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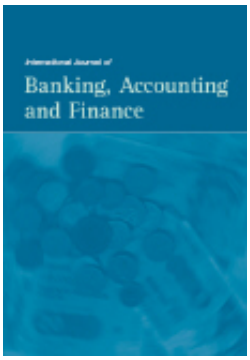

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Goodwill impairment disclosure and integrated reporting: evidence on credit ratings and earnings manipulation

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Abstract: This study examines the effect of goodwill impairment disclosure quality and integrated reporting (IR) compliance on earnings manipulation and credit ratings. We assess whether IR and goodwill impairment disclosure quality are associated with managerial behaviour. We find that firms with goodwill impairment are likely to use earnings manipulation and display lower IR compliance and goodwill impairment disclosure quality. We examine the impact of managerial discretion over goodwill impairment on the decision to publish voluntary IR information. We find that companies are likely to voluntarily adopt IR when goodwill impairment is low and goodwill impairment disclosure quality is high. When we broaden our investigation to companies that have already adopted IR, we find that IR compliance is likely to decrease earnings manipulation, increase credit ratings and improve the quality of goodwill impairment disclosure even in the presence of goodwill impairment. Our results highlight the informativeness of IR compliance and support the need for firms to disclose goodwill impairment losses in order to reduce information asymmetry and uncertainty.

Keywords: integrated reporting; goodwill impairment; credit ratings; voluntary disclosure; earnings manipulation.

JEL codes: G17, M41.

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1 Introduction

Managerial discretion is present to a significant extent when goodwill impairment tests are undertaken (Beatty and Weber, 2006). If applied neutrally, discretion gives management the ability to provide private information, and thus, make financial statements more informative. Although the main objective of goodwill impairment is to improve the quality of information of financial statements, the discretion allowed in estimating fair values has increased earnings manipulation (Han et al., 2020). Several empirical studies find that the management incentives to manipulate firm earnings can have an influence on the magnitude of reported goodwill impairments (AbuGhazaleh et al., 2011; Ramanna and Watts, 2012; Giner and Pardo, 2015), that goodwill non-impairment is not related to management's favourable private information on future cash flows (Ramanna and Watts, 2012), and that managers' real activities of earnings management are used by firms to avoid likely impairment losses (Filip et al., 2015). Hence, management may also exploit the discretion opportunistically by delaying (or accelerating) goodwill impairments, or by manipulating goodwill impairment losses (Li and Sloan, 2017; Albersmann and Quick, 2020).

Management has considerable discretion in recognising goodwill impairments because impairments are calculated as the amount by which the carrying value of goodwill is greater than its estimated fair value. The calculation of fair value or value in use is often based on firm-specific forward-looking information, such as business plans with expected future cash inflows and outflows, long-term growth expectations, and discount factors reflecting the risks of business units. By its nature, such information is subjective and hard to verify (IASB, 2004a; Glaum et al., 2018). The subjectivity in goodwill assets' fair value estimation cannot be verified since it partially depends on management's future actions (Ramanna and Watts, 2012) and this recognition of

goodwill impairment losses usually lags behind the deterioration of a firm's economic performance by many years (Hayn and Hughes, 2006; Jarva, 2009).

There is a plethora of studies showing mixed empirical evidence regarding the consequences of the exploitation of such discretion. Some studies (e.g., Godfrey and Koh, 2009; Jarva, 2009; AbuGhazaleh et al., 2011; Chalmers et al., 2011) argue that the use of goodwill impairment provides information about assets. Other studies claim that goodwill impairment is used by managers to serve private incentives based on agency theory (e.g., Sun and Zhang, 2017). Agency theory argues that the separation of ownership and control is likely to result in uncertainty and information asymmetry between managers and shareholders, lenders, auditors and other stakeholders (Jensen and Meckling, 1976). The resulting information asymmetry leads to agency conflicts between managers and stakeholders and subsequently calls for monitoring manager decisions and actions, which could otherwise harm firm value and credit ratings (Han et al., 2020).

