

DISCLOSURE OF GOODWILL IMPAIRMENT-TESTING IN A TIME OF GREAT UNCERTAINTY

A STUDY ON LARGE PUBLIC EUROPEAN FIRMS

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Master Thesis

Stockholm School of Economics

2021



Disclosure of Goodwill Impairment-Testing in a time of Great Uncertainty - a Study on Large Public European Firms

Abstract:

In this paper, we investigate firms' disclosure quality of goodwill impairment-testing under IAS 36, and whether it changes when there is a sudden increase in uncertainty in the macroeconomic environment, as experienced during the Covid-19 crisis in 2020. We define disclosure quality as the transparency in the reporting of the goodwill impairment-testing process and we proxy this as the width of information components disclosed under IAS 36. Using an index to measure disclosure quality, we further differentiate between two types of impairment-testing disclosures, prospective and descriptive. The former relates to disclosure items that provide information on valuation estimates and other management assumptions, and the latter relates to information such as descriptions of the standard and the impairment-testing procedure. Furthermore, we analyse if there is a difference in firms' change in disclosure quality during the crisis depending on to what degree they have experienced heightened uncertainty regarding their future operations. Based on a sample of large publicly traded European firms reporting under IFRS, studying the period 2018-2020, we find evidence suggesting that the total disclosure quality of goodwill impairment-testing increased during the Covid-19 crisis. The result seems to be driven by an increase in prospective disclosures, and not descriptive disclosures, as we only find an association between prospective disclosure quality and the crisis year. Furthermore, the results indicate that the observed association apply to all firms, regardless of to what degree they have been impacted by the crisis.

Keywords: Disclosure quality, Goodwill, Impairment-testing, IAS 36, Crisis

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Acknowledgements: We would like to extend our gratitude to our tutor Ting Dong for guidance and support throughout the process of writing this thesis.

Master Thesis

Master Program in Accounting, Valuation and Financial Management
Stockholm School of Economics

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1. Introduction

Growth through acquisitions has become increasingly common over the years (Institute for Mergers, Acquisitions and Alliances, 2021), which has resulted in the values of goodwill in companies' balance sheets to grow in magnitude and importance during the last decades. Simultaneously, there has been a shift in the accounting for, and the subsequent valuation of goodwill, as the International Accounting Standards Board (IASB) issued the revised International Accounting Standard No. 36 'Impairment of assets' (hereafter IAS 36) in 2004. The revised standard requires annual impairment test for goodwill, as opposed to the straight-line amortization method previously used under IFRS. The IASB's motive was to implement an accounting regime that better depicts the underlying value of firms' goodwill capital to increase the information usefulness of the related impairment charges for the users of the financial statements. Under the revised IAS 36, firms' management were assumed to be better equipped to transfer their private information of the projected future value of the combined entity into public information, using valuation models that incorporate management's own estimates. The related disclosures that firms were stipulated to provide in conjunction with the impairment-testing was further emphasised to have the important role of supporting the relevance and reliability of those models, as noted in the basis for conclusion of IAS 36.

However, critique has been raised regarding the impairment-testing of goodwill and many question the quality of the information that the impairments are conveying. Additionally, users of financial reports have communicated that the disclosures are insufficient to evaluate the performance of acquired businesses. This is due to the large amount of management discretion allowed within the standard, as the impairment-testing highly relies on management estimates and plans for the future. It has therefore been argued that the timing of impairment recognition can be subject to management's own interests, rather than truthfully depicting the evaluated value of firms' goodwill, which has also been suggested in empirical findings (Beatty & Weber, 2006; Ramanna & Watts, 2012; Mazzi et al., 2016). Moreover, IAS 36 has been argued to be a complex standard with limited guidelines on its application, which has led the practical implementation of goodwill impairment-testing (hereafter GWIT) to be widely disperse across companies (Petersen & Plenborg, 2010). Furthermore, as goodwill is not a separately identifiable asset, and hence, cannot easily be compared with other similar assets, it is difficult for outsiders to independently assess the value of goodwill. Therefore, the reporting of goodwill balances calls for qualitative and relevant disclosures in order for managers to communicate their apprehension of the future prospects of the combined entity, and thereby decrease the information asymmetry relating to their goodwill capital between themselves and external stakeholders (Healy & Palepu, 2001).

During a crisis when uncertainty regarding the future is high and the future prospects of a firm become less predictable, assessments of future cashflows and other inputs needed

for GWIT valuation models are more challenging to determine than during normal times (Kumar & Tokar, 2020). Thus, it requires management to be even more comprehensive and transparent in communicating assumptions and estimates made (Lahiri & Sheng, 2010; Kumar & Tokar, 2020). Consequently, in this paper we aim to investigate firms' disclosure quality of GWIT under IAS 36, and whether it changes as there is a sudden increase of uncertainty in the macroeconomic environment, as experienced during the Covid-19 crisis in 2020. We define disclosure quality as the transparency in the reporting of the GWIT process including the related estimates and assumptions made by management.

Previous research find that users of financial reports argue that managerial discretion allowed under the impairment-testing regime has made the associated disclosures of the tests even more important in order to monitor the veracious value of firms' goodwill (Schatt et al., 2016). However, the practical application of IAS 36 and the quality of firms' disclosures have been found to be widely disperse and external stakeholders have expressed a need for improvement in firms' GWIT disclosures (Petersen & Plenborg, 2010). From the firms' perspective, the choice of disclosure policy can be viewed as an optimizing challenge, weighing potential benefits against the increased cost of added disclosures (Malone et al., 1993). Increased disclosures in general, and of impairment of non-current assets under IAS 36 in particular, have been found to for example decrease firms' cost of capital due to improved transparency. On the other hand, it is typically associated with additional costs, such as processing costs (Foster, 1986) and proprietary costs (Verrecchia, 1983). Furthermore, building on economic disturbance theory (Gort, 1969), prior research has shown that a shock to the macroeconomic environment has the potential to impact the financial reporting behaviour of firms (Sutthachai & Cooke, 2009), suggesting that it can alter the way in which firms weigh the benefits and cost of their disclosure in this aforementioned optimization challenge.

For example, Krause et al. (2017) find that while the *quantity* of German firms' voluntary forward-looking disclosures increases, the *content quality* of the provided information decreases during the 2008 global financial crisis (GFC). On the other hand, Sutthachai & Cooke (2009) report that Thai listed firms improved their disclosure level of both mandatory and voluntary items in the 1997 Asian crisis, a fact they partly interpret as an effect of the shift in regulatory forces that Thailand experienced at the time, with increased inflow of foreign capital. Closely related to the scope of our research, Bepari et al. (2014) investigate how compliance of GWIT disclosures under IFRS and AASB 136 change during the 2008 GFC, and what impact different firm characteristic have in both the pre-crisis and crisis period. Looking solely at Australian firms', they find that firms' disclosure levels increase in the crisis year and that audit quality, goodwill intensity, size and profitability are determinates for firms' compliance with disclosures of GWIT. We extend their study by investigating what type of disclosures (prospective and descriptive) that potentially change during times of high uncertainty. Additionally, we go one step

further by investigating whether firms' individual degree of exposure to the shock shows a relation with their disclosure behaviour.

Our paper adds to the literature on disclosure quality, and more specifically, the research investigating firms' applications of GWIT and their related disclosures. Furthermore, we add to previous literature by looking at how this aforementioned disclosure behavior changes in certain settings, i.e. what impact external factors can have on firms' disclosure quality. Lastly, our paper adds to the knowledge of what effect a highly uncertain macroeconomic environment can have on the information distribution between firm insiders and outsiders, as in line with economic disturbance theory. Our results should be of interest to IFRS regulators and can contribute to the discussion regarding the difficulties in the application of IAS 36 and the complexities implied in the standard. Further, our results should be of interest to users of financial reporting information as well as auditors, to get a better understanding of how the disclosure quality relating to goodwill impairments change during times of extreme uncertainty.

In the next section we provide the institutional background which present the development and main features of IAS 136, as well as implications from the Covid-19 crisis. In section 3 we discuss the related literature and develop the hypotheses. Section 4 presents our research design, including how we measure GWIT disclosure quality, how we assess Covid impact and the regression model specifications. Further, it presents the sample selection process and the data used in the tests. In section 5, we present the empirical findings and discuss the implications of these. Finally, section 6 presents the concluding remarks.

2. Institutional Background

In the following section we review the development and requirements of the accounting of firms' goodwill under IAS 36, as well as the implications of increased uncertainty on the application of the standard.

2.1. Development of the revised IAS 36

In March 2004, the IASB issued the revised IAS 36, which applies to, inter alia, goodwill acquired in business combinations and intangible assets. The standard introduced, among other things, the impairment-test-only approach in the form of annual impairment tests to determine whether the value of acquired goodwill can be supported, or if an impairment is due. The standard, which is the current standard in power, replaced the previous standard under which goodwill was amortized linearly over its estimated useful life.

The motives for implementing the new standard were, partially, that regulators wanted to seek international convergence in the accounting for business combinations and the subsequent accounting for goodwill and intangible assets. IAS 36 was implemented subsequently to the adoption of SFAS 142 – Goodwill and Other Intangible Assets, which was issued by the Financial Accounting Standards Board (FASB) in 2001 and applies under US GAAP. Even though the requirements of SFAS 142 and IAS 36 are not identical they are similar in many aspects, which allows for findings of the effects following the implementation of the two standards to be used relatively interchangeably.

In addition to the goal of converging the accounting, and perhaps more central, was the idea that the impairment-only approach under the revised IAS 36 better allows managers to provide useful information to users of the financial statements about the firm's future earnings growth and cash flows, than what the previous amortization approach did. It was argued that the impairment-only approach of goodwill would be more transparent, given an adequate impairment-testing procedure and appropriate disclosure of information (International Accounting Standards Board, 2015). Due to the nature of the impairment tests, which heavily rely on management estimates, reliability and relevance were emphasized as two key characteristics that the information presented in the disclosures related to the GWIT must possess to be useful for economic decision making, as stated in paragraph 198 of the basis for conclusion for IAS 36.

2.2. Requirements of IAS 36

In order to achieve the increased information usefulness under the new impairment accounting regime, many have argued that the revised IAS 36 has been associated with a substantial increase in complexity for preparers of the financial reports. The monitoring

and reporting of firms' goodwill capital under IFRS now stipulates a comprehensive list of requirements for preparers to fulfil.

The main purpose of IAS 36 is to ensure that an entity's non-current assets in the financial statements is not carried at an amount higher than its recoverable amount, in which case an impairment loss needs to be recorded in the income statement (IAS 36, §59-61). If an impairment of goodwill has been made, it cannot be reversed in subsequent years (IAS 36, § 124). Following an acquisition, goodwill must be allocated to one or several of the acquirer's cash generating units (CGU) or group of CGUs (IAS 36, § 80), which is the smallest identifiable group of assets that generates independent cash flows (IAS 36, § 68). The impairment-testing of goodwill is made by considering the recoverable amount of each CGU, to which goodwill is allocated, separately (IAS 36, § 88-90), and forecasts and estimates should be specific to each CGU. The recoverable amount is measured as the higher of value in use and the fair value less costs of disposal¹ (IAS 36, §18). Value in use is calculated as the present value of future cash flows that can be expected to be generated from a CGU, and fair value can be calculated based on, e.g., observable prices, multiples or discounted cash flow analysis². Calculations often require management to make a significant number of estimates e.g., future cash flows, discount rate, growth rate, forecast period, terminal value. IAS 36 provides some guidance on how to make these estimates, e.g., estimates of future cash flows must be reasonable and verifiable, a lot of consideration must be given to external factors, cash flow predictions must be based on the latest, by management, decided budgets and prognosis, the discount rate should incorporate the time value of money and the price of the uncertainty inherent in the assets future cash flows, etc (IAS 36, § 30-57). Despite some guidelines from the standard, the impairment-testing still provides substantial discretion for managers.

Additionally, there are requirements specifically governing the comprehensiveness and content of the disclosures presented in relation to the firms' GWIT, as presented in paragraphs 126-137 of IAS 36. The disclosure requirements mandate firms to, among other things, report the events and circumstances that led to an impairment, the method or methods used for determining recoverable amounts, the key assumptions used in the impairment-testing and explanations of managements' approach to determining those key assumptions. For instance, for recoverable amounts estimated through value in use, an entity must disclose estimates of future cashflows including assumption and sources used for determining those cash flows, the detailed forecasting period, growth rates used for the extrapolation period, the discount rate used and details on how it was determined. The estimates must be presented for each CGU, or group of CGUs, to which a significant amount of goodwill is allocated, separately. Where a reasonable change in key assumption would lead to impairment, entities are required to disclose sensitivity

¹ Also called 'net selling price'

² As a level 3 estimate in the fair value hierarchy

analysis. Additionally, firms must disclose the amount of goodwill allocated to each CGU or group of CGUs.

Firms are thus required to perform the task of estimating and presenting the valuation of their goodwill, which infer substantial uncertainty as it involves forecasting and predicting the future outcome of the combined entity. Meanwhile, preparers are not always obtaining much guidance from the standard on how to best execute this task.

2.3. The Covid-19 crisis and the implications on goodwill impairment-testing and disclosures

Impairment-testing of goodwill involves the difficult task of forecasting the future, which is further complicated when the future suddenly becomes highly uncertain. Early in 2020, the new virus Covid-19 started spreading over the world, and as of March 11th 2020 the World Health Organization (2021) officially assessed that Covid-19 should be classified as a global pandemic. The pandemic resulted in severe macroeconomic turbulence as many countries implemented lockdowns and closed part of their society for an unknown period of time. Additionally, numerous businesses had to constrain or completely cease their operations and many people became furloughed or unemployed worldwide. The Covid-19 crises brought with it a lot of uncertainty regarding the future as no one could tell how long the pandemic would last and how much it would come to affect the economy, both short- and long-term. Despite the difficulty in predicting how the crisis would evolve and what impact it would have on firms' future operations, preparers of financial reporting were still left with the difficult task of attempting to estimate the value of their goodwill balances.

Partially addressing this difficulty, is the published article by members of IASB, which provides an overview on some considerations needed to be made by preparers and auditors when applying IFRS during the impact of the Covid-19 crises, as well as on how to tackle the complexities that come with it (Kumar & Tokar, 2020). The article depicts the views of an interdisciplinary panel on 'Applying IFRS Standards in 2020-impact of covid-19' at the IFRS Virtual Conference 2020. They state that even though the uncertain environment caused by Covid-19 makes GWIT more difficult and challenging for entities, estimates still need to be updated and based on the best reasonable information available at the time. They further note that management should have a robust impairment-testing process and well-reasoned estimates to avoid the risk of being second guessed. The views of the panel is further supported by that of auditors, who urge preparers to use extra precaution and thoroughness in the GWIT process, as a consequence of the high uncertainty caused by the crisis (EY, 2020; Deloitte, 2020; PwC, 2020), and they further emphasise the increased importance of high quality disclosures. E.g., EY states;

“The more the current environment is uncertain, the more important it is for the entity to provide detailed disclosure of the assumptions taken, the evidence they are based on and the impact of a change in the key assumptions (sensitivity analysis). Given the inherent level of uncertainty and the sensitivity of judgements and estimates, disclosures of the key assumptions used and judgements made in estimating recoverable amount will be particularly important.” (EY, 2020)

Ultimately, as the impairment-testing of goodwill has generally become even more complicated in 2020, the view from supervisory bodies is that it requires even more transparency, and therefore firms are encouraged to provide detailed and qualitative disclosure content.

3. Related literature and hypothesis development

In the following section we review the bodies of research that are most relevant to the scope of our study and that serves as a background for the motivation of our hypotheses. First, we will review the research area covering the problem of information asymmetry between firms and external stakeholders and how it relates to firms' goodwill capital. Next we review the research area investigating the benefits and costs for firms to provide disclosures. Afterwards, we provide a summary of the literature mapping information usefulness of goodwill impairments, and their associated disclosures, to users of financial reports. Finally, we discuss empirical findings from previous crisis and their impact on firms' financial reporting behavior and present our hypotheses.

3.1. Information asymmetry in goodwill capital and evidence of the effects of managerial discretion in related impairment-testing

Many would argue that the need for financial reporting and corporate disclosure stems from the information asymmetry and agency conflicts between firms' management and outsiders, as firm insiders typically have more information about the firm's quality and future prospects than external stakeholders (e.g. Healy & Palepu, 2001). The concept of information asymmetry was coined by researchers such as Akerlof (1970) who discusses the market of 'lemons' where the discrepancy between buyers' and sellers' information leads buyers to not have the ability to correctly identify high-quality investments from low-quality investments, resulting in adverse selection in the financial market. Apart from the effect of uneven information between the firm and its *prospect* investors, information imbalance between firm insiders and their *existing* investors also increases the risk for adverse principal-agent problems due to the separation of control and ownership commonly prevailing in modern businesses (e.g Leuz & Verrecchia, 2000). The negative effect of this aforementioned separation of control and ownership can manifest itself through actions and decisions of the firm's management, in the form of the agent, to not be in line with the interest of the principal, i.e. the investors. The actions taken by the firm's management in their own self-interest can then be concealed by the lack of complete transparency between the two parties. Research has shown evidence of agency costs stemming from this principal-agent problem (Jensen & Meckling, 1976), such as earnings management, where discretion provided by the financial reporting standards leaves room for opportunistic behaviour by management, allowing them to manage the firm's earnings in line with their own incentives (Healy & Wahlen, 1999).

