Reporting on male/female pay equality	Standard
Equal Opportunity Policy or Statement	Standard
Training & Education policy for employees	Standard
Health & Safety Policy	Standard
Health & Safety Risk Assessment	Standard
Pandemics Policy	Standard
Supplier Guidelines	Standard

For all: if N/A then not included in firm-specific total score and max score. Standard: Y = 2, N = 1, ND = 0. Nom. Com. = Nomination Committee

Table of CSR Metrics continued

Metric	Methodology
Disclosure of Supplier Evaluation Procedures	Standard
Supplier assessment for labor practices	Standard
Supplier assessment for environmental impact	Standard
Whistleblower mechanisms / hotlines	Standard
Anti-Corruption Policy, including extortion and bribery	Standard
Human Rights Policy or Statement	Standard
Code of Conduct / Ethics Policy	Standard
Social impact assessments on local communities	Standard
Local community development programs	Standard
Chairman of the Board Independent of Company and Senior Management	Standard
Chairman of the Board Independent of Major Shareholders	Standard
Percent Independent Directors on Audit Committee	ND = 0, otherwise Percent Independent Directors on Audit Comittee is multiplied by 2
GRI Compliance	Standard
GRI External Assurance	Standard
Total Energy Consumption (GJ)	For all supersectors, sales-scaled, compared with supersector mean, ND = 0, scaled obs. < mean = 2, scaled obs. > mean = 1
Increased usage of renewable energy	Standard
Disclosure of raw material consumption	Standard
Targets associated with Efficient use of Resources	Standard

For all: if N/A then not included in firm-specific total score and max score. Standard: Y = 2, N = 1, ND = 0. Nom. Com. = Nomination Committee

Table of CSR Metrics continued

Metric	Methodology
Total Water Withdrawal (1000 cubic meter)	For relevant supersectors, sales-scaled, compared with supersector mean, ND = 0, scaled obs. < mean = 2, scaled obs. > mean = 1
Disclosure of Water Discharges	For relevant supersectors, Y=1 otherwise 0
Total GHG Emissions (kilotonnes)	For relevant supersectors, sales-scaled, compared with supersector mean, ND = 0, scaled obs. < mean = 2, scaled obs. > mean = 1
Transportation Emissions (CO2, NOx, CO, HC, SO2, CH4, particulates in kilotonnes)	For relevant supersectors, sales-scaled, compared with supersector mean, ND = 0, scaled obs. < mean = 2, scaled obs. > mean = 1
Senior Executive without Core Business Background responsible for ESG	Y = 1, otherwise 0
Total salaries and remuneration expense (MEUR)	Y = 1, otherwise 0
Number of female employees	ND = 0, divided by total employees, sample mean comparison, scaled obs. > mean = 2, scaled obs. < mean = 1
Number of full-member females on the Board	ND = 0, divided by total members on the Board, sample mean comparison, scaled obs. > mean = 2, scaled obs. < mean = 1
Training & Education spending (hours/employee)	Compared with sample median for each year, ND = 0, obs. > median = 2, obs. < median = 1
Accidents per millions of hours worked (LTI)	For relevant supersectors, compared with supersector mean, ND = 0, obs. < mean = 2, obs. > mean = 1
Number of fatalities of employees and contractors on the job	For relvant supersectors, divided by total employees, supersector mean comparison, ND = 0, scaled obs. < mean = 2, scaled obs. > mean = 1
Disclosure of % Suppliers visited and audited	Y = 1, otherwise 0
Community Investments as percent of Sales	ND = 0, commun. invest. > 0 = 2, commun. invest. disclosed but equal to zero = 1
Number of Nom. Com. Board members, indep. of company and major shareholders	ND = 0, divided by total Nom. Com. Board members, percentage added with 1
Audit Fees (MEUR)	ND = 0, divided by sales, compared with sample mean / median each year, scaled obs. > mean / median = 2, scaled obs. < mean / median = 1
Board Duration Years	Y = 1, otherwise 0

For all: if N/A then not included in firm-specific total score and max score. Standard: Y = 2, N = 1, ND = 0. Nom. Com. = Nomination Committee