The presence of opportunism with regard to the amount and the timeliness of goodwill impairment is evidenced by a large part of the literature, such as Li et al. (2011), Amiraslani et al. (2013), Giner and Pardo (2015) and Han et al. (2020), and is explained by the agency theory (Andreicovici et al., 2020). Agency theory predicts that managers may attempt to opportunistically manipulate the discount factor, the cash flow projection period and the cash flow growth rate relating to the recoverable amount when testing for goodwill impairment (Beatty and Weber, 2006; Ramanna and Watts, 2012). It also predicts that in the light of bad news, such as goodwill impairment, managers are also likely to provide voluntary disclosures in an effort to reduce information asymmetry (Li, 2013; Guay et al., 2016). In support of this, Glaeser (2018) and Heinle et al. (2018) have shown that managers are likely to provide greater voluntary disclosures of non-proprietary information than voluntary disclosures of proprietary information. Opportunism creates noise in the reported financial information and decreases its usefulness for financial analysts and credit rating agencies, leading to forecast and rating errors (Ball et al., 2012).

Within the agency theory framework, the contribution of integrated reporting (IR) is that it resolves the agency problems by aligning management's interests with the objectives of shareholders, and reinforcing the credibility of accounting disclosure (Demsetz and Lehn, 1985). Thus, IR attracts more sophisticated investors with higher demands for transparency and disclosure quality (Li and Yang, 2016). Firms that adopt IR voluntarily aim at fulfilling their information obligations towards stakeholders, and expect that complying with IR will increase their firm value (Whitehouse, 2006).

This study addresses this question by examining the role of IR. The main role of IR is to explain how an organisation creates value over time (IIRC, 2013). The IIRC (2013) framework represents a new idea: merging in one document the financial statements presented in an annual report with a separate, mostly voluntary, stand-alone sustainability or corporate social responsibility (CSR) report. By merging financial and non-financial information, IR solves a number of problems relating to resource allocation that a firm uses to create value (Caglio et al., 2020). The importance of this reporting approach derives from the mandatory disclosure of non-financial information through the publication of an annual integrated report[1], which is mandatory in South Africa and voluntary in other countries, and which enhances financial reporting transparency. IR adoption is likely to provide assurance to investors about the reliability of impairment

factors and the possibility of the manipulating or tuning of impairment losses at the managers' discretion.

Integrated reports are prepared by managers and may give rise to agency conflicts and costs (Hay, 2015; Wang et al., 2020). The voluntary implementation of IR gives companies the ability to publish an integrated report when both their financial and their non-financial positions are good. No company would decide to publish an integrated report presenting bad financial and non-financial news voluntarily, because this would expose it (maybe irreparably) to its investors. Hence, low IR compliance will cause market value losses and reductions in managers' compensation, pressuring managers to inflate earnings. Due to the unverifiable discretion, managers are likely to manipulate earnings upwards by recording less goodwill impairment (Albersmann and Quick, 2020). This will result in an expected reduction in the impairment amount when IR compliance increases.

Contrarily, once a company has adopted IR and exhibits high compliance, it is viewed as honest and consistent. The company presents the information properly and does not opt to manipulate its earnings even if it has impairment losses. The explanation for this is that, when a company has high IR compliance, even if it includes bad news from an investor's perspective, the market recognises that the company is consistent and typical. Due to IR's aims of improving the quality of information available to providers of financial capital and enabling more efficient and productive allocation of capital [IIRC, (2013), p.2], IR compliance helps uncover opportunistic behaviours and corporate fraud. As a result, IR compliance mitigates managerial discretion and opportunism and disciplines managers to avoid earnings manipulation by understating goodwill impairment (Caruso et al., 2016).

Our study is motivated by the following considerations. Goodwill is a significant asset and reflects expectations for future cash flows and competitive advantages (Hayn and Hughes, 2006). In contrast, goodwill impairment shows the failure to effectively value and undertake previous acquisitions or benefit from them (Li et al., 2011). The volatility in goodwill values and the mandatory annual goodwill impairment test influence firm value and may introduce volatility in earnings (Filip et al., 2015). Thus, it affects managerial behaviour and the quality of accounting disclosure.

The literature has mostly investigated the financially measurable advantages of disclosure, such as higher market liquidity and stock returns (Diamond and Verrecchia, 1991), lower cost of capital (Dhaliwal et al., 2011) and higher analyst forecast accuracy (Horton et al., 2013). This paper examines whether the need to mitigate the negative effects of goodwill impairment leads to foggy disclosures either with respect to specific goodwill-related information releases or broader accounting disclosure settings, such as IR. It also seeks to show the power of disclosure quality by examining whether IR compliance increases credit ratings, which are expected to reflect changes in financial reporting quality (Han et al., 2020), even in the light of goodwill impairment.