Looking at goodwill specifically, as described in section 2.2, GWIT is to a high degree dependent on management plans and forecasts, which firm insiders typically possess better information about. Additionally, previous research has suggested that the shift from amortization of goodwill to yearly impairment-testing has substantially increased

management discretion about the amount and timing of goodwill impairments (Petersen & Plenborg, 2010) The standard has also received criticism for being too complex and time consuming for management to implement, leading to a lack of quality and consistency in firms' application of it which limits its effectiveness in providing high quality information (KPMG, 2011; Mazzi et al., 2016). Further evidence have indicated that goodwill impairments are made too late and that management incentives play an important role in the decision to record an impairment or not (Beatty & Weber, 2006; Ramanna, 2008; Ramanna & Watts, 2012).

For example, Beatty & Weber (2006) investigate the accounting choices made by firms at the initial adoption of SFAS-142, and the economic incentives affecting the decision to take a SFAS-142 write off. Their findings suggest that a firm's choice in taking a goodwill write-off or not is influenced by the firm's equity market concerns, debt contracting, bonus, turnover, and exchange delisting incentives. Ramanna & Watts (2012) extend their research by testing, for a sample of firms with market indications of goodwill impairment, whether goodwill non-impairment is associated with proxies for managers private information on positive future cash flows or with agency-based motives such as management interest in increasing compensation and reputation concern connected to a goodwill impairment. They find no evidence to confirm an association between non-impairment and managers private information, but they do find evidence for the agency-based motives. Additionally, they find that goodwill non-impairment increases with firm characteristics, such as the number and size of a firm's business units and the proportion of a firm's net assets that are unverifiable, characteristics that according to predictions made by Ramanna (2008) facilitate discretion under SFAS-142.

The valuation and impairment-testing of goodwill consequently requires a great amount of managerial discretion as it to a high degree depends on managements' plans and predictions for the future. Furthermore, as goodwill is not a separately identifiable asset, and thus, cannot easily be compared with other similar assets, it is difficult for outsiders to independently assess the value of goodwill. These factors combined, indicates that the information asymmetry between firm insiders and outsiders, connected to the firm's goodwill capital, risks being high if firms do not engage in information equating efforts, such as providing high-quality financial disclosures.

3.2. Benefits and costs of financial reporting and disclosures

While Verrecchia (2001) argues there is no central paradigm or core theory in the disclosure research literature, the area has still received much interest from academia. The research literature on disclosure quality has found that financial reporting and disclosures can serve as a way for firm insiders to transform their private information about the firm and its future prospects into public information (eg. Healy & Palepu, 2001). It can also mitigate aforementioned agency costs as capital providers can monitor how their capital

is being used subsequent to an investment (e.g. Jensen & Meckling, 1976; Smith & Warner, 1979; Watts & Zimmerman, 1986).

Building on these findings, a large body of research investigates how financial reporting and disclosure quality can most effectively overbridge the information asymmetry between the firm and the market, and what benefits higher quality disclosure could bring. What defines disclosure quality has somewhat different interpretations within academia. Singhvi & Desai (1971), for example, define it as the completeness, accuracy and reliability of information provided. Similarly, Brown & Hillegeist (2007) describe it as the extent to which “investors have the information necessary to make informed judgments”. We define disclosure quality in a similar manner, but more specifically as the transparency in the reporting of the GWIT process and related estimates and assumptions made by management. While it is difficult to capture quality and transparency of information, we proxy this as the width of information components disclosed under IAS 36, refer further to section 4.1.

In the area of disclosure quality, a large body of research has documented the effect of higher disclosure quality on a firm’s cost of capital. In their review, Beyer et al. (2010) argue that “whether disclosure policies and financial reporting affect a firm’s cost of capital is one of the most interesting questions in the accounting and finance literature”. They suggest that the empirical results are not unanimous, making it difficult to draw concrete conclusions of a statistical and economic linkage between disclosure quality and the cost of capital. With this in mind, there is still a large body of research arguing for an association between the two (Artiach & Clarkson, 2011). Under the assumption that estimation risk, i.e. uncertainty regarding the parameters of the return or process for estimating the cashflows, is priced, a reduction of estimation risk through increased disclosure would reduce a firm’s cost of capital (Brown., 1979; Barry & Brown, 1984). Furthermore, literature on information asymmetry typically focuses on how securities with relatively higher transactions costs, stemming from uneven information between market participants, have a higher cost of capital as investors require a discount on the price for these securities. Research then argues that greater disclosure quality improves the liquidity of securities, which is translated into a lower cost of capital, either due to reduced bid-ask spread (Amihud & Mendelson, 1986) or due to an increase in the overall demand for the firm’s security in the market (Diamond & Verrecchia, 1991).

There are also researchers who have attempted to capture the effect of disclosure quality of goodwill and other non-current assets impairment-testing, specifically, on firms’ cost of capital. Paugam & Ramond (2015) test whether increased impairment-testing disclosure quality, with regard to impairment-testing conducted under IAS 36, reduces cost of equity by looking at a sample of French firms over the period 2006–2009. They find that general impairment-testing disclosure quality is negatively associated with the cost of equity for a specific firm. However, they find that this relationship holds only for prospective disclosures (entity specific or high-effort information that entail information

on management assumptions and reduces information risk) and not for descriptive disclosures that merely contain information on how the impairment-testing is performed and do not reveal any critical information to investors or competitors. Following these results, it seems that relevant and informative disclosures related to estimates and assumptions used in the goodwill-impairment-testing can reduce information asymmetry between firm insiders and outsiders by reducing the estimation risk inherent in an external stakeholder's assessment of a firm's future prospects.

While academia seems to suggest that there are benefits to reap for firms which improve their disclosure quality, the question still remains why there is not full disclosure in the market with complete information symmetry between firm insiders and outsiders. In their review piece, Lundholm & Van Winkle (2006) develop a framework that maps empirical findings under three different types of frictions which affect firms' disclosure outcomes and that aids in explaining why firms might not fully disclose all relevant information; managers 1) do not know what information to disclose 2) do not care about the firm's stock price and its value-maximization 3) are reluctant to disclose information as there are costs associated with the disclosure. The third friction indicates that the choice of disclosure policy includes weighing the benefit of, e.g., achieving a lower cost of capital through the component which carries information asymmetry, against the costs of diminishing incentives, such as proprietary costs (Verrecchia, 1983) and processing costs (Foster, 1986).

Several studies have found evidence suggesting that disclosure quality and quantity tends to increase with firm performance, and vice versa (e.g. Lang & Lundholm, 1993; Miller, 2002), indicating that the costs of full disclosure is only worth suffering when a firm has positive news to reveal. General corporate finance theory consequently predicts that a firm's management, which wants to maximize the value of their firm, will optimize their disclosure quality up until the point where the costs of improved disclosure outweigh the benefits (Malone et al., 1993).

Ultimately, more symmetric information in the market, facilitated through improved disclosure quality, has the potential to benefit firms. However, firms will only want to level out the information between themselves and outsiders, as long as they do not in fact benefit from the prevailing information asymmetry, or find the additional disclosure too costly. Moreover, this rests on the assumption that the firms' management do in fact possess information that is relevant to its users.

3.3. Information usefulness of goodwill impairments and the related disclosures

Being able to predict goodwill impairments is an important input for users to better predict the prospects of firms' future net cash flows and to evaluate the performance of acquired businesses (Accounting Standards Board of Japan (ASBJ) et al. 2014). However, as the

impairment-testing of goodwill involves significant management judgement, an important area of research investigates how investors and other stakeholders use and interpretate the information provided by goodwill impairments and the related disclosures.

Some research show that the information provided by a goodwill impairment is used in analysts' and investors' decision-making (Bens et al., 2011; Li et al., 2011; Chen et al., 2015; Knauer & Wöhrmann, 2016). Through event study analysis, Bens et al. (2011) test the information content of goodwill impairments pre and post the implementation of SFAS 142 and find that impairments of goodwill, on average, carry a significant negative stock market reaction, even though the effect is lower following the implementation of SFAS 142. They further find that the result holds stronger for firms with relatively higher information asymmetry, as proxied by analyst coverage, indicating that the value relevance of goodwill impairments is highest when information asymmetry is high.

Moreover, research also shows that the value relevance of goodwill impairments to investors and analysts depend heavily on the context surrounding the impairment. For example, Knauer & Wöhrmann (2016) find that investors react more negatively to goodwill impairments when a country's level of investor legal protection is low, which they mean would allow for more management discretion in the impairment-testing. Schatt et al. (2016) review the academic literature regarding the association between goodwill impairments and the revision of investors' expectations following an impairment. They find three main factors that seem important for goodwill impairments to be relevant for investors; 1) there is strong information asymmetry between managers and investors, 2) disclosures include detailed information regarding management assumptions about future cashflows, and 3) managers provide reliable information to investors that is free from earnings management. The findings by Schatt et al. (2016) highlight that relevant and reliable disclosures are of great importance.

While the value of the information content of a goodwill impairment seems dependent on the associated disclosures and explanations that are given for the impairment charge, previous studies have documented a great variety in how European firms apply and comply with IAS 36 in aspect to 1) how the impairment-testing is conducted 2) the quality of the disclosures they provide (Petersen & Plenborg, 2010; European Securities and Markets Authority, 2013; Amiraslani et al., 2013; Paugam & Ramond, 2015), and there are conflicting views regarding the usefulness of goodwill impairment disclosures.

There has been criticism raised in regard to users' inability to, based on the disclosures provided in accordance with the requirements of IAS 36, predict when a goodwill impairment is approaching or understand why an impairment has not been made (Hayn & Hughes, 2006; ASBJ et al., 2014). Petersen & Plenborg (2010), using a questionnaire survey, document evidence that there is a large variation in Danish firms' application and implementation of IAS 36 related to GWIT, potentially explained by the difficulty in

interpreting the standard. A study by the European Securities and Markets Regulator (2013) found that goodwill impairment disclosures were generally of descriptive nature and did not include much entity-specific information such as key assumptions used in cash flow forecasts, discount rates, and terminal growth rates as well as details on sensitivity analysis. The latter type of disclosures are those that are generally considered to be relevant forward looking information facilitating users' estimation of future prospects.

The disclosures that firms generally insufficiently provide are the type of disclosures that are viewed as the most useful and relevant for users of the financial statements, facilitating them to estimate a firm's future prospects and reduces information risk (Paugam & Ramond, 2015). In a survey made by EY (2010) of 170 users of financial statements including investors, analysts and lenders, they found that a majority of respondents use the information disclosed in relation to impairment-testing when making investment decisions, and that the especially relevant disclosures are the ones revealing information on management's assumptions. KPMG (2011) made an interview-based study gathering participants' thoughts on the GWIT under IAS 36. Their findings suggest that the information provided by goodwill impairments has a confirmative value rather than a predicting value and that the high degree of subjectivity in GWIT limits its effectiveness. On the contrary, some analysts stated that the disclosures to the impairment-testing was sometimes used as inputs to their own valuations and indicated that they would find more qualitative disclosures useful. Their results indicate that the disclosures paired with the GWIT procedure do provide useful information for investors, but that it could be further improved by increasing information that facilitates estimation of a firms' future prospects.

To conclude, there are conflicting views regarding the information usefulness of goodwill impairments, partially driven by the trust users can put in managers impairment decisions. However, it is evident that the disclosures for GWIT serves an important role in providing useful information to investors, as a complement to the impairments, and provide input to decision. This is especially true when they are interpreted within the context in which they are disclosed, as for example, when information asymmetry is high.

3.4. Evidence from previous crises

There are indications that the general information asymmetry between firms and the market elevates when the uncertainty in the macroeconomy suddenly increases. Empirics suggest that a financial crisis can function as a fundamental economic disruption, which under economic disruption theory is argued to create an information disequilibrium between market participants (Gort, 1969). This can partially be driven by how it, during uncertain times, becomes more difficult to assess a firm's future cashflows and prospects (Kumar & Tokar, 2020). Further, the uncertainty can be directly transmitted into the valuation of balance sheet items estimated through models based on management's

expectations of future cash flows. Studies have also shown results indicating an association between a financial crisis and an increase of bid-ask-spreads (e.g. Liao et al., 2013), where bid-ask-spread is commonly used as proxy for information asymmetry (eg. Leuz & Verrecchia, 2000; Cormier et al., 2013; Liao et al., 2013).

Furthermore, there are indications that the information asymmetry problem related to firms' goodwill capital, specifically, increases in times of extreme uncertainty. This since the carrying value of firms' goodwill capital is supported by models that rely on managements' assumptions of market data-based estimates, which becomes more difficult to collect during a crisis. In addition, the models are based on cash-flow forecasts and plans that might experience more disruption than normal as information from previous periods is harder to extrapolate into the future. This suggests that the estimation risk in valuing firms' goodwill increase during periods of great uncertainty.

Research also shows that a financial crisis alters the financial reporting behaviour of firms due to the information disequilibrium it induces (Sutthachai & Cooke, 2009; Bepari et al., 2014; Krause et al., 2017). Krause et al., (2017) find that while the *quantity* of disclosures in German firms' voluntary forward-looking disclosures as given by word-count increases, the *content quality* of the provided information, which is the focus of our study, decreases during the 2008 GFC. They interpretate the results as an indication that extreme uncertainty impairs the quality and information density of firms' voluntary disclosures and that firms compensate by instead providing a larger quantity of information. Conversely, Sutthachai & Cooke (2009) report how Thai listed firms improved their disclosure level in the 1997 Asian crisis period when looking at both mandatory and voluntary disclosure items. They conclude that these results seem to, a large extent, capture the shift in regulatory forces and the change in contractual and political cost incentives that Thailand experienced at the time, as the inflow of foreign capital increased significantly. This, in turn, might make the findings difficult to translate to areas with significantly different regulatory environments. Closely related to the scope of our study, Bepari et al. (2014) investigate how compliance of GWIT disclosures under IFRS and AASB 136 changes during the 2008 GFC in relation to previous periods, and what impact different firm characteristic have in both the pre-crisis and crisis period. Looking solely at Australian firms, they find that firms' disclosure levels increases in the crisis year and that audit quality, goodwill intensity, size and profitability are determinates for firms' compliance with GWIT.

To conclude, it seems that an economic disruption affects both the dynamics surrounding firms' goodwill capital as well as their financial reporting behavior.

3.5. Hypothesis development

Consequently, when information asymmetry is high, as under a financial crisis, the value relevance of goodwill impairments increases to users of the financial statements (Bens et

al., 2011; Knauer & Wöhrmann, 2016; Schatt et al., 2016), as does the need for reliable and informative disclosures (KPMG, 2011; Schatt et al., 2016). As argued in section 3.2, financial disclosures can function as a way for firms to equate the information asymmetry between themselves and the market, and even more so in the setting of extreme uncertainty as discussed in section 3.4.

Firms might both have incentives to either attempt, or not attempt, to equate this information asymmetry related to their goodwill capital through improved disclosure quality. On one hand, reducing the information asymmetry via higher quality impairment disclosures can bring benefits such a lower cost of capital (Paugam & Ramond, 2015), which could be even more beneficial during a crisis when cost of capital generally increases as there is higher information asymmetry in the market (Botosan, 1997). On the other hand, as the future becomes more uncertain, making estimates of model inputs needed for the GWIT becomes more difficult, and improving the disclosure quality of goodwill can become more costly. It can involve substantial information processing costs to comply with the IAS 36 standard that seems even more complex to apply in a time of crisis as found by Mazzi et al., (2016) surveying Italian CFOs regarding the 2008 GFC. Additionally, it brings costs associated with a reduced ability to use managerial discretion opportunistically when the transparency of the impairment-testing increases.

Hence, there are conflicting indications on how firms' will alter their disclosure quality of GWIT during times of crisis, which has also been documented in previous research (refer to section 3.4). To test these predictions and to examine the association between disclosure quality of GWIT and a time of great uncertainty, as experienced during the Covid-19 crisis, we propose the following hypothesis:

H1: *Firms will change their goodwill impairment-testing disclosure quality during the crisis year*

Disclosures on GWIT relating to management's assumptions and estimates, are viewed to be more relevant for firms' stakeholders than so called "boiler plate" disclosures that have more of a descriptive characteristic, e.g., explaining how the impairment-testing is performed (EY, 2010). As previously mentioned, Paugam & Ramond (2015) divide the impairment-testing disclosures into prospective and descriptive disclosures when testing for the relationship of these with firms' cost of equity. They argue that prospective disclosures will reduce information risk by providing information on parameters of cash flow distributions while descriptive disclosures do not. They present evidence supporting these arguments as they find a negative association between prospective impairment-testing disclosures and firms' cost of equity, while descriptive impairment-testing disclosures exhibit no association. Following the findings of Paugam & Ramond (2015), we expect that it is primarily the prospective disclosures that will as a consequence of the high uncertainty. There should be less motivation for executives to increase descriptive disclosures as these are unlikely to reduce information asymmetry. Similarly, since

descriptive disclosures do not include information on management estimates, these should not be as difficult to disclose during a year of high uncertainty as during a normal year. Following this discussion, we propose our second hypothesis:

H2: *On average, there will be a change in firms' prospective disclosure quality of goodwill impairment-testing in the crisis year, but there will be less change in their descriptive disclosure quality*

The Covid-19 crisis has been a systemic shock to the market with wide-spread effects internationally and across industries. However, the crisis has had more severe impact on some countries and industries than others, driven by, for example, different countries' approaches to contain the spreading of the virus, where some were more stringent than others in implementing lock downs and restrictions. Additionally, the relative impact of the crisis on firms is highly dependent on the nature of different businesses' operations where some are more disadvantaged by the general decrease in peoples' physical movement, and some firms have better abilities to adapt to this new reality than others.

The effects and motives of increased versus decreased disclosure quality, as described in previous sections, are believed to be more prominent for firms that are highly impacted by the Covid-19 crisis, as these firms experience a higher degree of uncertainty. Hence, it can be presumed that highly impacted firms will display a different financial reporting behavior in the crisis year compared to firms that are less impacted. We test this prediction with the following hypothesis:

H3: *The change in goodwill impairment-testing disclosure quality in the crisis year, will be different for firms that are highly impacted by the crises, compared to firms that are less impacted.*

4. Research design and sample

In this section we go through our research design and sample selection process. First, we explain the construction of our measure for GWIT disclosure quality followed by an explanation of our method for measuring the impact from the Covid-crisis. Next, we go through the regression model specifications and assumptions inherent in these. Finally, we present our sample selection process and the data collected for our tests.

4.1. Measuring goodwill impairment-testing disclosure quality

As previously mentioned, we define disclosure quality as transparency in the financial reporting, proxied as the width of information components disclosed. In order to capture firms' level of disclosure quality of their goodwill impairment tests, a disclosure quality index is used, which is a common approach within the disclosure quality literature (Marston & Shrikes, 1991). Within the disclosure literature, researchers have taken different approaches in constructing their disclosure quality indices by either using weighted or unweighted disclosure measurements (Amiraslani et al., 2013). Typically, weighting of different measurement items within an index is determined by the relative importance of chosen items as perceived by different user groups, such as investors, analysts or other 'experts' (Singhvi & Desai, 1971). To limit subjectivity from determining weights, our disclosure quality index is comprised of unweighted item scores that are binary coded. Similar types of indices have been deployed by other researchers, such as Amiraslani et al. (2013) and Paugam & Ramond (2015), who examine the quality of impairment-testing disclosure for a broader set of assets under IAS 36.

Our GWIT disclosure index is based on the index used by Paugam & Ramond (2015), but with some adjustments. Adjustments are made to account for the fact that this paper has a focus on GWIT solely, as opposed to impairment-testing under IAS 36 in general. Additionally, with inspiration from the paper by Bepari et al. (2014) who look specifically at firms' compliance with the disclosure requirements of IFRS for GWIT, we have adjusted the index to ensure that all relevant disclosure requirements of IAS 36 are included. Following Paugam & Ramond (2015), the index used in this paper aims to capture the descriptive and prospective disclosures of firms' goodwill impairment test, where 1) descriptive disclosures are general descriptions of the standard requirements and gives information on how the impairment-testing is performed, and 2) prospective disclosures provide information on key valuation assumptions used in the impairment-testing and provides a higher informational value to investors.

Our GWIT disclosure index includes 36 items and covers the main disclosure requirements of IAS 36 (paragraph 126-136) as well as other disclosures related to the main valuation assumptions used when estimating recoverable amounts. We code each item with '1' if the item exists in the annual report and with '0' if it does not. The coding

is made through manually controlling if the item is disclosed in the firms' annual reports. As the focus in this paper is on disclosure quality of impairment-testing for goodwill specifically, we require that the items are mentioned in the context of GWIT, for an item to be coded with '1'. For the purpose of allocating items as either descriptive or prospective disclosures, the items are grouped into 13 sub-categories, containing one to seven items each. Table 1 exhibits the individual disclosure items, grouped into sub-categories, and divided by descriptive and prospective disclosures.

To derive the total GWIT disclosure quality score for a given firm j at year t we standardize the total number of items (36) and multiply this by 10 to obtain a score ranging from a minimum of 0 to a maximum of 10 points. See equation 1:

$$Score_{j,t} = \frac{1}{36} \sum_{i=1}^{36} Items(i)_{j,t} * 10 \quad (1)$$

The GWIT disclosure score is split into two sub-scores, descriptive and prospective, where all items are assigned to either category on the basis of the type of disclosure, as described above. Similarly as the total quality score, the score for the descriptive and prospective disclosures respectively, for firm j at year t , is calculated as the sum of points divided by the maximum number of items (12 and 24, respectively) and multiplied by 10, see equations 2 and 3:

$$Descr_{j,t} = \frac{1}{12} \sum_{i=1}^{12} Items(i)_{j,t} * 10 \quad (2)$$

$$Prosp_{j,t} = \frac{1}{24} \sum_{i=1}^{24} Items(i)_{j,t} * 10 \quad (3)$$

Table 1. Items included in the GWIT Disclosure Score

<i>Item #</i>	<i>Category</i>	<i>Item</i>
<i>Descriptive disclosure items</i>		
1	Presentation and general explanation of IAS 36	Does the report explicitly mention IAS 36?
2		Does the report explain the alternative between value-in-use and fair value (less costs to sell) to estimate recoverable value?
3	Details on the possible valuation methods: fair value or value-in-use	Does the report mention 'costs to sell' / 'costs of disposal' to estimate fair value?
4		Does the report mention the use of a DCF model to determine value-in-use?
5		Does the report mention the use of a DCF model to determine fair value (as a level 3 estimate)?
6		Does the report mention another approach to determine fair value?

Table 1. Continued

<i>Item #</i>	<i>Category</i>	<i>Item</i>
7	Complexity of methods used	Does the report mention using different methods for valuation of different CGUs?
8		Does the report mention different valuation methods for the same CGU?
9	Definition of cash flows	Does the report explain if projected cash flows are CGU-specific?
10		Does the report explain if projected cash flows are from management BP or from analysts' forecasts?
11	Origin of the discount rate	Does the report mention using outside consultants to conduct impairment tests/provide services in the valuation process/estimation of discount rate?
12		Does the report mention that discount rates are based on estimates of analysts covering the firm or the sector?
<i>Prospective disclosure items</i>		
13	Number of cash-generating units	Does the report include the number of CGUs?
14		Does the report disclose the total amount of goodwill per CGU?
15	Details on the discount rate	Does the report mention the model used for determining the discount rate? ³
16		Does the report mention the alternative between different discount rates or mention the use of several models to estimate cost of capital?
17		Does the report mention the tax effect on discount rate?
18		Does the report give details on the computation of the discount rate? ⁴
19	Number of discount rates	Does the firm adjust the firm's wide discount rate for specific CGUs?
20		Does the report disclose the different discount rates used per CGU?
21		Does the report explain the adjustments/different discount rates used?
22	Cost of capital components	Does the report disclose the base rate of the discount rate?
23		Does the report disclose the risk-free rate chosen?
24		Does the report mention the beta coefficient chosen?
25		Does the report mention the risk premium chosen?
26		Does the report mention management's target leverage ratio?
27		Does the report mention the specific beta of the company?
28		Does the report mention the beta of peer firms?

³ e.g WACC, APV or unlevered cost of equity

⁴ e.g., risk premium, risk-free rate

Table 1. Continued

<i>Item #</i>	<i>Category</i>	<i>Item</i>
29	Sensitivity of impairment tests	Does the report mention sensitivity tests performed on any of the components? ⁵
30		Does the report mention the difference between the estimated recoverable amount and the carrying amount?
31		Does the report mention the required change in an estimate for which the estimated recoverable amount would equal the carrying amount? (or the implied impairment in a change in assumption)
32	Explanation of the variations of the discount rate	Does the report explain the variations of discount rates from the previous year?
33	Extrapolation	Does the report mention the extrapolation period between the end of the BP ⁶ and terminal value?
34		Does the report mention what is the maximum number of periods for BPs?
35	Terminal value	Does the report mention if terminal value is computed with a multiple or with an infinite projection period?
36		Does the report mention the level of multiple applied / the terminal growth rate assumption?

Table 1 presents the individual disclosure items, underlying our three QWIT disclosure quality scores, i.e., *Tscore*, *Descr* and *Prosp*. The items are classified as either descriptive or prospective disclosure items and are grouped into 13 sub-categories.

Reliability of disclosure score

To ensure reliability and consistency of our disclosure quality score coding, we interacted in developing a cohesive and clear quality index with clarification of the interpretations of certain items where this was deemed necessary. For the first sample of firms, we cooperated in coding the quality score to ensure that a common understanding of interpretation was achieved, and adjustments and clarifications of items were developed during this process. Additionally, all classification items that were borderline cases were discussed jointly by both researchers to ensure that classifications were uniform. We feel confident that the coding scheme is clear and transparent, and any potential deviations in coding is unlikely to have a significant impact on the results.

4.2. Measuring Covid-19 impact

An important aspect of our research design is the classification of firms as ‘high impacted’ vs ‘low impacted’ by the Covid-19 crisis. To assign each sample firm with an impact

⁵ e.g. the discount rate/growth rate/cashflow

⁶ BP = business plan

score, we use data from a time-varying measure of firm-level exposure to the outbreak of Covid-19, developed by Hassan et al. (2020). They have constructed a measure that uses a text-classification method to quantify the costs, benefits and risks that firms in over 80 countries associate with the Covid-19 pandemic. The measure is based on transcripts from publicly listed firms quarterly earnings conference calls hosted with financial analysts. The authors' motivation for using earnings calls as an input for the construction of the firm-specific exposure measure, rests on the assumption that they provide a setting where senior management in a timely manner has to respond to questions from market participants regarding the firm's future prospects, providing a timely and transparent measure of a firm's exposure. The benefit of using the scores developed by Hassan et al. (2021) is that it provides us with a score developed for each individual firm specifically. There are other Covid-19-impact scores developed that are based on e.g., industry or country level (Stephany et al., 2020; Hale et al., 2021). However, using a firm specific impact score will most likely provide us with a more just approximation of the degree of Covid-19 impact for a specific firm, compared to the alternative measures mentioned. Though it should be noted that the Covid impact score used, is based on firms' own assessment and perception of their respective Covid-19 exposure and therefore might not precisely reflect actual exposure. For the purpose of our research question, however, we believe that self-perceived Covid-19 impact more strongly relates to financial reporting behaviour.

To construct our Covid impact index we use two of the measures developed by Hassan et al. (2020), namely *Covid Risk* and *Covid Net Sentiment*. *Covid Risk* is measured by counting the number of times Covid-19, or a synonym of Covid-19, is mentioned in proximity to synonyms of risk or uncertainty. The measure conditions on a maximum of 10 words in between the mentioning of words associated with Covid-19 and the mentioning of the respective synonym for risk or uncertainty. Finally, it divides this number by the total number of sentences in the earnings conference call transcript to account for differences in transcript length. See equation 4 for specification of the *Covid Risk* measure.

$$Covid Risk_{jt} = \frac{1}{S_{jt}} \sum_{b=1}^{B_{jt}} \{1[b = Covid19] * 1[|b - r| < 10]\} \quad (4)$$

Where $b = 0, 1, \dots, B_{jt}$ represents the words contained in the transcript of firm j in quarter t , S is the total number of sentences in the earnings conference call transcript, and r is the position of the nearest synonym of risk or uncertainty. The higher the *Covid Risk* score for a specific firm, the greater the firm is expected to foresee related to Covid-19.

Covid Net Sentiment is calculated in a similar manner as *Covid Risk* in the way that it also counts the number of words associated with Covid-19, but instead of synonyms for risk or uncertainty, it conditions on the proximity to negative- or positive-tone words. See equation 5 for specification of the *Covid Net Sentiment* measure.

$$Covid\ Net\ Sentiment_{jt} = \frac{1}{B_{jt}} \sum_{b=1}^{B_{jt}} \left\{ 1[b = Covid19] * \left(\sum_{c=b-10}^{b+10} S(c) \right) \right\} \quad (5)$$

Where S assigns +1 if c is a negative tone word and -1 if c is a positive tone word. A positive (negative) *Covid Net Sentiment* score indicates that the earnings conference call transcripts include more negative (positive) tone words in relation to Covid-19 than positive (negative) words.

To engender our *Covid impact* score we combine the two measures, *Covid Risk* and *Covid Net Sentiment*, see equation 6. We use a combination of the measures as we believe that both perceived risk and net sentiment serves as relevant proxies for a firm's perceived impact from Covid-19 and it allows us to include the effect of both negative and positive perceptions related to Covid-19.

$$Covid\ impact_{jt} = Covid\ Risk_{jt} + Covid\ Net\ Sentiment_{jt} \quad (6)$$

The *Covid impact* score was manually matched to our sample firms by company name. For eight of our sample firms, no data on *Covid Risk* or *Covid Net Sentiment* existed and therefore these firms have been excluded in the regressions where we include *Covid impact* as a variable. Since the index is based on the firms' earnings calls, there could be several scores for each firm as earnings calls are held quarterly for most firms. The data covers the period from January until last of December 2020 why earnings calls relating to quarter 3 are the last ones included in the data set as earnings call relating to quarter 4 have not yet been released. To capture the effect of how uncertainty related to Covid-19 has varied over time, we have used the score from the earnings call closest to the firms' period end date. This implies that there will be some differences in the length between period end date and the earnings conference call date, potentially influencing our results.

4.3. Model specification

To test our hypothesizes, we use pooled ordinary least squares (OLS) regressions with clustered standard errors at the country level. We use clustered standard errors to address the potential concern of heteroscedasticity and autocorrelation within the error terms, as is common when working with accounting data. We cluster on country level rather than firm level since the sample period only includes three years, which reduces the potential issue of autocorrelation. Using bigger and more aggregate clusters is a more conservative approach and reduces the risk of bias that could arise from having too narrow clusters (Cameron & Miller, 2015). To address the concern of endogeneity, the regressions are also estimated using a country fixed effects model, refer to section 5.5.1. We use pooled OLS rather than fixed effects as our main model since our sample period is relatively short with little within-firm time variation. Therefore, it is unlikely that a fixed effects model would work ideally on our sample as it would likely reduce the power of our results.

4.3.1. Model 1

Hypothesis 1 and 2 are tested using the following regression model:

Model 1:

$$\begin{aligned} Disclosure_{jt} = & \beta_0 + \beta_1 Crisis_{jt} + \beta_2 Size_{jt} + \beta_3 Leverage_{jt} \\ & + \beta_4 ROE_{jt} + \beta_5 GWintensity_{jt} + \beta_6 Imp\ made_{jt} + \beta_7 Imp\ size_{jt} \\ & + \beta_8 Vola_{jt} + \beta_9 Sales\ decline_{jt} + \beta_{10} NrBS_j + \varepsilon_{it} \end{aligned}$$

Where:

$Disclosure_{jt}$	is the GWIT disclosure quality score for firm j at time t . Disclosure is represented by any of the following three variables: $Tscore$ = Total disclosure quality score including all items in the index. $Descr$ = Descriptive disclosure quality sub-score. $Prosp$ = Prospective disclosure quality sub-score.
$Crisis_{jt}$	is an indicator variable taking the value 1 if year t is the crisis year (2020), and 0 otherwise (2018 and 2019).
$Size_{jt}$	is the natural logarithm of firm j 's total assets at the end of year t .
$Leverage_{jt}$	is the fraction of firm j 's total debt to total equity at the end of year t .
ROE_{jt}	is firm j 's return on equity in percent calculated as earnings from continuing operations divided by the average of last years and current year's total equity, at the end of year t .
$GWIntensity_{jt}$	is the fraction of firm j 's goodwill, before any goodwill impairments, to total assets at the end of year t .
$Imp\ made_{jt}$	is an indicator variable taking the value 1 for firms j that have made a goodwill impairment during year t , and 0 otherwise.
$Imp\ size_{jt}$	is the fraction of firm j 's goodwill impairment to total assets at the end of year t .
$Vola_{jt}$	is firm j 's variance of daily stock returns over the last five years prior to the end of year t .
$Sales\ decline_{jt}$	is an indicator variable taking the value 1 if the sales for firm j declined by 10% or more during year t .
$NrSegments_j$	is the number of business segments for firm j .

As we want to investigate the effect of high uncertainty on GWIT disclosure quality, we include *Disclosure* as the dependent variable. As we predict that the crisis will have a greater effect on prospective disclosures (*Prosp*) than on descriptive disclosures (*Descr*), we run separate regressions where we include these as the dependent variable, in addition to the total disclosure quality score. To test our prediction that extreme uncertainty, as observed during the crisis year, will be related to firms' observed disclosure quality, we include the indicator variable *Crisis* that takes the value '1' for the crisis year (2020) and '0' otherwise (2018 and 2019). Thus, the coefficient β_1 is the main coefficient of interest.

We then include different control variables to capture the difference in disclosure behavior driven by specific firm characteristics and their individual information environment. There are several corporate characteristics that to a varying degree have a documented association with the level of disclosure quality.