According to Taylor and Verrecchia (2015), managers may be able to reduce information asymmetry by releasing voluntary disclosures. Noh et al. (2019) argues that the level of disclosure as well as the trade-off between mandatory and voluntary disclosures depends on the characteristics of the various forms of disclosure that are applied. This provides a motivation to examine whether managers voluntarily adopt settings of enhanced disclosure, such as IR, to mitigate uncertainty relating to goodwill impairment and the degrading of future firm value expectations, or whether they voluntarily adopt IR when goodwill impairment is low.

This study analyses an international sample of non-financial firms that use IR either mandatorily or voluntarily from 2011 to 2019. First, we investigate whether companies with goodwill impairment losses use earnings manipulation and display lower IR compliance and goodwill impairment disclosure quality. Our findings suggest that, when a firm performs poorly, this pressures managers to manipulate earnings by decreasing goodwill impairment losses. This study contributes to the goodwill impairment literature by showing that goodwill impairment disclosure is negatively associated with goodwill impairment. The variability in goodwill disclosures results in doubtful disclosure quality, which questions the effectiveness of goodwill impairment as opposed to other policies, such as amortisation. Second, we examine whether companies adopt IR voluntarily when goodwill impairment is low and goodwill impairment disclosure quality is high. We examine the impact of managerial discretion over goodwill impairment on the decision to publish voluntary information related to IR. We find that firms adopt IR voluntarily when their financial position is good and the possibility of impairments that would otherwise downgrade their growth prospects is low. In such cases, it is likely the management would have no reason not to provide rich accounting disclosures. Our findings are consistent with theoretical predictions and contribute to the literature that managers time the adoption of a new policy or set of rules, such as IR, when it is most suitable financially for them to achieve optimal financial performance. Third, we investigate the relation between voluntary IR adoption and credit ratings, and how this relation is affected by the quality of IR compliance and goodwill impairment disclosure quality. We find a positive relation between credit ratings and voluntary IR adoption. This study contributes that the voluntary adoption of a financial reporting system of higher informational quality decreases the need to search for further information and results in better assessments of company credibility. On the other hand, if IR is used compulsorily by all firms, this could reduce the benefits of voluntary disclosure (see Noh et al., 2019).

Fourth, after discussing the timing with which companies choose to voluntarily adopt IR, we extend our investigation to companies that have already adopted IR. We investigate whether IR compliance decreases earnings manipulation and increases the quality of goodwill impairment disclosure, even in the presence of goodwill impairment. We find that the disclosure of high-quality information on IR and goodwill impairment is likely to prevent the use of earnings manipulation practices and increase the quality of reported financial information. Fifth, in an IR-transparent environment, where information supply is more sufficient, we investigate how goodwill impairment disclosure affects credit ratings. We find that, under effective IR and goodwill impairment disclosure, earnings manipulation is low and credit ratings are high even in the presence of goodwill impairment losses. In fact, we would expect that the market response to impairments and the credit ratings of impairing companies would be favourable for those that provide high quality disclosures. The findings of this paper suggest that IR compliance improves long-term financial performance and firms' creditworthiness. The association between goodwill impairment losses and credit ratings has not been examined previously. This study suggests that the consideration of goodwill impairment contributes to the better understanding of a firm's creditworthiness and thus to the making of more effective and meaningful credit ratings. This study extends the findings of Ramanna and Watts (2012) and Li and Sloan (2017), who provide evidence of managerial discretion in manipulating or timing goodwill impairment. It contributes that,

in the presence of goodwill impairment, managers may be inclined to exercise opportunistic discretion because goodwill impairment leads to lower credit ratings.

The rest of this paper is organised as follows. Section 2 presents the research hypotheses and literature review. Section 3 describes the data. Section 4 presents the main results and Section 5 the conclusions of the study.

2 Research hypotheses

2.1 Goodwill impairment and earnings manipulation

The literature (e.g., Jahmani et al., 2010; Zang, 2012; Giner and Pardo, 2015; Li and Sloan, 2017) examines how goodwill impairment might be used for real and discretionary earnings manipulation, concluding there is a mixed use of both types of manipulation. Ramanna and Watts (2012) study the implementation of SFAS 142 for US firms with a high likelihood of goodwill impairment, and claim that non-impairment of goodwill is not associated with proxies for managers' private information on positive future cash flows, but rather with proxies for opportunistic behaviour relevant to personal concerns over compensation, and reputation debt-covenant violation concerns. Their results also suggest that non-impairment is associated with managers' flexibility under the SFAS 142 impairment rules. Filip et al. (2015), in a sample of US companies applying SFAS 142, test whether the use of real activities to improve current cash flows is necessary to convince auditors and other stakeholders of the firm that goodwill impairment is not important. They find that companies tend to avoid goodwill impairments and to manipulate their cash flows upward. Moreover, they find that the real activities used to manipulate the companies' cash flows are detrimental to future performance. Beatty and Weber (2006) provide evidence that managers with earnings-based bonuses and longer tenures under-report goodwill impairment losses due to the subjectivity permissible. As earnings manipulation techniques, managers can use the change of depreciation policies (Teoh et al., 1998), the reclassification of expenses (McVay, 2006), the adjustment of loan charge-offs (Beatty et al., 1995) and the discretion to delay the accounting recognition of goodwill write-offs (Riedl, 2004; Giner and Pardo, 2015; Majid, 2015; Li and Sloan, 2017).

This study aims to shed light on the effect of IR compliance on goodwill impairment decisions in firms that publish integrated reports. A consequence of goodwill impairment is that managers use discretion and earnings manipulation to strategically influence their key financial numbers (Han et al., 2020). Goodwill impairment reflects bad news about the ability of the company to generate returns in the future and to create competitive advantages and synergies. The presence of bad news has a negative effect on the image of a company and investors' perceptions. As a result, companies are likely to employ earnings manipulation practices and recognise untimely impairments, so that their key financial numbers look better (Jahmani et al., 2010; Brown et al., 2015; Caruso et al., 2016; Irani and Oesch, 2016). It is thus expected that companies will be likely to report limited disclosures on goodwill, goodwill impairment and recoverable amount, and display a lower level of IR compliance when they have goodwill impairment losses (Baboukardos and Rimmel, 2016; Bernardi and Stark, 2018). The hypothesis is presented below:

H_1 Companies with goodwill impairment losses are likely to use earnings manipulation and display lower IR compliance and goodwill impairment disclosure quality.

2.2 Voluntary IR adoption and credit ratings

An increasing number of companies are disclosing non-financial information (Havlova, 2015; Gonçalves et al., 2020). This provides extra information about reputation, employee motivation (Kolk, 2010), customer satisfaction (Šontaitė-Petkevičienė, 2015) and investor relations (Becchetti et al., 2015). However, some companies avoid disclosing non-financial information, particularly given the high disclosure costs (Prado-Lorenzo and Garcia-Sanchez, 2010), because they fear that it may affect their reputation (Kolk, 2005). The disclosure of non-financial information is costly and is meant to create a competitive advantage. If companies fail to highlight the advantages of their environment-based investment by reporting it comprehensively, then they will be equalised with their competitors (Gonçalves et al., 2020).

We highlight the existence of opportunistic financial reporting that aligns with private benefits through the exercising of managerial discretion. Prior research finds that managers time grants (Yermack, 1997), change the price of options prior to news releases (Callaghan et al., 2004; Ferri, 2004), announce good news near to grant dates (Chauvin and Shenoy, 2001) and manipulate accruals around grant dates (Baker et al., 2009). Because of the pressure of financial analysts on management (Irani and Oesch, 2016; Sun and Liu, 2016), managers may resort to earnings manipulation to meet earnings targets (Matsunaga and Park, 2001; Bartov et al., 2002).

We examine whether managers opportunistically use their discretion regarding the timing and/or amount of reported goodwill impairment, and whether the resulting goodwill impairment disclosure is informative (Amiraslani et al., 2013). We propose that companies are likely to adopt a new regulatory regime when it is most suitable for them, unless its implementation is mandatory. The most demanding reporting requirements of IR would further expose companies with bad news and poor financial performance. It follows that they would voluntarily adopt IR when their key financial numbers were good and the possibility of impairments that would otherwise downgrade their growth prospects was low, under which circumstances they should have no reason not to provide rich accounting disclosures.