Size is a firm characteristic many researchers argue have an association with corporate disclosure as larger firms are suggested to follow better disclosure practices (Meek et al., 1995). The increased disclosure quality in larger firms is suggested to be a result of the greater agency costs and information asymmetry they face due to their relatively more complex operations (Krause et al., 2017). Additionally, relatively larger firms should face a lower cost of accumulating comprehensive and detailed financial information as it is typically already used for internal reporting purpose (Singhvi & Desai, 1971). *Size* is proxied by the firm's total assets. Furthermore, Malone et al. (1993) have found a positive association between *Leverage* and the extent of firms' financial disclosure while Krause et al. (2017) argue that its effect on disclosures will depend on whether lenders are firm insiders or outsiders. In our model, *Leverage* is proxied as the firm's total debt divided by total equity and is aimed to capture potential agency costs related to debt (Jensen & Meckling, 1976). *ROE*, represents a firm's profitability and is included to capture that high-performing firms are expected to have different disclosure practices than low-performing firms. However, we are careful in predicting the signed direction of the variable in relation to disclosure quality since evidence in previous research have been presented for both a positive and negative relation (Singhvi & Desai, 1971; Wallace & Naser, 1995). A positive relationship can partly be due to firms' increased incentives to disclose more when they have good news to share (Lang & Lundholm, 1993). *GWintensity*, given by a firm's percentage of total goodwill before impairment to its total assets, is included as a proxy for the relative importance of the firm's goodwill item. Previous research suggests that goodwill intensity has explanatory value in determining firms' compliance with goodwill impairment regulation (Bepari et al., 2014). We expect that disclosure quality of the GWIT increases with the relative importance of the asset class. The indicator variable *Imp made* is included since we have a presumption that firms that have recorded an impairment charge against goodwill during the year will be more inclined to disclose information to the market regarding the underlying cause and assumptions that led to the recognized impairment charge. *Imp size* is aimed to capture the magnitude of an impairment, where a relatively larger impairment charge in relation to the firm's asset is believed to be an indication of the importance that managers as well as external stakeholders are placing on the charge. Therefore, we predict that a relatively larger impairment will lead to improved disclosure of the firm's GWIT. We include *Vola*, which measures volatility in the firm's stock return in the preceding five years. We believe that volatility should affect a firm's ability to provide forecasts (Waymire, 1985) which, in turn, is an essential component of GWIT. The *Sales decline* indication variable functions as a measure that captures whether the firm is facing distress in its operations. Since we want to capture the relationship between firms' disclosures

and the impact of a crisis in the macroeconomic environment, we include the variable to control for ordinary operational deterioration across years that is not an effect of the crisis. *NrBS* represents the number of business segments for a specific firm and is included since it, similar to *Size*, represents the complexity inherent in a firm's operations. Firms are required to disclose GWIT information on the CGU level, where one CGU cannot be larger than a business segment. Firms with several business segments are expected to have a more complex GWIT procedure, therefore we expect that firms with more business segments will disclose more information.

Another common control variable to include when testing for disclosure quality is an indicator variable of whether the firm's auditor is one of the big four auditing firms, since large skilled auditing firms are expected to have higher requirements on disclosures. (Glaum & Street, 2003). Additionally, it is common to include an indicator variable of whether the firm's shares are cross-listed, and often more specifically, whether they are cross-listed in the US. This since a US listing generally implies more stringent disclosure requirements (Glaum & Street, 2003; Krause et al., 2017). We do not include these variables since almost all our sample firms, consisting of large European firms, have a big four auditor, and very few of the sample firms are cross listed in the US. Due to the low variation in these variables they would not add any explanatory power to our model.

4.3.2. Model 2

To test the predictions of our third hypothesis, we estimate the following difference-in-difference (DID) regression:

Model 2:

$$\begin{aligned} Disclosure_{jt} = & \beta_0 + \beta_1 Crisis_{jt} + \beta_2 High\ impact_j + \beta_3 (Crisis_{jt} \bullet High\ impact_j) \\ & + \beta_4 Size_{jt} + \beta_5 Leverage_{jt} + \beta_6 ROE_{jt} + \beta_7 GWintensity_{jt} \\ & + \beta_8 Imp\ made_{jt} + \beta_9 Imp\ size_{jt} + \beta_{10} Vola_{jt} + \beta_{11} Sales\ decline_{jt} \\ & + \beta_{12} NrBS_j + \varepsilon_{it} \end{aligned}$$

Where:

Disclosure_{jt} is one of the quality score indicators, *Tscore*, *Descr* or *Prosp*, refer to description of Model 1.

Crisis_{jt} is an indicator variable taking the value 1 if year *t* is the crisis year (2020), and 0 otherwise (2018 and 2019).

High impact_j is an indicator variable taking the value 1 if the firm *j* is classified as 'high impacted' by the crisis, and 0 otherwise.

Crisis_{jt} • High impact_j is an interaction term between *Crisis* and *High impact*, taking the value 1 if year *t* is the crisis year (2020) and the firm *j* is in the high impact group, and 0 otherwise.

The remaining variables are defined in the same way as for Model 1.

In the DID regression the purpose is to measure the difference in the change in GWIT disclosure quality in the crisis year, between ‘high impacted’ firms (treatment group) and ‘low impacted’ firms (control group). This difference is represented by the coefficient β_3 which is the main coefficient of interest. To define firms as either ‘high impacted’ or ‘low impacted’ we split the sample in half based on the median of the Covid impact score discussed in section 4.2, where highly impacted firms are the ones with a score above the 50th percentile.

Assumptions, strengths and weaknesses related to difference-in-difference

A central assumption for a DID regression to remain free from selection bias and to achieve casual inference is that the treatment group and control group have a parallel trend in GWIT disclosure quality prior to the crisis year. This assumption is generally more likely to hold if, first, the assignment to treatment comes from an exogenous shock, as this reduces the risk that unobserved covariates impact the assignment to treatment. Second, the treatment and control groups are similar prior to the treatment, both in terms of trend in outcome of the dependent variable and in terms of covariate balance for a large set of observed covariates. This increases the chance that the potential observed change for treatment firms comes from the treatment rather than from differences between treated and control firms. Third, the shock is strong, as a stronger shock makes it more likely to observe a significant treatment effect and increases the chance that the observed effect comes from the shock and not from some other unobserved factor (Atanasov & Black, 2016).

The treatment effect that we intend to study, high uncertainty regarding future prospects as measured by the Covid-19 pandemic, can definitely be considered an exogenous shock. The assignment of firms as ‘high impacted’ versus ‘low impacted’ firms, is unlikely to be related to the group of firms’ respective covariate balance or trends in GWIT disclosure quality, prior to the crises. Panel A of Table 2 corroborates that fundamental firm characteristics that are of relevance for a firm’s level of GWIT disclosure quality, between the high and ‘low impacted’ firms, are not statistically different in the pre-crisis years. In addition, we test if there is a statistically significant difference in the pre-crisis trend of GWIT disclosure quality for ‘high impacted’ firms compared to ‘low impacted’ firms. Panel B of Table 2 confirm that the trend in descriptive, prospective, as well as total GWIT disclosure quality score is indistinguishable between the two groups of firms prior to the crisis year.

A concern for all DID estimations is to ensure that the post-treatment trend would have continued to be parallel if the crises had not taken place. To mitigate this concern, we include firm characteristics in the regression tests that are expected to impact GWIT disclosure quality and that could cause firm trends to diverge in the crisis year for reasons unrelated to uncertainty caused by the crisis. These characteristics include those fundamental firm characteristics presented in Panel A of Table 2, as well as variables for

sales decline and goodwill impairments. See further explanations and motivations of these variables in section 4.3.1 above. Furthermore, to address the concern of endogeneity we estimate the regression using country-fixed effects that control for unobserved country-specific trends in GWIT disclosure quality.

The stronger the shock (treatment) is in relation to other potential unobserved factors, the less likely it is that the potential observed treatment effect comes from those other unobserved factors. The Covid-19 pandemic has affected companies all over the world, some countries and industries more than others. It is difficult to determine whether the shock was strong enough for our sample of ‘high impacted’ firms to provide a significant effect. However, the case that the observed treatment effect would come from other factors than the crisis is not assessed to be likely as all sample firms in the treatment and control group report under IFRS and changes in the requirements of IFRS would change for all firms simultaneously. Furthermore, the treatment group and control group will include firms from several industries and countries, making it unlikely that any unobserved factor in a specific country or industry will drive the observed effect of our results. However, this is something that we cannot explicitly control for, and would this be the case, it could potentially lead to a biased estimation of the causal effect.

An evident weakness of our research design is that there is no clear cut in the degree of Covid-19 impact between our treatment firms and control firms, as the degree of impact follows a continuous scale. Our sample of firms was not determined based on the Covid-19 impact, rather the classification of firms as ‘high impacted’ or ‘low impacted’ firms was made subsequent to the sample selection. Hence, the difference in Covid-19 impact between the lowest impacted firms within the treatment group, and the highest impacted firms within the control group, will be quite small. The consequence of this is that we are less likely to observe a treatment effect compared to if the spread in impact would be larger. As an attempt to solve this, we conduct an additional regression where we divide the sample in three bins based on the Covid impact score, and let the bin containing firms with the highest score comprise the treatment group, and firms in the bin with the lowest scores comprise the control group. For this test we drop the sample of firms with the Covid impact score in the middle bin. We also conduct a test using the continuous *Covid impact* score as an independent variable. The results from these regressions are presented in section 5.5.3.

Table 2. Characteristics of ‘high impacted’ firms and ‘low impacted’ firms**Panel A: Comparison of ‘high impacted’ firms with ‘low impacted’ firms by pre-crisis years**

Variable	Mean of high impacted firms	Mean of Low impacted firms	Difference	t-Statistic	p-value	N	Year
Size	9.675	9.704	-0.029	-0.182	0.856	178	2018
Leverage	0.807	0.669	0.138	0.718	0.474	178	2018
GWintensity	0.210	0.177	0.033	1.401	0.163	178	2018
ROE	15.446	14.046	1.400	0.544	0.587	178	2018
Vola	7.099	7.614	-0.516	-0.726	0.469	178	2018
NrBS	6.135	6.079	0.056	0.091	0.928	178	2018
Size	9.738	9.760	-0.021	-0.135	0.893	178	2019
Leverage	0.785	0.729	0.055	0.302	0.763	178	2019
GWintensity	0.198	0.166	0.032	1.465	0.145	178	2019
ROE	11.845	11.904	-0.058	-0.031	0.976	178	2019
Vola	7.524	7.657	-0.133	-0.181	0.857	178	2019
NrBS	6.135	6.079	0.056	0.091	0.928	178	2019

Panel B: Parallel trends in *Tscore*, *Descr* and *Prosp* in the pre-crisis years (2018-2019)

Dependent variable	Mean of high impacted firms	Mean of Low impacted firms	Difference	t-Statistic	p-value	N	Year
$\Delta Tscore$	0.059	0.000	0.059	0.914	0.362	178	2019
$\Delta Descr$	0.094	0.037	0.056	0.634	0.527	178	2019
$\Delta Prosp$	0.042	-0.019	0.061	0.712	0.478	178	2019

Table 2 presents the descriptive statistics for firm characteristics that are of relevance for a firm’s level of GWIT disclosure quality and the three GWIT disclosure quality scores (*Tscore*, *Descr* and *Prosp*), for the ‘high impacted’ firms (treatment group) and ‘low impacted’ firms (control group) before the Crisis year in 2020. Panel A compares the mean values of the firm characteristics for the treatment group and the control group in the pre-crisis period by year. Panel B presents the mean difference in the change in *Tscore*, *Descr* and *Prosp* between the treatment and control firms in the pre-crisis years (2018 to 2019). The ‘high impacted’ firms comprises of firms with a Covid impact score above the 50th percentile and ‘low impacted’ firms comprises of firms with a Covid impact score below the 50th percentile. The definitions of the variables are as follows: Size is the natural logarithm of total assets; Leverage is the fraction of total debt to total equity; GWintensity is the fraction of goodwill, before any goodwill impairments, to total assets; ROE is the percentage return on equity calculated as earnings from continuing operations divided by the average total equity; Vola is the variance of daily stock returns over the last five years; NrBS represents the number of business segments. *Tscore* is the total GWIT disclosure quality score, *Descr* is the disclosure score relating to descriptive disclosure items and *Prosp* is the quality score relating to prospective disclosure items. The three measures are explained in detail in section 4.1.

4.4. Sample selection and data

The following sections presents the sample selection process and the collection and quality of data used.

4.4.1. Sample selection process

Table 3. Sample selection process

	Number of remaining Firms
Firms incorporated in Europe and listed on a European stock exchange	11,175
- financial and insurance companies	6,831
- duplicate firm observations	6,804
- firms with missing accounting and financial data	1,335
- firms that do not have a significant amount of goodwill	1,196
- firms that do not report under IFRS	1,108
- firms with period end dates before march	1,081
- firms that are not among the 250 largest in terms of total assets 2018	250
- firms that are subsidiaries to another sample firm	241
- firms with missing annual reports	194
- firms that don't report under IFRS or that have not been listed for the full sample period	186
Final sample	186
Total number of firm-year observations	558

Table 3 describes the sample selection process. We start with all firms that are incorporated in a European country and are listed on a European stock exchange. We exclude financial and insurance firms, duplicate firm observations, firms with missing accounting and financial data in the S&P Capital IQ database, firms that do not have a significant amount of goodwill capital, firms not reporting under IFRS and firms with a period end date before march. We then keep only the 250 largest firms in terms of total assets 2018. From these we further exclude firms that are subsidiaries of another sample firm, firms with missing annual reports as of the 4th of April 2020 and firms that have not been listed or not reported under IFRS for the full sample period.

To conduct our tests, we use firm-year panel data covering the period 2018 to 2020. Our sample is drawn from the S&P Capital IQ database, including all active firms that are incorporated in Europe and that are listed on a European stock exchange. We exclude financial and insurance companies⁷ as these are usually subject to specific reporting requirements (Paugam & Ramond, 2015). We exclude all firms whose accounting and financial data are not available in S&P Capital IQ and firms that do not report under IFRS. Our sample only includes firms with fiscal-year endings on, or after, the last of March as the Covid-19 pandemic started affecting the European economy with significant force in March 2020⁸. Additionally, for goodwill not to represent a clearly insignificant amount, we require our sample firms to have either a minimum of 1% of goodwill in relation to total assets at the beginning of each fiscal year, or a minimum of 20 million EUR in opening balance of goodwill at each fiscal year.

After sorting down the firms according to the steps described above, we are left with a sample of 1 081 firms. Since a large part of the data used is hand collected from firms'

⁷ SIC codes 60-64

⁸ Covid-19 was officially classified by the World Health Organization as a global pandemic as of March 11th 2020

annual reports, we limit our sample to the 250 largest firms in terms of closing balance of total assets in 2018. We conduct our research on the largest European firms since 1) larger firms are expected to be more subject to many of the forces that is believed to influence disclosure behaviour, such as information asymmetry and agency costs, due to their relatively higher complexity, 2) data collection is done during the spring of 2021, the time during which financial reports for 2020 are released, and we would otherwise face a sampling design issue as larger firms are typically reporting faster than smaller firms. This would result in an unintended skewness towards larger firms since they, to a larger extent, would have published their annual reports. From these 250 firms we exclude all firms which do not have published and readily available annual reports or consolidated financial statements in English, for all three years, as of the 4th of April 2021. It should be noted as a weakness that our sample selection is still to some degree influenced by what firms have released their annual reports by this date. Additionally, to eliminate the presence of multiple firms within the same group, we exclude firms that are subsidiaries of another firm within our sample. Finally, we exclude firms that have not been listed for the full sample period or where found not to report under IFRS for the full period. Our final sample consists of 186 firms and 558 firm-year-observations, forming a balanced panel data. Table 3 presents the sampling process and Table 4 presents the sample composition based on industry and country of incorporation.

Table 4. Sample Composition

Panel A. Sample composition by country		Panel B. Sample composition by industry	
<i>Country</i>	<i>Nr of firms</i>	<i>Industry</i>	<i>Nr of firms</i>
Austria	4	Mining	5
Belgium	4	Construction	6
Denmark	5	Manufacturing	89
Finland	7	Transportation	11
France	36	Communications	14
Germany	28	Public Utilities	15
Greece	1	Wholesale Trade	4
Ireland	2	Retail Trade	13
Jersey	3	Real Estate & Holding and other investments	5
Luxembourg	2	Services	22
Netherlands	12	Public Administration	2
Norway	3	Total	186
Portugal	1		
Russia	2		
Spain	10		
Sweden	12		
Switzerland	14		
Turkey	1		
United Kingdom	39		
Total	186		

Table 4 presents the sample composition of the sample firms. **Panel A** presents sample composition by country, where country represents the firms' country of incorporation. **Panel B** presents sample composition by industry and is classified according to the Standard Industrial Classification (SIC) codes. The SIC codes representing each industry classification are as follows; Mining (10-14), Construction (15-17), Manufacturing (20-39), Transportation (40-47), Communications (48), Public Utilities (49), Wholesale Trade (50-51), Retail Trade (52-59) Real Estate & Holding and other investments (65-67), Services (70-89), Public Administration (91-99).

4.4.2. Data collection and quality of data

We collect data from 2018 to 2020 to ensure that we have two consecutive years where the financial reporting is not affected by the Covid-19 crisis, with 2020 being the year representing a year of high uncertainty in the market. We realize that firms with fiscal year end per the 31st of December 2019 will most likely not release their annual reports until February or March of 2020 when the pandemic has started to become a fact. This could potentially have an impact on our results as we treat 2019 as a year not affected by the elevated uncertainty. However, we do not see this as an issue for the purpose of our research since the financial reporting is supposed to reflect the situation per the reporting date, considering adjusting events, but not non-adjusting events, occurring after the reporting period. Adjusting events are those that provide evidence of conditions that existed at the end of the reporting period, while non-adjusting events are those that are indicative of conditions that arose after the reporting period (Gould & Arnold, 2020). It is a general consensus that Covid-19 is a non-adjusting event for firms with fiscal year periods ending on or before 31 December 2019, and hence their impairment-testing of goodwill should not be adjusted for events related to Covid-19 (Gould & Arnold, 2020).

From the S&P Capital IQ database we collect data of firms' total assets, goodwill balances, return on equity, total equity, total debt, total sales, daily stock prices, number of business segments and region of incorporation. Manual adjustments are subsequently made for firms' goodwill impairment charges as we discover that they were not stated correctly in the S&P Capital IQ database. Additionally, our analysis of extreme values in our dataset revealed outliers in our leverage variable as some of the firm observations have negative equity balances that highly influence the distribution of the variable. Since the data sample is limited in size to begin with, winsorizing was used as opposed to dropping these observations. The winsorizing was done at the 1st and 99th percentiles. No need for winsorizing was found for the other continuous variables. The disclosure quality index (refer to section 4.1) is based on assessments of the firms' annual reports, which are retrieved from the firms' websites.