H_{2a} Companies are likely to voluntarily adopt IR when goodwill impairment is low and goodwill impairment disclosure quality is high.

Noh et al. (2019) report that a high quality of mandatory accounting disclosure increases the reliability and usefulness of voluntary accounting disclosure. Ball et al. (2012) suggest that mandatory and voluntary accounting disclosures are complementary means of communicating to investors. IR conveys detailed information about firms' financial performance and provides supplementary earnings information, improving firm credibility.

Li and Yang (2016) report that IFRS adoption improves the quality of guidance, because it improves earnings quality and attracts sophisticated investors with higher demand for voluntary disclosure. Francis et al. (2008) find that voluntary disclosure results in a lower cost of capital. Guay et al. (2016) investigate the relationship between voluntary accounting information and the length and complexity of mandatory

accounting disclosures. They find that the provision of voluntary accounting information is positively related to the complexity of firms' previous financial statements. Hence, firms use voluntary accounting information to cover the loss of accounting information that results from long and complicated mandatory accounting disclosures. Given the discussion above, the provision of voluntary accounting information is deemed to be positively related to credit ratings for firms with high IR compliance, leading to H_{2b}.

H_{2b} Voluntary IR adoption is positively related to credit ratings for firms with high IR compliance and goodwill impairment disclosure quality.

2.3 IR compliance and earnings manipulation

Contrary to the opportunistic use of discretion, the literature suggests that some companies indeed exercise fair judgment in their goodwill impairment evaluations, which increases the informativeness of future cash flows (Han et al., 2020). Jarva (2009) highlights that write-offs of goodwill reflect an asset's underlying economics and provide essential information rather than indicating intentional avoidance. AbuGhazaleh et al. (2011), using a sample of UK firms, find that managers' goodwill accounting choices provide transparent information instead of representing opportunism. Companies with high disclosure quality engage in less earnings manipulation and information asymmetry (Lang and Lundholm, 1996; Jo and Kim, 2007). Kim et al. (2012) find evidence that firms characterised by greater CSR display less manipulation, leading them to conclude that voluntary engagement in CSR signals a firm's focus on corporate ethics and that this is reflected in less earnings manipulation. Although there is no agreement on whether the goodwill impairment approach has achieved its intended goal, Kabir and Rahman (2016) state that corporate governance techniques can reduce manipulation.

In parallel with the informativeness of goodwill impairment, IR can also increase transparency by presenting financial and non-financial information in a concise way [IIRC, (2013), p.21]. The increased IR information set and IR disclosure quality provides investors with the ability to better monitor the firm, allowing them to effectively verify the actions of management and constrain opportunism (Obeng et al., 2020). Further, financial and non-financial analysis increases the quality of IR information, allowing investors to achieve more efficient contracting solutions that can align their goals with the managers' interests (e.g., Bushman and Smith, 2001; Barth et al., 2017). In a transparent environment, information supply is more sufficient, allowing IR compliance and better goodwill impairment disclosure practices to capture reliable information, and evaluations to be conducted more effectively. IR leads to stronger internal communications, and requires firms to provide new ways of managing and disclosing information (De Villiers et al., 2017). IR firms adjust their strategies in an integrated manner, considering environmental, human, social and natural principles (Busco et al., 2019). Thus, compliance with IR requirements is likely to restrain the use of earnings manipulation and increase the quality of reported financial information.

H_3 IR compliance is likely to decrease earnings manipulation and increase the quality of goodwill impairment disclosure, even in the presence of goodwill impairment.

2.4 Goodwill impairment and credit ratings

Prior research tests the association of stock market returns with credit rating changes (Goh and Ederington, 1993; Dichev and Piotroski, 2001; Choy et al., 2006). Goh and Ederington (1993) find a negative stock return reaction when a bond rating is downgraded after a deterioration in the financial performance of the firm. Dichev and Piotroski (2001) find that poor returns are related to under-reaction to the announcement of downgrades, rather than to lower systematic risk. Choy et al. (2006), using an Australian sample, find that stock returns are affected by bond rating changes when the market reacts to downgrades. Chan et al. (2013) present a strong positive association between foreign firms that are cross-listed in the USA and adopt IFRS mandatorily, and their credit ratings. Iatridis (2018) finds that there is a tendency for firms that pay cash compensation to manipulate their earnings when their actual credit ratings differ from their expected ratings.