5. Empirical Analysis

In this section we present our empirical findings. First, we present descriptive statistics related to the disclosure quality scores and the control variables. Second, we present specific information related to firm impact from Covid-19. We then present our main results followed by a supplementary test on goodwill impairments. Thereafter we examine the sensitivity of our results and finally we discuss our findings.

5.1. Descriptive statistics

Descriptive statistics of disclosure quality score

Table 5. Disclosure quality scores over time

Year	N	mean	std	min	p25	median	p75	max
Total Score								
2018	186	4.31	1.03	0.83	3.89	4.44	5.00	6.94
2019	186	4.35	1.00	0.83	3.89	4.17	5.00	6.67
2020	186	4.53	0.98	1.11	3.89	4.44	5.28	6.67
Descriptive Score								
2018	186	4.42	1.22	1.67	4.17	4.17	5.00	7.50
2019	186	4.50	1.24	1.67	4.17	4.17	5.00	8.33
2020	186	4.57	1.19	1.67	4.17	4.17	5.00	8.33
Prospective Score								
2018	186	4.25	1.32	0.00	3.75	4.17	5.00	7.50
2019	186	4.28	1.25	0.00	3.75	4.17	5.00	7.08
2020	186	4.51	1.23	0.00	3.75	4.58	5.42	7.50

Table 5 reports descriptive statistics per year on the three dependent variables *Tscore*, *Descr* and *Prosp*. *Tscore* is the total GWIT disclosure quality score, *Descr* is the disclosure score relating to descriptive disclosure items and *Prosp* is the quality score relating to prospective disclosure items. The three measures are explained in detail in section 4.1.

Table 5 depicts the descriptive statistics of our different measures of GWIT disclosure quality (*Tscore*, *Descr* and *Prosp*) for the years 2018 to 2020. We notice that on average the disclosure scores are relatively low, ranging from 4.25 to 4.57, out of a maximum of 10 points for each score. While we solely examine GWIT disclosures, and therefore have made some adjustments to their disclosure quality index, the comparable scores for Paugam & Ramond (2015) are 5.40, 6.19 and 4.09 for *Tscore*, *Descr* and *Prosp*, respectively. Even though our disclosure quality index does not only focus on compliance with IAS 36, but also incorporates some additional items related to valuation assumptions that are not mandatory to disclose, we still conclude that there is room for improvement

for firms' impairment-testing disclosures. While the mean of all three measures increase monotonously through the complete span of year observations, a larger increase is observed for *Tscore* and *Prosp* in 2020, while no similar effect can be observed for *Descr*. We interpret the increment change in the two former as tentative evidence in line with our H1 and H2, namely; that firms change their GWIT disclosure behavior in the crisis year 2020, and that the change is more prominent for what we classify as prospective disclosures. Furthermore, the descriptive statistics show that the 25th percentile remains unchanged for all three disclosure scores while the 75th percentile increases quite significantly in 2020 for *Tscore* and *Prosp*.

When studying in detail which disclosure score items drive the change in total and prospective disclosure scores in 2020, we notice that the largest increase can be observed for the sub-categories 'Number of discount rates', 'Sensitivity of impairment tests' and 'Explanation of the variations of the discount rate', refer to Table A.1 in Appendix. These sub-categories all form part of the prospective disclosure quality score. The proportion of disclosed items within the respective sub-categories, averaged over the sample firms, moved from 67%; 48%; 4% in 2018 to 72%; 54%; 11% in 2020. The respective changes between 2018 and 2019 are minor in comparison. We can further note that the increase in disclosure of these sub-categories seem to be driven by all disclosure items within the respective categorie. Additionally, as could be observed for the general disclosure scores (*Tscore*, *Descr* and *Prosp*) presented in Table 5, many sub-categories display a gradual increase over the years, e.g., 'Presentation and general explanation of Standard IAS 36', 'Details on the discount rate' and 'Cost of capital components'. Finally, we can note that the disclosure items that firms are generally insufficient in providing, relates to items in the sub-categories 'Complexity of methods used', 'Origin of the discount rate', 'Cost of capital components' and 'Explanation of the variations of the discount rate'.

General descriptive statistics

Descriptive statistics on the dependent variables and all the independent variables are presented in Table 6 and show the aggregate descriptive statistics for all three sample years combined. In terms of the independent variables, the mean (median) ROE across the sample is 9.42 (10.45) percentage, which is slightly below the 2019 average return on equity for a subset of European countries (Statista, 2021). More noteworthy is the lowest and highest ROE values observed for our firms; -170.0 % and 124.6 %, respectively. The minimum value was recorded for the company International Consolidated Airlines Group's in fiscal year 2020, most certainly reflecting the extremely negative effect the Covid-19 crisis has had on the flight transport industry while the maximum value was observed for Evraz plc in 2018. Additionally, we can observe that the relative size of our sample firms' goodwill to total assets range from 0.3 to 79 % and has a mean (median) of 18 (14) %, which implies that, on average, goodwill comprises a significant amount of our sample firms' total assets. The mean of 0.33 for *Imp made* indicates that a goodwill impairment was recognized for 184 out of 558 firm-year observations within the three

fiscal years. The average *Imp size* of our firm-year observations comprises 0.4 % of total assets. The mean (median) number of business segments of our sample firms is 6.15 (5.5) and ranges from 1 to 28 segments, indicating quite varying structural complexity within the firms. The mean of 0.15 for the indicator variable *Sales decline* indicates that 15 % of firm-year observations recorded a decline in sales. Refer to section 5.2 for further analysis of the variation in sales growth and other variables in the pre-crisis period and crisis year for our sample firms.

Table 6. Descriptive statistics

	N	Mean	std	min	p25	median	p75	max
<i>Dependent Variables</i>								
Tscore	558	4.40	1.01	0.83	3.89	4.44	5.00	6.94
Descr	558	4.50	1.22	1.67	4.17	4.17	5.00	8.33
Prosp	558	4.35	1.27	0.00	3.75	4.58	5.42	7.50
<i>Independent Variables</i>								
Size	558	9.74	1.05	8.22	8.87	9.42	10.58	12.62
Leverage	558	0.79	0.93	-2.97	0.34	0.61	1.07	4.90
ROE	558	9.42	20.47	-170.00	3.55	10.45	16.60	124.60
GWintensity	558	0.18	0.15	0.00	0.06	0.14	0.27	0.79
Imp made	558	0.33	0.47	0.00	0.00	0.00	1.00	1.00
Imp size	558	0.36	1.32	0.00	0.00	0.00	0.04	18.71
Vola	558	8.88	8.38	0.59	4.80	6.85	10.20	101.42
Sales decline	558	0.15	0.35	0.00	0.00	0.00	0.00	1.00
NrBS	558	6.15	4.20	1.00	4.00	5.50	8.00	28.00

Table 6 presents descriptive statistics on the dependent and independent variables. *Tscore* is the total GWIT disclosure quality score, *Descr* is the disclosure score relating to descriptive disclosure items and *Prosp* is the quality score relating to prospective disclosure items. The three measures are explained in detail in section 4.1. *Size* is the natural logarithm of total assets; *Leverage* is the fraction of total debt to total equity; *ROE* is the percentage return on equity calculated as earnings from continuing operations divided by the average total equity; *GWintensity* is the fraction of goodwill, before any goodwill impairments, to total assets; *Imp made* is an indicator variable equal to 1 for firm-year observations that have made a goodwill impairment during the year, and 0 otherwise; *Imp size* is the fraction of goodwill impairment to total assets; *Vola* is the variance of daily stock returns over the last five years; *Sales decline* is an indicator variable equal to 1 if the sales for the respective firm-year observation declined by 10% or more; *NrBS* represents the number of business segments.

Pearson correlations

Table A.2 in Appendix displays the Pearson correlations between our dependent and independent variables. The variable *Tscore* is positively and significantly correlated with both *Descr* (coefficient = 0.566) and *Prosp* (coefficient = 0.919), which is to be expected since the two latter are subcomponents of the former. Additionally, it is not surprising that the correlation between *Tscore* and *Prosp* is stronger than that between *Tscore* and *Descr*, as *Prosp* constitutes a larger total weight of *Tscore* due to the relatively larger

amount of disclosure items within that category. Potentially more interesting is the fact that we observe a much smaller correlation between the two individual sub-scores; *Descr* and *Prosp* (coefficient = 0.195, p-value = 0.00). This suggests that a high descriptive disclosure quality for a given firm does not necessarily imply a high prospective disclosure quality, which one might have expected.

Looking at how our dependent variables correlate with our measure for extreme uncertainty ‘*Crisis*’, we can observe that they behave relatively similarly, where *Tscore* and *Prosp* show a similar correlation with coefficients of 0.092 (p-value = 0.030) and 0.090 (p-value = 0.034), respectively, and where *Descr* has a correlation coefficient of 0.041 (p-value = 0.331). Apart from the dependent variables, the independent variables that correlate the most are *Sales decline* and *Crisis* with a strong positive correlation (coefficient = 0.389, p-value = 0.000), which to some degree is to be expected given how they both potentially capture economic and operational decline in our firms. Further, as the highest correlation between some of the independent variables is 0.389, this indicates that multicollinearity is not a concern.

5.2. Impact of the crisis in descriptive statistics

As a basis for analyzing our main research question, i.e. the association between great uncertainty and firms’ GWIT disclosure policies, we start by investigating the impact that Covid-19 has had on our sample firms in general. Panel A of Table 7 describes the change in firm performance metrics that are dynamic and believed to capture some of the economic and operational health of our firms by year, across our observation years 2018 to 2020. The *ROE* of our sample firms decreases significantly in 2020 with a mean (median) in 2020 of 2.16 (6.77) compared to corresponding figures in 2019 of 11.70 (11.05) and in 2018 of 14.39 (12.70). Additionally, we can observe a decrease in sales growth in terms of both mean and median, which both turned negative in 2020, whereas they display positive single digits in 2018 and 2019. Looking more closely at the effect of the crisis on our firms’ goodwill impairment recognition, we can observe that there are more firms which have recognized a goodwill impairment in 2020 than in the prior years. Given by the binary variable *Imp made*, the number of firms recognizing a goodwill impairment in 2020 was 82 compared to 56 in 2019 and 47 in 2018. Further, the variable *Imp size* indicates that the magnitude of impairments increased from 0.27 and 0.25 % of total assets in 2018 and 2019 respectively, to 0.55 % in 2020. Refer to section 5.4 for our additional tests on the statistical significance of the observed increase in impairments recognized.

Panel B of Table 7 depicts the *Covid impact* scores (as defined in section 4.2) of our sample firms. Results are presented for firms classified as ‘high impacted’ and ‘low impacted’, respectively. The table shows that there is a clear difference in the degree of impact between the two group of firms with a mean (median) for ‘high impacted’ firms

of 0.77 (0.98) and for ‘low impacted’ firms of 0.00 (0.00). However, as previously discussed as a weakness of our research design (refer to section 4.3.2), the difference between the minimum impact score for ‘high impacted’ firms (0.29) and the maximum impact score for ‘low impacted’ firms (0.27) is very small, potentially reducing the power of our results.

Table 7. Performance metrics over time and Covid impact scores

Panel A. Performance metrics by year									
	N	mean	std	min	p25	median	p75	max	Year
ROE	186	14.39	17.28	-38.10	6.69	12.70	18.20	124.60	2018
ROE	186	11.70	12.48	-41.00	5.49	11.05	17.10	66.30	2019
ROE	186	2.16	26.91	-170.00	-2.48	6.77	13.70	60.30	2020
Imp made	186	0.25	0.44	0.00	0.00	0.00	1.00	1.00	2018
Imp made	186	0.30	0.46	0.00	0.00	0.00	1.00	1.00	2019
Imp made	186	0.44	0.50	0.00	0.00	0.00	1.00	1.00	2020
Imp size	186	0.27	0.88	0.00	0.00	0.00	0.00	5.38	2018
Imp size	186	0.25	0.85	0.00	0.00	0.00	0.01	5.67	2019
Imp size	186	0.55	1.93	0.00	0.00	0.00	0.18	18.70	2020
Sales growth	186	5.35	10.61	-29.02	0.44	3.88	7.98	54.07	2018
Sales growth	186	2.92	11.59	-73.21	-1.21	4.38	8.26	29.80	2019
Sales growth	186	-6.98	18.41	-69.92	-12.27	-5.60	0.34	106.26	2020

Panel B. Covid impact scores									
	N	mean	std	min	p25	median	p75	max	Year
All Firms	178	0.39	0.55	-1.16	0.00	0.28	0.62	2.86	2020
High impacted	89	0.77	0.49	0.29	0.44	0.62	0.98	2.86	2020
Low impacted	89	0.00	0.25	-1.16	-0.08	0.00	0.18	0.27	2020

Panel A Table 7 presents descriptive statistics on performance metrics per year and **Panel B** of Table 7 presents descriptive statistics on the Covid impact scores. *ROE* is the percentage return on equity calculated as earnings from continuing operations divided by the average total equity; *Imp made* is an indicator variable equal to 1 for firm-year observations that have made a goodwill impairment during the year, and 0 otherwise; *Imp size* is the fraction of goodwill impairment to total assets; *Sales growth* is the growth in sales between year t and t -1. *High impacted* refers to the Covid impact scores for firms with a Covid impact score above the 50th percentile, and *Low impacted* refers to the Covid impact scores for firms with a Covid impact score below the 50th percentile.

Furthermore, during the collection of disclosure quality data in the firms’ annual reports, we also collect data for a binary variable called ‘COVID-19 impact mentioned’, which we define as a variable capturing whether the firm mentioned the impact of Covid-19 on the firm’s GWIT or not. It is reasonable to expect firms to mention this since, as described in section 2.2, IAS 36 stipulates that consideration must be given to external factors when

performing the impairment-testing of assets. More specifically, the collection of the variable mean that we require that the firm mentioned the impact of Covid-19, or similar words and synonyms implying the crisis, on the firm’s GWIT procedure. The variable is coded as ‘1’ if the Covid-19 impact was mentioned and ‘0’ otherwise. Analysing the variable, we can observe that 130 out of the 186 firms in our sample mentioned Covid-19, specifically, as a consideration when conducting their GWIT in 2020. This indicates that most firms find the crisis to be a significant event that is relevant to be incorporated in relation to the impacts it could have on the firm’s goodwill balance and related impairment-testing.

5.3. Main results

Our research is centered around investigating the impact that great uncertainty in the macroeconomic environment has on the financial disclosure policy of firms, and more specifically, on firms’ GWIT disclosures. This has been investigated by comparing firms’ disclosers in ‘normal times’ and whether they change when the firm is exposed to a shock, such as the crisis brought on by the Covid-19 pandemic in 2020.

We present the pooled OLS regression results of Model 1, used to test H1 and H2, in Table 8. The table reports t-statistics with country-clustered standard errors (see further motivation for model choice in section 4.3). We examine the determinants of GWIT disclosure quality by including *Tscore*, *Descr* and *Prosp* as the dependent variables, see Model 1a, 1b and 1c respectively.

Table 8. Effect of high uncertainty on GWIT disclosure quality

<i>Variables</i>	Model (1a)		Model (1b)		Model (1c)	
	<i>Disclosure = Tscore</i>	<i>Std error</i>	<i>Disclosure = Descr</i>	<i>Std error</i>	<i>Disclosure = Prosp</i>	<i>Std error</i>
Crisis	0.171 ***	0.059	0.045	0.105	0.234 ***	0.055
Size	-0.005	0.056	0.134 *	0.075	-0.075	0.080
Leverage	0.186 *	0.097	0.160 **	0.073	0.199	0.118
ROE	-0.011 ***	0.002	-0.013 **	0.005	-0.009 ***	0.002
GWintensity	1.504 ***	0.510	0.328	0.558	2.090 ***	0.593
IMP made	0.323 ***	0.063	0.250	0.184	0.359 ***	0.075
IMP size	-0.058	0.034	-0.055	0.047	-0.060	0.040
Vola	-0.002	0.005	-0.006	0.005	0.000	0.006
Sales decline	-0.271 *	0.138	-0.280 **	0.104	-0.267	0.175
NrBS	0.053 ***	0.016	0.039	0.028	0.061 ***	0.019
Intercept	3.717 ***	0.578	2.903 ***	0.861	4.127 ***	0.813
No. of observations	558		558		558	
R-squared	0.177		0.111		0.142	

Table 8 presents pooled OLS regressions of Model 1 for our three measures of disclosure quality for GWIT. Standard errors are clustered at the country level. ***, ** and * denotes significance at the 1 %, 5 % and 10 % level, respectively. P-values are computed according to two-sided tests. The definitions of the dependent and independent variables are as follows: *Disclosure* refers to *Tscore*, *Descr* and *Prosp*. *Tscore* is the total GWIT disclosure quality score, *Descr* is the disclosure score relating to descriptive disclosure items and *Prosp* is the quality score relating to prospective disclosure items. The three measures are explained in detail in section 4.1. *Crisis* is an indicator variable equal to 1 if the respective observation is from the crisis year 2020, and 0 otherwise; *Size* is the natural logarithm of total assets; *Leverage* is the fraction of total debt to total equity; *ROE* is the percentage return on equity calculated as earnings from continuing operations divided by the average total equity; *GWintensity* is the fraction of goodwill, before any goodwill impairments, to total assets; *Imp made* is an indicator variable equal to 1 for firm-year observations that have made a goodwill impairment during the year, and 0 otherwise; *Imp size* is the fraction of goodwill impairment to total assets; *Vola* is the variance of daily stock returns over the last five years; *Sales decline* is an indicator variable equal to 1 if the sales for the respective firm-year observation declined by 10 % or more; *NrBS* represents the number of business segments.

Model 1a of Table 8 represent our results for the test of H1 and show that the total disclosure quality score, *Tscore*, is positively associated with the *Crisis* variable, significant at the 1 % level (coefficient = 0.171). This indicates that during the crisis year, total GWIT disclosure quality was on average 0.17 points higher, representing an increase of 3.9 % compared to the average score of 2018 and 2019, when controlling for firm characteristics that are believed to influence disclosure reporting behaviour. The economic magnitude is not great in size but still indicates a shift in the amount of disclosure items reported. The regression results thus support our prediction of H1 that high uncertainty about the future, as experienced during the Covid-19 crisis, has an association with disclosure quality and the results show that the relationship is positive.

In addition, the results show that *Tscore* is negatively associated with *ROE* (coefficient = 0.011), and that it is positively associated with *GWintensity* (coefficient = 1.504), *Imp made* (coefficient = 0.323) and *NrBS* (coefficient = 0.053). These coefficients are significant at the 1 % level. Further, *Tscore* is negatively associated with *Sales decline* (coefficient = 0.271) and positively associated with *Leverage* (coefficient = 0.186) at the 10 % level. The remaining control variables show no significant relationship with *Tscore* for our sample. The sign of the coefficient of *ROE* and *Sales decline* might be in support of the theory suggesting that disclosure quality decrease with firm performance and the presence of bad news, and vice versa (Lang & Lundholm, 1993; Miller, 2002). The positive coefficient of the remaining significant variables agrees with the predicted relation with disclosure quality. The R-squared of the regression is relatively low at 0.177, which is not uncommon in disclosure research (Owusu-Ansah, 1998; Morris et al., 2004; Sutthachai & Cooke, 2009), and suggests that the models ability to generalize is limited (Field, 2000). As our purpose is not to construct a model for predicting disclosure quality, this is not an issue for the interpretation of our results.

Model 1b and 1c of Table 8 represents the regression results for our test of H2 and includes the two sub-scores *Descr* and *Prosp* as dependent variables. The results show

that the prospective disclosure score ‘*Prosp*’ is positively associated with *Crisis* and significant at the 1 % level (coefficient = 0.234), while the descriptive disclosure score ‘*Descr*’ show no significant association with *Crisis* (coefficient = 0.045). The *Crisis* coefficient of Model 1c indicates that on average, prospective disclosure quality score was 0.23 points higher in the crisis year, representing an increase of 5.5 % from the average score of *Prosp* in 2018 and 2019. The economic magnitude of the association between prospective disclosure quality and *Crisis* is thus somewhat higher than that of the total disclosure quality and *Crisis*. The results are consistent with our prediction of H2, that prospective disclosure quality changes with high uncertainty regarding the future, while descriptive disclosure quality does not. As expected, the association between *Prosp* and *Crisis* is positive, in line with the results of our test of H1. Further, the results from the tests of prospective and descriptive disclosure quality are of particular interest as they indicate that the result of H1 is driven by the prospective score items (entity specific and high effort disclosures) rather than the descriptive score items.

The control variables for Model 1b and 1c present similar associations with *Descr* and *Prosp*, as with *Tscore*, but with some differences. *ROE* still has a negative and significant coefficient for both *Descr* and *Prosp*. *Leverage* and *Sales decline* only have a significant coefficient for *Descr*, with the same directions as in Model 1a. On the contrary, *GWintensity*, *Imp made* and *NrBS* only have a significant coefficient for *Prosp*, with the same directions as in Model 1a. In addition, *Descr* have a positive association with *Size*, which *Tscore* did not have, and is significant at the 10 % level.

Table 9. Effect of high uncertainty on GWIT disclosure quality, for ‘high impacted’ compared to ‘low impacted’ firms

<i>Variables</i>	Model (2a)		Model (2b)		Model (2c)	
	<i>Disclosure = Tscore</i>		<i>Disclosure = Descr</i>		<i>Disclosure = Prosp</i>	
	<i>Coefficient</i>	<i>Std error</i>	<i>Coefficient</i>	<i>Std error</i>	<i>Coefficient</i>	<i>Std error</i>
Crisis	0.107	0.070	-0.022	0.084	0.171**	0.076
High impact	-0.107	0.160	-0.092	0.251	-0.114	0.136
Crisis • High Impact	0.063	0.080	0.087	0.155	0.051	0.059
Size	-0.018	0.055	0.165**	0.078	-0.110	0.072
Leverage	0.207*	0.106	0.159*	0.077	0.231	0.135
ROE	-0.011***	0.002	-0.012**	0.005	-0.010***	0.002
GWintensity	1.436**	0.503	0.620	0.594	1.844***	0.515
IMP made	0.415***	0.083	0.250	0.203	0.498***	0.086
IMP size	-0.072*	0.036	-0.067	0.054	-0.074*	0.036
Vola	0.003	0.011	0.006	0.009	0.001	0.015
Sales decline	-0.253*	0.124	-0.332***	0.114	-0.213	0.149
NrBS	0.062***	0.014	0.038	0.030	0.074***	0.016
Intercept	3.792***	0.574	2.485**	0.882	4.446***	0.759
No. of observations	534		534		534	
R-squared	0.207		0.117		0.177	

Table 9 presents pooled OLS regressions of Model 2 for our three measures of disclosure quality for GWIT. Standard errors are clustered at the country level. ***, ** and * denotes significance at the 1 %, 5 % and 10 % level, respectively. P-values are computed according to two-sided tests. For eight of our sample firms (24 observations), there were no data on *Covid impact* and therefore these firms have been excluded in these regressions. The definitions of the dependent and independent variables are as follows: *Disclosure* refers to *Tscore*, *Descr* and *Prosp*. *Tscore* is the total GWIT disclosure quality score, *Descr* is the disclosure score relating to descriptive disclosure items and *Prosp* is the quality score relating to prospective disclosure items. The three measures are explained in detail in section 4.1. *Crisis* is an indicator variable equal to 1 if the respective observation is from the crisis year 2020, and 0 otherwise; *High impact* is an indicator variable equal to 1 if the firm has a Covid impact score above the 50th percentile, and 0 otherwise; *Crisis • High impact* is an interaction term between *Crisis* and *High impact*; *Size* is the natural logarithm of total assets; *Leverage* is the fraction of total debt to total equity; *ROE* is the percentage return on equity calculated as earnings from continuing operations divided by the average total equity; *GWintensity* is the fraction of goodwill, before any goodwill impairments, to total assets; *Imp made* is an indicator variable equal to 1 for firm-year observations that have made a goodwill impairment during the year, and 0 otherwise; *Imp size* is the fraction of goodwill impairment to total assets; *Vola* is the variance of daily stock returns over the last five years; *Sales decline* is an indicator variable equal to 1 if the sales for the respective firm-year observation declined by 10 % or more; *NrBS* represents the number of business segments.

Next, we turn to our test of H3 where we investigate if the relation between the high uncertainty experienced during Covid-19 and GWIT disclosure quality is different for firms that are highly impacted by the crisis in comparison to firms that are less impacted. Table 9 presents the DID regression results of Model 2, including *Tscore*, *Descr* and *Prosp* as dependent variables (refer to Model 2a, 2b and 2c of Table 9 respectively). The model tests if there is a difference in the change in disclosure quality from the pre-crisis period (2018-2019) to the crisis period (2020), for ‘high impacted’ firms compared to ‘low impacted’ firms. This difference in change would then be represented by the coefficient of *Crisis • High impact*. If the ‘high impacted’ firms increase disclosure quality more than ‘low impacted’ firms in 2020, we would expect the coefficient to be positive. Conversely, if highly impacted firms are less inclined to increase disclosure quality during the crisis, we would expect the coefficient to be negative.

The main variable of interest, the interaction term *Crisis • High impact*, show no significant association with disclosure quality for any of the disclosure quality score measures. The estimated coefficients are 0.063, 0.087 and 0.051 for Model 2a, 2b and 2c respectively. Thus, the results show no support for our prediction in H3 as we cannot reject the null hypothesis that the coefficient of the variable *Crisis • High Impact* is different from zero. We interpretate the results as an indication that the degree of which a specific firm was impacted by Covid-19 has had no impact on firms’ disclosure reporting behaviour.

In addition, the coefficient of *Crisis* is not significant in Model 2a and 2b, while in Model 2c, it is positive and significant at the 5 % level (coefficient = 0.171). In contrast to what the *Crisis* variable represented in the regression estimation of Model 1, the coefficient of *Crisis* in the DID estimation represents the association between *Disclosure* and *Crisis* for

the ‘low impacted’ firms. Additionally, the results show a negative but insignificant relation between *Tscore* and highly impacted firms, (coefficient = -0.107) indicating that there is no significant difference in the total GWIT disclosure quality score between the two groups of firms, prior to the crisis. The control variables present similar association with goodwill impairment disclosure quality as they did in the regressions presented in Table 8.

5.4. Supplementary tests

As noted in section 5.2, an analysis of descriptive statistics for our variables *Imp made* and *Imp size* suggest that goodwill impairments have increased among our sample firms in 2020, both in terms of size and frequency. Consequently, it is of interest to see whether the application of IAS 36 during a crisis fulfills its purpose to capture the sudden decrease in firms’ future outlook and prospects, as should be reflected in their GWIT. As previously mentioned, the purpose of the new goodwill impairment accounting regime was to provide better usefulness to investors compared to the previous linear amortization method. To analyse whether the observed change in 2020 is statistically significant, we perform two additional regressions where *Imp made* and *Imp size*, respectively, are the dependent variables and where *Crisis* is the main variable of interest, see Model 3.

Model 3:

$$Impairment_{j,t} = \beta_0 + \beta_1 Crisis_{jt} + \beta_2 Size_{jt} + \beta_3 Leverage_{jt} + \beta_4 GWintensity_{jt} + \beta_5 NrBS_j + \varepsilon_{it}$$

Where *Impairment* is either *Imp made* or *Imp size*.

Table 10. Effect of high uncertainty on goodwill impairment recognition

<i>Variables</i>	Model (3a)		Model (3b)	
	<i>Coefficient</i>	<i>Std error</i>	<i>Coefficient</i>	<i>Std error</i>
Crisis	0.150***	0.043	0.317**	0.149
Size	0.098***	0.014	-0.063**	0.028
Leverage	-0.021	0.026	-0.064*	0.033
GWintensity	0.124	0.148	1.860**	0.750
NrBS	0.007	0.006	0.019**	0.007
Intercept	-0.722***	0.139	0.471*	0.242
No. of observations	558		558	
R-squared	0.083		0.060	

Table 10 presents pooled OLS regressions of Model 3 for our two measures of *Impairment*, i.e., *Imp made* and *Imp size*. Standard errors are clustered at the country level. ***, ** and * denotes significance at the 1 %, 5 % and 10 % level, respectively. P-values are computed according to two-sided tests. The definitions of the dependent and independent variables are as follows: *Imp made* is an indicator variable equal to 1 for firm-year observations that have made a goodwill impairment during the year, and 0 otherwise. *Imp size* is

the fraction of goodwill impairment to total assets. *Crisis* is an indicator variable equal to 1 if the respective observation is from the crisis year 2020, and 0 otherwise; *Size* is the natural logarithm of total assets; *Leverage* is the fraction of total debt to total equity; *GWintensity* is the fraction of goodwill, before any goodwill impairments, to total assets; *NrBS* represents the number of business segments.

The results from the regressions on *Imp made* and *Imp size* are presented in Model 3a and 3b of Table 10. The coefficient of *Crisis* is positive and significant for both *Imp made* (coefficient = 0.150) and *Imp size* (coefficient = 0.317). The coefficient of *Crisis* in Model 3a suggest that 15 % more of the sample firms recorded a goodwill impairment in the crisis year compared to previous years. In Model 3b the coefficient suggests that the fraction of impairments in relation to total assets increased by 0.3 percentage points, which corresponds to an increase of 122 % of the average impairment size in 2018 and 2019. The results thus indicate that goodwill impairments recorded by our sample firms increased significantly in both frequency and magnitude during the crisis year.

5.5. Sensitivity analysis

In this section we present various sensitivity analysis to test the robustness of our results to: 1) Fixed effects regression estimation; 2) Winsorizing of variables; 3) Alternative specifications of Covid-19 impact.

5.5.1. Fixed effects estimation

To address the concern of endogeneity we estimate Model 1 and 2 using country fixed effects which eliminate the omitted variable bias arising from unobserved time-independent variables that vary between countries. As explained previously, fixed effects estimation is not used for our main results as our sample period includes only three years, and fixed effects regression is best suited for data with sufficient change in variables over time. The results from the fixed effects regressions are presented in Table A.3 in Appendix. Our inferences regarding all hypotheses remain the same when using country-fixed effects estimation models. This suggests that the regression results presented in the main results section do not seem to suffer from omitted variable bias related to country specific covariates.⁹

5.5.2. Estimation using winsorized variables

The regression results presented in the main results section are estimated with no winsorizing of variables, except for *Leverage*, which had outliers that highly influenced the distribution variable as some of the firm observations have negative equity balances. To rule out the possibility that extreme values could be driving our results, which could

⁹ In addition, we run all regression models using firm fixed effects. The inferences regarding all hypotheses still remain unchanged from our main tests.

be a risk with a limited sample size, we estimate the regressions for H1 and H2 using winsorized continuous variables at the 1st and 99th percentile level. The conclusions from our main results remain largely unchanged when reestimating the regressions using winsorized variables, refer to Table A.4 in Appendix. The main difference is that when estimating Model 1 to test H1, the association between *Tscore* and *Crisis* is somewhat lower and significant only at the 5 % level (coefficient = 0.137).

5.5.3. Alternative specifications for Covid-19 impact

Alternative estimations using the Covid impact score

The main test of H3 heavily relies on the classification of firms as either ‘high impacted’ or ‘low impacted’ by the Covid-19 crisis. As discussed in section 4.3.2, since the degree of Covid impact follows a continuous scale, a weakness of our research design is that the difference in Covid impact between the lowest impacted firms within the treatment group, and the highest impacted firms within the control group, is small, as shown in section 5.2. To address this concern, we reestimate the regression of Model 2, where we divide the sample in three bins based on the Covid impact score, and let the bin containing firms with the highest score comprise the treatment group, and firms in the bin with the lowest scores comprise the control group. For this test we drop the sample of firms with the Covid impact score in the middle bin, to get a larger difference in the impact score between high and ‘low impacted’ firms. It should be mentioned however that this could potentially lower the power of our results as it reduces the sample size. The results from the DID regression using this alternative classification of high vs ‘low impacted’ firms is presented in Table A.5 in Appendix. Our inferences regarding the difference in the association of *Disclosure* and *Crisis* between high and ‘low impacted’ firms is unchanged from the main test, as *Disclosure* is not associated with any of the variables; *High Impact*, *Crisis* or *Crisis • High impact*, when testing for all three variants of *Disclosure* (*Tscore*, *Descr* and *Prosp*).

Further, since the Covid impact score follows a continuous scale, and to avoid the problems related to separating our sample into two separate groups, we also estimate the regression of Model 2 using *Covid impact* as a continuous variable, refer to Table A.6 in Appendix for presentation of the regression results. The inferences from our main results are still the same as we do not observe a significant association between any of the *Disclosure* metrics with the variable of interest *Crisis • Covid impact*.

Estimation using Covid-19 stringency index

As an additional robustness test for our H3, in order to control for potential insufficiencies in the design of our main Covid exposure index ‘Covid Impact’, we include the use of another impact index which attempts to capture the effect of the Covid crisis on a country level. While our main index allows for a proxy of the specific exposure of Covid-19 on an individual firm, as it is based on firms’ earnings calls, there might be some limitations

associated with the index design. More specifically, there could be a risk of endogeneity in the score that we observe if two firms that should be similarly impacted by the crisis, e.g., firms in the same industry and country with comparable size, have management teams communicating their perceived Covid impact in vastly different ways. The communication of firms might vary due to e.g., management incentives that affect management's willingness to transparently communicate their perceived impact from the Covid-19 crisis, or due to other unknown factors.

Consequently, we employ an alternative index without the same risk of endogeneity, the Covid stringency index developed by Hale et al. (2021), which captures Covid exposure on a country-level. The index returns a number between '0' to '100' for a specific country and date based on how stringent the country has been in implementing different restrictions and policies with the aim to stop the spread of the Covid virus. The stringency index is a composite measure of nine response metrics¹⁰, e.g., workplace and school closures, travel bans, etc. In this index measure, '0' indicates the least strict Covid government response and '100' the strictest. We have matched the respective Covid stringency scores to our sample of firms based on country of incorporation and period end date. Similar to our main test of H3, we classify firms as 'high impacted' and 'low impacted' based on whether they are above or below the 50th percentile.

The results of the DID regressions of Model 2, using the Covid stringency index to classify firms as 'high impacted' or 'low impacted' by Covid-19, are presented in Table A.7 in Appendix. The results show no significant difference in the change in GWIT disclosure quality between the two group of firms, indicating that our inferences of H3 from the main results presented in section 5.3, remain unchanged.

Important to note is that obviously there is no perfectly constructed index without any weaknesses, and we realize that the use of the Covid stringency Index on a country level could suffer from other shortcomings. However, with the use of these two different indices, we have addressed some of the difficulties of measuring Covid exposure using an index.