This study also examines the effect of goodwill impairment on credit ratings. Prior studies show evidence that goodwill impairment is an important component of the financial reporting process (Ayres et al., 2019). Prior studies support the information content of goodwill impairment since capital markets react negatively to unexpected goodwill write-offs (Bens et al., 2011; Li et al., 2011; Knauer and Wöhrmann, 2016). Other studies (e.g., Francis et al., 1996; Hirschey and Richardson, 2002; Henning and Shaw, 2003; Xu et al., 2011) find that goodwill impairment is value relevant to the market. EY (2010), FRC (2014) and KPMG (2014) reflect on the value relevance of goodwill impairment and show that the users of financial statements, including analysts, use impairment disclosure when making investment or lending decisions. Li et al. (2011) find that goodwill impairment has a negative impact on investor reactions and this can lead to a reduction in future firm performance.

Consistent with the IR literature, many empirical studies illustrate the positive impact of corporate disclosures on accounting information (Guay et al., 2016; Lee and Yeo, 2016), show that they improve information transparency (Bova and Pereira, 2012) and that they specifically highlight the quality of reported earnings (Agostino et al., 2011; Pavlopoulos et al., 2019). Barth et al. (2017) find a positive association between IR disclosure quality, and firm value and the bid-ask spread. Zhou et al. (2017) identify a negative relation between IR disclosure quality and analyst forecast error. They find that IR adoption minimises the level of information asymmetry. Generally, these studies support a positive impact of the disclosure mechanism on accounting information quality (Obeng et al., 2020).

Sun and Zhang (2017) and Andreicovici et al. (2020) find that goodwill impairment is perceived by investors as bad news. They show a negative relation between disclosure transparency and disagreement about goodwill impairment among economic agents in the capital markets. Sun and Zhang (2017) analyse the impact of goodwill impairment losses on bond credit ratings and find a negative relationship between the two, suggesting that firms recognising goodwill impairment losses receive low bond ratings. We expect that companies facing goodwill impairment and exhibiting indifferent financial reporting quality are likely to resort to earnings manipulation to decrease impairment losses and show higher profits. Thus, we hypothesise that, for companies that comply with IR and release good goodwill disclosures, the presence of goodwill impairment is unlikely to lead to opportunistic behaviours and therefore credit ratings are unlikely to be negatively affected.

H_{4a} IR compliance and goodwill impairment disclosure quality increase credit ratings.

Greater goodwill impairment disclosure improves the reliability of the goodwill impairment test (Andreicovici et al., 2020). The relevance of goodwill impairment is also highlighted by studies of market participants that illustrate that financial statement users, including managers and analysts, use impairment-testing disclosure when making their investment or lending decisions (EY, 2010; FRC, 2014). Moreover, as discussed above, prior studies find that well-governed companies tend to engage in increased CSR disclosure (e.g., Ntim and Soobaroyen, 2013; Gao et al., 2016; Wang et al., 2020). Obeng et al. (2020) claim that companies that provide increased IR information can enhance investor monitoring, allowing investors to better check the managers' actions and constrain opportunism. Barth et al. (2017) and Lee and Yeo (2016) find that IR disclosure quality is positively associated with firm value. Our hypothesis is as follows:

H_{4b} Goodwill impairment losses are not likely to affect credit ratings negatively for firms with high IR compliance and goodwill impairment disclosure quality.

3 Research design

In this section, we present the sample selection and the distribution by industry, country and year, and discuss the methodology. Also, we develop our regression models and describe all variables.

3.1 Sample description

We focus on an IR sample composed of non-financial firms that use IR either mandatorily or voluntarily from 2011 to 2019. This period was chosen to reflect the IIRC's establishment in 2010. Only South African firms use IR mandatorily. Hence, our sample includes all non-financial listed South African firms. Voluntary IR adopters were collected from PWC (2016), KPMG (2019a) and the official website of the IIRC. We obtained data from DataStream and Worldwide Governance Indicators (WGI). Our sample excludes financial, insurance and real estate firms. Adjusting for missing values, our final sample includes 3,984 firm-year observations. The voluntary adopters comprise 289 firms, and the mandatory adopters 209 firms. Panel A of Table 1 reports the sample selection process. The sample distribution by industry is presented in Panel B of Table 1. Most firms belong to the industrial sector (31.93%), the energy sector (12.65%) or the consumer staples sector (13.45%). Panel C reports the distribution of the IR sample by country. The sample consists of companies from 19 countries, with most of them coming from South Africa (41.97%), Japan (30.92%) or the USA (10.84%). Other countries represent less than 10% of the sample individually. Panel D reports the distribution of the IR sample by year. An increasing trend of IR adoption is observed.