5.6. Discussion

Our regression results indicate that the disclosure behaviour of firms' GWIT changed during the Covid-19 crisis year, where a general increase in total disclosure score can be observed among our sample of large European firms. This is in line with previous research suggesting that economic disruption, represented by for example a financial crisis, is expected to create a disequilibrium of information in the market that can alter the financial

¹⁰ The nine metrics used to calculate the stringency index are: school closures; workplace closures; cancellation of public events; restrictions on public gatherings; closures of public transport; stay-at-home requirements; public information campaigns; restrictions on internal movements; and international travel controls.

reporting environment of firms (Sutthachai & Cooke, 2009; Bepari et al., 2014; Krause et al., 2017) Thus, these results show support for our first hypothesis, stating that firms' disclosure quality of GWIT changes in a year of crisis.

Additionally, our results show that firms primarily altered their *prospective disclosures*, which increased in the crisis year 2020. As discussed in section 5.1 above, the increase seem to be mainly drive by three sub-categories; 'Number of discount rates' that reveals information on the specific risks related to a firm's various CGUs, 'Sensitivity of impairment tests' which allows investors to better understand operational and financial risks of future cash flows and how sensitive these are to the estimates made by firm management, and 'Explanation of the variation in discount rates' which allows investors to understand the change in risk exposure for the firm (Paugam & Ramond, 2015). The first and second category, especially, could help reduce uncertainty that investors might hold regarding a firm's level of impact from the macroeconomic shock caused by the Covid-19 crisis, and the effect it has on the firms' future prospects. Prospective disclosures, that generally entail information on management assumptions, have also been established to be the type of disclosures users of financial reporting and the standard setters deem the most informative and value relevant (EY, 2010; European Securities and Markets Authority, 2013).

Conversely, the same increase in quality is not observed for firms' descriptive disclosures in 2020, which remain on similar levels as in the pre-crisis period. These two findings in combination show support for our H2 suggesting that firms primarily change their prospective disclosure quality, but not their descriptive disclosure quality, in a period of elevated uncertainty. This indicates that firms mainly improve the disclosure of information that aid in reducing estimation risk during the crisis, and thereby bring the benefit of reduced cost of capital as found by Paugam & Ramond (2015).

As a next step, we tested whether the change in financial reporting and disclosure behavior of firms' GWIT was different for firms estimated to be relatively more affected by the crisis. This since we hypothesized that the benefits and costs of increased disclosure quality are believed to be more prominent for these firms due to the higher degree of uncertainty regarding their future prospects. Our DID regression results did not support our H3, that the change in firms' disclosure quality in the crisis year is different for firms that are highly impacted by the crisis compared to firms that are less impacted. The results remain unchanged under various classifications of 'high' and 'low' Covid impacted firms. While this might be due to the limitations of the test and the impact score index used, it could also be interpreted as an indication that the degree to which firms altered their disclosure behavior is unrelated to their impact from the crisis. Rather, it seems as though the increase in disclosure quality of GWIT was associated with the macroeconomic shock in the market at large.

Further, examining the effects that the Covid crisis year has had on our sample firms' operational health, descriptive statistics show that the firms on average have experienced a negative sales development and a significant drop in return on equity in 2020 compared to previous years. Moreover, we can conclude that a greater share of firms recognized a goodwill impairment in 2020 than in the two preceding years and that the average magnitude of the impairments, measured as the relative size of the charge against firms' total assets, increased as well. Hence, we see indications of how 2020 was in fact a special year. As these operational metrics are included as control variables in our regression estimations, it still seems as if the disclosure quality had an association with the heightened uncertainty and that the observed effect was not just a consequence of the decline in performance in general. Additionally, our supplemental test of whether the number and magnitude of goodwill impairments increased during the crisis year further support that the Covid-19 crisis has impacted our sample firms and that they have adjusted their impairment-testing for goodwill, accordingly. However, we cannot assess whether this increase in amount of impairments was sufficient, or conversely, justified in relation to how much Covid-19 has impacted the firms. But none the less, these findings are of interest in the context of the discussion on the practical use of IAS 36. Especially, the findings can aid in the discussion regarding whether the standard fulfills its purpose as to capture sudden erosion of firms' goodwill capital, which can be expected during a crisis when the operational prospects deteriorate.

To conclude, our findings suggest that prospective but not descriptive GWIT disclosure quality increase when uncertainty is high, and that this seems to apply to all firms, regardless of the degree of impact from the crisis. The inferences from the tests are robust to several model specifications. Even though we have to be cautious with what conclusion we can draw from these results, as we cannot establish causality of the relation between GWIT disclosure quality and high uncertainty, there are still interesting analysis that can be made. The findings can be interpreted in the context of the information asymmetry and disclosure theory where the alleviation of the information asymmetry problem that occurs in a crisis when information becomes more disperse across market participants, changes firms' incentives to pursue information equating efforts by turning their private information into public information. As the total disclosure score among our sample firms increased, it suggests that firms found it worthwhile to undertake the potential added cost of increased disclosures. According to corporate finance theory, and under the assumption that firms' management attempt to maximize the value of their firms, this would suggest that most firms found the benefit of e.g. a lower cost of capital (via increased transparency in the relatively more estimation risk-dense disclosures), outweighed any associated increase in e.g. proprietary and processing costs.

The increase in disclosures across our firms also suggest that the increased uncertainty about the future did not seem to amplify the friction under which Lundholm & Van Winkle (2006) argue that firms disclose sub-optimally as firms' management simply 'do

not know any relevant information to disclose'. Hence, while the estimation of many components of the impairment-testing most likely were further complicated during the crisis, most firms at least attempted to make the best possible estimates given the information available at the time. From the perspective of the supervisory bodies, i.e. the standard setter and auditors, this gives insight into how firms managed to practically go about their GWIT during the crisis. As previously described, GWIT and their associated disclosures was one of the areas that ranked high on the supervisory bodies' agenda and areas for where they urged for additional thoroughness and robustness during the crisis (EY, 2020; Kumar & Tokar, 2020). Consequently, our findings suggest that firms were apprehensive to the importance of being transparent in how they report regarding their goodwill capital.

6. Concluding remarks

The aim of this paper is to investigate firms' disclosure quality of GWIT under IAS 36, and whether it changes when there is a sudden increase of uncertainty in the general macroeconomic environment. We find that large listed European firms improve their GWIT disclosures under a period of extreme uncertainty in the macroeconomy, such as during a crisis. More specifically, we find that firms increase their *prospective* disclosures, explanation what that is, which is the type of information that external stakeholders, such as analysts, investors and the standard setter, typically deems as the most value relevant in order to interpret the reliability of firms' estimated value of goodwill capital. Our findings suggest that the change in disclosures were systematic across firms and not dependent on the relative impact of the heightened uncertainty on individual firms. Therefore, we interpret the results as an indication that firms' altered their GWIT disclosures not solely when their own future prospects suddenly might get more uncertain, but also when the uncertainty in the market at large elevates.

Our paper adds to the literature on disclosure quality, and more specifically, the research investigating firms' application of GWIT and their related disclosures. Furthermore, we add to previous literature by looking at how this aforementioned disclosure behavior changes in certain settings, i.e. what impact external factors can have on firms' disclosure quality, and specifically different types of disclosure quality (prospective versus descriptive disclosures). Lastly, our paper adds to the knowledge of what effect a highly uncertain macroeconomic environment can have on the information distribution between firm insiders and outsiders, as in line with economic disturbance theory. The findings in this paper are therefore of interest for standard setters, investors and auditors as they shed light on firms practical application of IAS 36, which infers substantial complexity as it involves forecasting and predicting the future, in a context when the future suddenly gets highly uncertain. Furthermore, in this paper we have documented in detail to what extent large public European firms include various types of disclosure items related to the GWIT. This is information that should be of particular interest to standard setters and auditors in their assessment of strengths and weaknesses of firms' application of the standard.

One important weakness implicit in our research design is that we cannot guarantee that our disclosure quality index fully captures the actual disclosure quality of firms' GWIT. Further, we are aware of how manual collection of disclosure quality with the use of an index involves some degree of subjectivity. It also limits the feasible sample size of our study. Another limitation is that there could be other underlying factors that influence the disclosure reporting behavior of firms' GWIT that we are not capturing in our model. Such factors could for example include management's individual knowledge levels, prior experiences, and agency-based motives, e.g. bonus incentives or equity market concerns. While this paper investigates if differences in firms degree of impact from a crisis helps

explain the change in disclosure reporting behavior, further research could study if such management traits or incentives can explain differences in firms disclosure behavior during times of high uncertainty.

Our paper is one of the few to investigate the relationship between a substantial shock to the macroeconomic environment and firms' financial reporting of goodwill. While we document a change in how firms choose to disclose in relation to their goodwill, we are not able to draw any conclusions on the potential aftermath of this change; e.g. what accuracy or value relevance the additionally provided information had. Further research could therefore be done on the potential effects on firms' cost of capital during a crisis as well as analysts' and investors' incorporation of that information provided. Finally, future research could study the motives and reasons for firms' GWIT disclosure behavior, and through, e.g., surveys or interviews investigate the processes proceeding a change in the disclosure quality.

7. References

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8. Appendix

Table A.1. Detailed description of GWIT disclosure items reported

Panel A. Proportion of disclosed items within each sub-category					
<i>Sub-category #</i>			<i>2018</i>	<i>2019</i>	<i>2020</i>
<i>Descriptive disclosure sub-categories</i>					
1.	Presentation and general explanation of Standard IAS 36		55.6%	58.1%	60.8%
2.	Details on the possible valuation methods: fair value or value-in-use		53.0%	54.2%	54.2%
3.	Complexity of methods used		7.8%	7.3%	7.8%
4.	Definition of cash flows		93.0%	92.7%	93.5%
5.	Origin of the discount rate		3.2%	3.8%	3.8%
<i>Prospective disclosure sub-categories</i>					
6.	Number of cash-generating units		90.9%	91.4%	91.7%
7.	Details on the discount rate		50.9%	52.2%	53.1%
8.	Number of discount rates		66.7%	68.1%	72.0%
9.	Cost of capital components		4.5%	4.8%	5.2%
10.	Sensitivity of impairment tests		47.7%	45.3%	53.6%
11.	Explanation of the variations of the discount rate		4.3%	3.8%	10.8%
12.	Extrapolation		54.6%	54.0%	55.6%
13.	Terminal value		73.9%	75.0%	75.3%
Panel B. Proportion of sample firms disclosing each disclosing item					
<i>Sub-category #</i>	<i>Item #</i>		<i>2018</i>	<i>2019</i>	<i>2020</i>
1.	1.	Does the report explicitly mention IAS 36?	33.3%	34.9%	39.8%
	2.	Does the report explain the alternative between value-in-use and fair value (less costs to sell) to estimate recoverable value?	78.0%	81.2%	81.7%
2.	3.	Does the report mention 'costs to sell' / 'costs of disposal' to estimate fair value?	80.1%	82.8%	83.9%
	4.	Does the report mention the use of a DCF model to determine value-in-use?	95.2%	95.7%	93.0%
	5.	Does the report mention the use of a DCF model to determine fair value (as a level 3 estimate)?	17.3%	19.4%	20.4%
	6.	Does the report mention another approach to determine fair value?	18.8%	18.8%	19.4%
3.	7.	Does the report mention using different methods for valuation of different CGUs?	7.0%	7.0%	6.5%
	8.	Does the report mention different valuation methods for the same CGU?	8.6%	7.5%	9.1%
4.	9.	Does the report explain if projected cash flows are CGU-specific?	96.2%	95.7%	96.2%

Table A.1. Continued

Panel B. Proportion of sample firms disclosing each disclosing item					
<i>Sub- category #</i>	<i>Item #</i>		<i>2018</i>	<i>2019</i>	<i>2020</i>
	10.	Does the report explain if projected cash flows are from management BP or from analysts' forecasts?	89.8%	89.8%	90.9%
5.	11.	Does the report mention using outside consultants to conduct impairment tests/provide services in the valuation process/estimation of discount rate?	4.3%	5.4%	5.4%
	12.	Does the report mention that discount rates are based on estimates of analysts covering the firm or the sector?	2.2%	2.2%	2.2%
6.	13.	Does the report include the number of CGUs?	91.9%	92.5%	93.0%
	14.	Does the report disclose the total amount of goodwill per CGU?	89.8%	90.3%	90.3%
7.	15.	Does the report mention the model used for determining the discount rate?	68.8%	71.0%	73.7%
	16.	Does the report mention the alternative between different discount rates or mention the use of several models to estimate cost of capital?	1.6%	1.1%	1.1%
	17.	Does the report mention the tax effect on discount rate?	89.2%	89.2%	88.7%
	18.	Does the report give details on the computation of the discount rate?	44.1%	47.3%	48.9%
8.	19.	Does the firm adjust the firm's wide discount rate for specific CGUs?	84.4%	85.5%	88.2%
	20.	Does the report disclose the different discount rates used per CGU?	75.8%	78.0%	81.7%
	21.	Does the report explain the adjustments/different discount rates used?	39.8%	40.9%	46.2%
9.	22.	Does the report disclose the base rate of the discount rate?	0.5%	0.5%	0.5%
	23.	Does the report disclose the risk-free rate chosen?	12.4%	13.4%	14.0%
	24.	Does the report mention the beta coefficient chosen?	5.9%	6.5%	7.0%
	25.	Does the report mention the risk premium chosen?	8.1%	8.6%	9.7%
	26.	Does the report mention management's target leverage ratio?	3.8%	3.8%	4.3%
	27.	Does the report mention the specific beta of the company?	0.0%	0.0%	0.5%
	28.	Does the report mention the beta of peer firms?	0.5%	0.5%	0.5%
10.	29.	Does the report mention sensitivity tests performed on any of the components?	70.4%	69.4%	76.3%

Table A.1. Continued

Panel B. Proportion of sample firms disclosing each disclosing item					
<i>Sub- category #</i>	<i>Item #</i>		<i>2018</i>	<i>2019</i>	<i>2020</i>
	30.	Does the report mention the difference between the estimated recoverable amount and the carrying amount?	27.4%	26.9%	31.2%
	31.	Does the report mention the required change in an estimate for which the estimated recoverable amount would equal the carrying amount? (or the implied impairment in a change in assumption)	45.2%	39.8%	53.2%
11.	32.	Does the report explain the variations of discount rates from the previous year?	4.3%	3.8%	10.8%
12.	33.	Does the report mention the extrapolation period between the end of the BP and terminal value?	17.2%	16.1%	17.7%
	34.	Does the report mention what is the maximum number of periods for BPs?	91.9%	91.9%	93.5%
13.	35.	Does the report mention if terminal value is computed with a multiple or with an infinite projection period?	61.8%	61.8%	61.8%
	36.	Does the report mention the level of multiple applied / the terminal growth rate assumption?	86.0%	88.2%	88.7%
Additional item		Does the report mention the impact of Covid-19 on the GWIT?	-	-	69.6%

Panel A of Table A.1 presents the proportion of GWIT disclosure quality items that are disclosed within each sub-category, averaged over the sample firms. **Panel B** of Table A.1 presents the proportion of sample firms that disclose the specific disclosure items.

Table A.2. Pearson correlations

Variables	Tscore	Descr	Prosp	Crisis	ROE	Leverage	Size	Gwintensity	Imp made	Imp size	Vola	NrS
Descr	0.566*** (0.000)											
Prosp	0.919*** (0.000)	0.195*** (0.000)										
Crisis	0.092** (0.030)	0.041 (0.331)	0.090** (0.034)									
ROE	-0.191*** (0.000)	0.180*** (0.000)	-0.141*** (0.001)	-0.251*** (0.000)								
Leverage	0.140*** (0.001)	0.104** (0.014)	0.117*** (0.006)	-0.057 (0.179)	0.146*** (0.001)							
Size	0.097** (0.022)	0.197*** (0.000)	0.021 (0.626)	0.047 (0.264)	-0.035 (0.403)	0.099** (0.020)						
Gwintensity	0.166*** (0.000)	-0.009 (0.826)	0.202*** (0.000)	-0.041 (0.329)	0.023 (0.581)	-0.031 (0.469)	-0.120*** (0.005)					
Imp made	0.189*** (0.000)	0.152*** (0.000)	0.152*** (0.000)	0.162*** (0.000)	-0.240*** (0.000)	-0.026 (0.544)	0.233*** (0.000)	-0.001 (0.983)				
Imp size	0.079* (0.062)	0.025 (0.554)	0.082* (0.053)	0.105** (0.013)	-0.312*** (0.000)	-0.059 (0.164)	-0.058 (0.169)	0.202*** (0.000)	0.386*** (0.000)			
Vola	0.065 (0.124)	0.023 (0.591)	0.067 (0.116)	0.165*** (0.000)	-0.326*** (0.000)	0.089** (0.036)	-0.079* (0.061)	-0.044 (0.303)	0.112*** (0.008)	0.210*** (0.000)		
NrBS	0.222*** (0.000)	0.184*** (0.000)	0.176*** (0.000)	0.000 (1.000)	-0.069* (0.105)	0.063 (0.139)	0.271*** (0.000)	-0.148*** (0.000)	0.109*** (0.010)	0.012 (0.779)	0.054 (0.200)	
Sales decline	0.032 (0.451)	0.016 (0.700)	0.030 (0.477)	0.389*** (0.000)	-0.377*** (0.000)	0.011 (0.794)	0.009 (0.839)	-0.057 (0.178)	0.146*** (0.001)	0.132*** (0.002)	0.233*** (0.000)	0.078* (0.064)

Table A.2 presents Pearson correlation coefficients between the dependent and independent variables, with p-values in parentheses below the coefficients. ***, ** and * denotes significance at the 1 %, 5 % and 10 % level, respectively. The definitions of the dependent and independent variables are as follows: **Tscore** is the total GWIT disclosure quality score, **Descr** is the disclosure score relating to descriptive disclosure items and **Prosp** is the quality score relating to prospective disclosure items. The three measures are explained in detail in section 4.1. **Crisis** is an indicator variable equal to 1 if the respective observation is from the crisis year 2020, and 0 otherwise; **Size** is the natural logarithm of total assets; **Leverage** is the fraction of total debt to total equity; **ROE** is the percentage return on equity calculated as earnings from continuing operations divided by the average total equity; **GWintensity** is the fraction of goodwill, before any goodwill impairments, to total assets; **Imp made** is an indicator variable equal to 1 for firm-year observations that have made a goodwill impairment during the year, and 0 otherwise; **Imp size** is the fraction of goodwill impairment to total assets; **Vola** is the variance of daily stock returns over the last five years; **Sales decline** is an indicator variable equal to 1 if the sales for the respective firm-year observation declined by 10 % or more; **NrBS** represents the number of business segments.