In the subsequent multivariate analysis, we use the fixed-effects OLS method to test equations (1) and (4). We implement the Newey and West (1986) method that has been modified for use in a panel dataset. Through this method, we create robust standard errors (Liang and Zeger, 1986; Moulton, 1986; Rogers, 1993). The Newey-West approach is suitable for panel data, and the estimation results are consistent regarding heteroskedasticity and autocorrelation (Cecchetti et al., 1997; Sun and Cui, 2014). In

equations (2), (7) and (8), where the dependent variables are dichotomous dummies (*VOLIR* and *DOWNGRADE*, respectively), we use binary logit models.

Table 1 Background statistics

Panel A: sample selection process		
Selection criteria	*Firm-year observation*	*No. of firms*
IR firm-year observations from 2011 to 2019	4,664	583
Less:		
Firm-year observations in financial, insurance and real estate industries	(96)	(12)
Firm-year observations whereby the dependent variables are missing	(344)	(43)
Firm-year observations whereby the control variables are missing and extreme outliers at 1% at the top and bottom	(240)	(30)
Usable observations	*3,984*	*498*

Panel B: sample distribution by industry			
Industry		*Firm-year observation*	*Frequency*
1	Consumer discretionary	440	11.04%
2	Consumer staples	536	13.45%
3	Energy	504	12.65%
4	Healthcare	352	8.84%
5	Industrials	1,272	31.93%
6	Information	40	1.00%
7	Materials	128	3.21%
8	Telecommunication services	304	7.36%
9	Utilities	408	10.24%
Total		*3,984*	*100.00%*

Panel C: sample distribution by country		
Country	*Firm-year observation*	*Frequency*
Austria	8	0.20%
Belgium	8	0.20%
Brazil	32	0.80%
Denmark	8	0.20%
France	104	2.61%
Germany	192	4.82%
Greece	16	0.40%
India	8	0.20%
Italy	40	1.00%
Japan	1,232	30.92%
Netherlands	16	0.40%
Poland	8	0.20%

Table 1 Background statistics (continued)

Panel C: sample distribution by country		
Country	*Firm-year observation*	*Frequency*
South Africa	1,672	41.97%
Spain	48	1.20%
Sri Lanka	8	0.20%
Sweden	16	0.40%
Switzerland	8	0.20%
UK	128	3.21%
USA	432	10.84%
Total	*3,948*	*100.00%*
Panel D: sample distribution by year		
Year	*Firm-year observation*	*Frequency*
2011	396	10.01%
2012	399	10.13%
2013	399	10.16%
2014	428	10.21%
2015	428	10.44%
2016	451	11,22%
2017	451	12.61%
2018	498	12.61%
2019	498	12.61%
Total	3,948	100.00%

We run the Levin, Lin and Chu panel unit root test, rejecting the null hypothesis that the unit root process is not stationary. The independent variables are standardised to mitigate multicollinearity issues (Kim and Park, 2010). All variables except dummy variables are winsorised at the top and bottom 1% of observations in each year. Industry and year fixed effects are also controlled through dummy variables (Chan et al., 2013).

We estimate instrumental variables – generalised method of moments (IV-GMM) models to account for endogeneity where appropriate. We use an IV-GMM regression to deal with possible reverse causality and omitted variable concerns. According to Kang and Sivaramakrishnan (1995), we estimate credit ratings using IV, instead of the cross-sectional procedure, by applying the GMM. In order to use proper instruments, we focus on García-Meca et al. (2015) and Kang and Sivaramakrishnan (1995) and apply the two-year lags of independent variables in order to smooth any bias from the first-order correlation in the residuals. The Hansen J-statistic for over-identifying restrictions is insignificant. Since our results do not differ from previous estimations [Hausman's (1978) simultaneity specification test is not significant within conventional levels], our findings indicate no serious endogeneity problems in the estimation of credit ratings. This estimation technique has been applied on equations (3), (5) and (9).