Table A.3. Fixed effects estimations**Panel A. Fixed effects estimation of Model 1**

<i>Variables</i>	Model (1d)		Model (1e)		Model (1f)	
	<i>Disclosure = Tscore</i>	<i>Std error</i>	<i>Disclosure = Descr</i>	<i>Std error</i>	<i>Disclosure = Prosp</i>	<i>Std error</i>
Crisis	0.193***	0.060	0.080	0.110	0.250***	0.052
Size	0.001	0.047	0.081	0.086	-0.034	0.066
Leverage	0.154*	0.083	0.175**	0.072	0.144	0.106
ROE	-0.006***	0.002	-0.010*	0.005	-0.005**	0.002
GWintensity	1.582***	0.543	0.268	0.499	2.356***	0.698
IMP made	0.234***	0.069	0.148	0.181	0.277***	0.091
IMP size	-0.031	0.027	-0.001	0.032	-0.042	0.037
Vola	0.000	0.004	-0.007*	0.004	-0.004	0.006
Sales decline	-0.207	0.122	-0.253**	0.104	-0.185	0.150
NrBS	0.058***	0.016	0.054*	0.003	0.061***	0.017
Intercept	3.547***	0.512	3.356***	0.947	3.647***	0.714
Country fixed effects	Yes		Yes		Yes	
No. of observations	558		558		558	
R-squared	0.317		0.226		0.268	

Panel B. Fixed effects estimation of Model 2

<i>Variables</i>	Model (2d)		Model (2e)		Model (2f)	
	<i>Disclosure = Tscore</i>	<i>Std error</i>	<i>Disclosure = Descr</i>	<i>Std error</i>	<i>Disclosure = Prosp</i>	<i>Std error</i>
Crisis	0.137**	0.062	0.008	0.077	0.201***	0.068
High Impact	-0.059	0.131	-0.057	0.218	-0.060	0.109
Crisis • High impact	0.069	0.075	0.083	0.159	0.062	0.047
Size	-0.037	0.052	0.113	0.090	-0.112*	0.061
Leverage	0.195*	0.101	0.176**	0.072	0.204	0.140
ROE	-0.007**	0.003	-0.010*	0.006	-0.005**	0.002
GWintensity	1.232**	0.474	0.261	0.521	1.718***	0.533
IMP made	0.312***	0.076	0.149	0.195	0.394***	0.096
IMP size	-0.036	0.025	-0.022	0.037	-0.044	0.029
Vola	0.000	0.011	0.004	0.004	-0.002	0.015
Sales decline	-0.182*	0.100	-0.304**	0.109	-0.121	0.119
NrBS	0.068***	0.014	0.054	0.033	0.075***	0.011
Intercept	3.950***	0.540	2.938***	0.992	4.457***	0.651
Country fixed effects	Yes		Yes		Yes	
No. of observations	534		534		534	
R-squared	0.350		0.223		0.308	

Panel A and **Panel B** of Table A.3 presents country fixed effects regressions of Model 1 and Model 2 respectively, for our three measures of disclosure quality for GWIT. Standard errors are clustered at the country level. ***, ** and * denotes significance at the 1 %, 5 % and 10 % level, respectively. P-values are computed according to two-sided tests. For eight of our sample firms (24 observations), there were no data

on *Covid impact* and therefore these firms have been excluded in the regressions presented in Panel B. The definitions of the dependent and independent variables are as follows: *Disclosure* refers to *Tscore*, *Descr* and *Prosp*. *Tscore* is the total GWIT disclosure quality score, *Descr* is the disclosure score relating to descriptive disclosure items and *Prosp* is the quality score relating to prospective disclosure items. The three measures are explained in detail in section 4.1. *Crisis* is an indicator variable equal to 1 if the respective observation is from the crisis year 2020, and 0 otherwise; *High impact* is an indicator variable equal to 1 if the firm has a Covid impact score above the 50th percentile, and 0 otherwise; *Crisis • High impact* is an interaction term between *Crisis* and *High impact*; *Size* is the natural logarithm of total assets; *Leverage* is the fraction of total debt to total equity; *ROE* is the percentage return on equity calculated as earnings from continuing operations divided by the average total equity; *GWintensity* is the fraction of goodwill, before any goodwill impairments, to total assets; *Imp made* is an indicator variable equal to 1 for firm-year observations that have made a goodwill impairment during the year, and 0 otherwise; *Imp size* is the fraction of goodwill impairment to total assets; *Vola* is the variance of daily stock returns over the last five years; *Sales decline* is an indicator variable equal to 1 if the sales for the respective firm-year observation declined by 10 % or more; *NrBS* represents the number of business segments.

Table A.4. Estimation of Model 1 using winsorized variables

<i>Variables</i>	Model (1g)		Model (1h)		Model (1i)	
	<i>Disclosure = Tscore</i>		<i>Disclosure = Descr</i>		<i>Disclosure = Prosp</i>	
	<i>Coefficient</i>	<i>Std error</i>	<i>Coefficient</i>	<i>Std error</i>	<i>Coefficient</i>	<i>Std error</i>
Crisis	0.137**	0.065	0.014	0.104	0.198***	0.067
Size	-0.021	0.060	0.158*	0.080	-0.111	0.080
Leverage	0.207*	0.103	0.168**	0.074	0.226	0.133
ROE	-0.013***	0.004	-0.019***	0.006	-0.011***	0.003
GWintensity	1.509***	0.490	0.703	0.583	1.912***	0.510
IMP made	0.423***	0.084	0.271	0.189	0.499***	0.105
IMP size	-0.109	0.064	-0.135*	0.072	-0.096	0.077
Vola	0.003	0.013	0.004	0.009	0.002	0.018
Sales decline	-0.259**	0.119	-0.374**	0.131	-0.201	0.139
NrBS	0.065***	0.015	0.042	0.030	0.076***	0.017
Intercept	3.786***	0.673	2.572**	0.946	4.393***	0.875
No. of observations	534		534		534	
R-squared	0.204		0.127		0.170	

Table A.4 presents pooled OLS regressions of Model 1 for our three measures of disclosure quality for GWIT. Standard errors are clustered at the country level. ***, ** and * denotes significance at the 1 %, 5 % and 10 % level, respectively. P-values are computed according to two-sided tests. The definitions of the dependent and independent variables are as follows: *Disclosure* refers to *Tscore*, *Descr* and *Prosp*. *Tscore* is the total GWIT disclosure quality score, *Descr* is the disclosure score relating to descriptive disclosure items and *Prosp* is the quality score relating to prospective disclosure items. The three measures are explained in detail in section 4.1. *Crisis* is an indicator variable equal to 1 if the respective observation is from the crisis year 2020, and 0 otherwise; *Size* is the natural logarithm of total assets; *Leverage* is the fraction of total debt to total equity; *ROE* is the percentage return on equity calculated as earnings from continuing operations divided by the average total equity; *GWintensity* is the fraction of goodwill, before any goodwill impairments, to total assets; *Imp made* is an indicator variable equal to 1 for firm-year observations that have made a goodwill impairment during the year, and 0 otherwise; *Imp size* is the fraction of goodwill impairment to total assets; *Vola* is the variance of daily stock returns over the last five years;

Sales decline is an indicator variable equal to 1 if the sales for the respective firm-year observation declined by 10 % or more; *NrBS* represents the number of business segments. All continuous independent variables have been winsorized at the 1st and 99th percentile.

Table A.5. Estimation of Model 2 using top and bottom third of Covid impact to classify firms as ‘high impacted’ and ‘low impacted’

<i>Variables</i>	Model (2g)		Model (2h)		Model (2i)	
	<i>Disclosure = Tscore</i>		<i>Disclosure = Descr</i>		<i>Disclosure = Prosp</i>	
	<i>Coefficient</i>	<i>Std error</i>	<i>Coefficient</i>	<i>Std error</i>	<i>Coefficient</i>	<i>Std error</i>
Crisis	0.106	0.113	-0.059	0.096	0.189	0.146
High Impact	-0.161	0.194	-0.000	0.224	-0.241	0.207
Crisis • High impact	0.046	0.078	-0.027	0.129	0.082	0.100
Size	-0.019	0.072	0.172	0.118	-0.114	0.083
Leverage	0.166	0.207	0.034	0.100	0.232	0.275
ROE	-0.010***	0.002	-0.011*	0.006	-0.009**	0.004
GWintensity	1.870***	0.482	0.745	0.700	2.433***	0.535
IMP made	0.465***	0.100	0.243	0.191	0.576***	0.110
IMP size	-0.107**	0.045	-0.060	0.051	-0.130**	0.047
Vola	0.013	0.019	0.003	0.012	0.018	0.025
Sales decline	-0.276	0.166	-0.120	0.153	-0.355*	0.204
NrBS	0.080***	0.024	0.018	0.040	0.111***	0.021
Intercept	3.553***	0.746	2.591**	1.216	4.034***	0.913
No. of observations	357		357		357	
R-squared	0.250		0.089		0.263	

Table A.5 presents pooled OLS regressions of Model 2 for our three measures of disclosure quality for GWIT. Standard errors are clustered at the country level. ***, ** and * denotes significance at the 1 %, 5 % and 10 % level, respectively. P-values are computed according to two-sided tests. The definitions of the dependent and independent variables are as follows: *Disclosure* refers to *Tscore*, *Descr* and *Prosp*. *Tscore* is the total GWIT disclosure quality score, *Descr* is the disclosure score relating to descriptive disclosure items and *Prosp* is the quality score relating to prospective disclosure items. The three measures are explained in detail in section 4.1. *Crisis* is an indicator variable equal to 1 if the respective observation is from the crisis year 2020, and 0 otherwise; *High impact* is an indicator variable equal to 1 if the firm has a Covid impact score in the top third bin, and 0 if the firm has a Covid impact score in the lower third bin, firms with a Covid impact score in the middle bin have been dropped for these regressions; *Crisis • High impact* is an interaction term between *Crisis* and *High impact*; *Size* is the natural logarithm of total assets; *Leverage* is the fraction of total debt to total equity; *ROE* is the percentage return on equity calculated as earnings from continuing operations divided by the average total equity; *GWintensity* is the fraction of goodwill, before any goodwill impairments, to total assets; *Imp made* is an indicator variable equal to 1 for firm-year observations that have made a goodwill impairment during the year, and 0 otherwise; *Imp size* is the fraction of goodwill impairment to total assets; *Vola* is the variance of daily stock returns over the last five years; *Sales decline* is an indicator variable equal to 1 if the sales for the respective firm-year observation declined by 10 % or more; *NrBS* represents the number of business segments.

Table A.6. Estimation of Model 2 using continuous Covid impact score

<i>Variables</i>	Model (2j)		Model (2k)		Model (2l)	
	<i>Disclosure = Tscore</i>		<i>Disclosure = Descr</i>		<i>Disclosure = Prosp</i>	
	<i>Coefficient</i>	<i>Std error</i>	<i>Coefficient</i>	<i>Std error</i>	<i>Coefficient</i>	<i>Std error</i>
Crisis	0.123	0.073	0.016	0.092	0.177**	0.079
Covid impact	-0.192	0.119	-0.044	0.142	-0.265*	0.143
Crisis • Covid impact	0.027	0.069	0.012	0.077	0.034	0.086
Size	-0.030	0.053	0.163*	0.080	-0.127*	0.069
Leverage	0.214*	0.109	0.160*	0.079	0.241	0.141
ROE	-0.011***	0.002	-0.012**	0.005	-0.010***	0.002
GWintensity	1.448***	0.474	0.606	0.581	1.869***	0.477
IMP made	0.420***	0.085	0.244	0.199	0.508***	0.088
IMP size	-0.071*	0.036	-0.067	0.054	-0.073*	0.037
Vola	0.004	0.012	0.007	0.009	0.002	0.015
Sales decline	-0.237*	0.116	-0.326***	0.112	-0.193	0.141
NrBS	0.060***	0.015	0.038	0.030	0.072***	0.016
Intercept	3.928***	0.582	2.479**	0.921	4.653***	0.746
No. of observations	534		534		534	
R-squared	0.215		0.116		0.188	

Table A.6 presents pooled OLS regressions of Model 2 for our three measures of disclosure quality for GWIT. Standard errors are clustered at the country level. ***, ** and * denotes significance at the 1 %, 5 % and 10 % level, respectively. P-values are computed according to two-sided tests. For eight of our sample firms (24 observations), there were no data on *Covid impact* and therefore these firms have been excluded in these regressions. The definitions of the dependent and independent variables are as follows: *Disclosure* refers to *Tscore*, *Descr* and *Prosp*. *Tscore* is the total GWIT disclosure quality score, *Descr* is the disclosure score relating to descriptive disclosure items and *Prosp* is the quality score relating to prospective disclosure items. The three measures are explained in detail in section 4.1. *Crisis* is an indicator variable equal to 1 if the respective observation is from the crisis year 2020, and 0 otherwise; *Covid impact* is a continuous variable, ranging from -1.16 to 2.86, and represents each firms Covid impact score; *Crisis • Covid impact* is an interaction term between *Crisis* and *Covid impact*; *Size* is the natural logarithm of total assets; *Leverage* is the fraction of total debt to total equity; *ROE* is the percentage return on equity calculated as earnings from continuing operations divided by the average total equity; *GWintensity* is the fraction of goodwill, before any goodwill impairments, to total assets; *Imp made* is an indicator variable equal to 1 for firm-year observations that have made a goodwill impairment during the year, and 0 otherwise; *Imp size* is the fraction of goodwill impairment to total assets; *Vola* is the variance of daily stock returns over the last five years; *Sales decline* is an indicator variable equal to 1 if the sales for the respective firm-year observation declined by 10 % or more; *NrBS* represents the number of business segments.

Table A.7. Estimation of Model 2 using Covid stringency index to classify firms as ‘high impacted’ and ‘low impacted’

<i>Variables</i>	Model (2m)		Model (2n)		Model (2o)	
	<u><i>Disclosure = Tscore</i></u>		<u><i>Disclosure = Descr</i></u>		<u><i>Disclosure = Prosp</i></u>	
	<i>Coefficient</i>	<i>Std error</i>	<i>Coefficient</i>	<i>Std error</i>	<i>Coefficient</i>	<i>Std error</i>
Crisis	-0.061	0.319	-0.250	0.342	0.031	0.438
High Impact	-0.145	0.143	-0.236	0.251	-0.100	0.167
Crisis • High Impact	0.003	0.005	0.004	0.005	0.003	0.007
Size	-0.010	0.058	0.127	0.076	-0.078	0.081
Leverage	0.196*	0.099	0.178**	0.069	0.205	0.121
ROE	-0.011***	0.002	-0.013**	0.005	-0.009***	0.002
GWintensity	1.478***	0.498	0.284	0.560	2.072***	0.584
IMP made	0.309***	0.061	0.227	0.192	0.350***	0.069
IMP size	-0.051	0.035	-0.042	0.048	-0.055	0.041
Vola	-0.003	0.005	-0.007	0.005	-0.000	0.006
Sales decline	-0.272*	0.133	-0.283**	0.100	-0.267	0.169
NrBS	0.054***	0.016	0.040	0.027	0.061***	0.019
Intercept	3.836***	0.606	3.096***	0.986	4.210***	0.815
No. of observations	558		558		558	
R-squared	0.180		0.119		0.143	

Table A.7 presents pooled OLS regressions of Model 2 for our three measures of disclosure quality for GWIT. Standard errors are clustered at the country level. ***, ** and * denotes significance at the 1 %, 5 % and 10 % level, respectively. P-values are computed according to two-sided tests. The definitions of the dependent and independent variables are as follows: *Disclosure* refers to *Tscore*, *Descr* and *Prosp*. *Tscore* is the total GWIT disclosure quality score, *Descr* is the disclosure score relating to descriptive disclosure items and *Prosp* is the quality score relating to prospective disclosure items. The three measures are explained in detail in section 4.1. *Crisis* is an indicator variable equal to 1 if the respective observation is from the crisis year 2020, and 0 otherwise; *High impact* is an indicator variable equal to 1 if the firm has a Covid stringency score above the 50th percentile, and 0 otherwise; *Crisis • High impact* is an interaction term between *Crisis* and *High impact*; *Size* is the natural logarithm of total assets; *Leverage* is the fraction of total debt to total equity; *ROE* is the percentage return on equity calculated as earnings from continuing operations divided by the average total equity; *GWintensity* is the fraction of goodwill, before any goodwill impairments, to total assets; *Imp made* is an indicator variable equal to 1 for firm-year observations that have made a goodwill impairment during the year, and 0 otherwise; *Imp size* is the fraction of goodwill impairment to total assets; *Vola* is the variance of daily stock returns over the last five years; *Sales decline* is an indicator variable equal to 1 if the sales for the respective firm-year observation declined by 10 % or more; *NrBS* represents the number of business segments.