Our sample is categorised based on regulatory quality (*RQ*) and public enforcement index (*ENFORCE*). *RQ* reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector

development. The estimate of governance ranges from approximately –0.907 (weak) to 2.096 (strong) governance performance with a median of 1.217. Firms with *RQ* values greater than the median are from the USA, Germany, Austria, the UK, France and Japan. *ENFORCE* measures the effectiveness of law enforcement of investor protection through sanctions such as fines and prison terms. Higher values of *ENFORCE* indicate better enforcement (Djankov et al., 2008). The median of *ENFORCE* is 0.988. Firms with *ENFORCE* values greater than the median are from Sweden, Switzerland, Denmark, Germany, the UK, the USA and Japan.

3.2 Model specification

We develop equations (1) to (9) in Section 3.2.1 to Section 3.2.4 to test our research hypotheses.

3.2.1 Goodwill impairment and earnings manipulation

To test H_1, we estimate the following equation, in line with the arguments of Albersmann and Quick (2020), Han et al. (2020) and Iatridis et al. (2021):

$$\begin{aligned} IMPAIR_{i,t} = {} & \alpha_0 + \alpha_1 PREPOST_{i,t} + \alpha_2 DAC_{i,t} + \alpha_3 R_{i,t} + \alpha_4 BDR_{i,t} + \alpha_5 R_{i,t} \times BDR_{i,t} \\ & + \alpha_6 IR_{i,t} + \alpha_7 GWDS_{i,t} + \alpha_8 GWDS_{i,t} \times PREPOST_{i,t} + \alpha_9 UNTIMPAIR_{i,t} \\ & + \alpha_{10} ROA_{i,t-1} + \alpha_{11} LEV_{i,t-1} + \alpha_{12} SIZE_{i,t} + \alpha_{13} MBV_{i,t} + \alpha_{14} SPREAD_{i,t} \\ & + \alpha_{15} GW / TA_{i,t} + \alpha_{16} CAPINT_{i,t} + \alpha_{17} TURNAVG_{i,t} + \alpha_{18} RQ_{i,t} \\ & + \alpha_{19} ENFORCE_{i,t} + e_{it} \end{aligned} \quad (1)$$

where *IMPAIR* is goodwill impairment divided by lagged total assets (Beatty and Weber, 2006; AbuGhazaleh et al., 2011; Li and Sloan, 2017; Han et al., 2020). *PREPOST* is a dummy variable that takes 1 for firm years of IR implementation, and 0 for firm years of non-IR implementation. *DAC* is discretionary accruals. It is estimated by the Jones (1991) model. *DAC* are the residuals that are derived from the estimation of the accruals equation (DeFond and Subramanyam, 1998; Bartov et al., 2001; Kothari et al., 2005; Garza-Gomez et al., 2006). *DAC* equation is:

$$\begin{aligned} ACC_{i,t} / TA_{i,t-1} = {} & \alpha_0 + \alpha_1 \left(1 / TA_{i,t-1}\right) + \alpha_2 \left(\Delta REV_{i,t} / TA_{i,t-1}\right) + \alpha_3 \left(PPE_{i,t} / TA_{i,t-1}\right) \\ & + e_{it} \end{aligned}$$

where $ACC_{i,t}$ is the total accruals equal to net income minus the operating cash flow at the end of fiscal year *t*, $TA_{i,t-1}$ is the book value of total assets at the beginning of year *t*, $\Delta REV_{i,t}$ is the change in sales revenue from the preceding year and the $PPE_{i,t}$ net properties, plants and equipment divided by total assets at the end of fiscal year *t* (Clarkson et al., 2008). *R* is the annual stock return for the 12-month period of the financial year *t*. *BDR* is an indicator variable that takes 1 for negative returns and 0 otherwise.

IR is the integrated reporting disclosure score index. We follow the methodology of Lee and Yeo (2016) and create a composite IR index by assigning equal weights (see Street and Bryant, 2000) to each of the eight content elements:

1 organisational overview and external environment

2 governance

3 business model

4 risks and opportunities

5 strategy and resource allocation

6 performance

7 outlook

8 basis of preparation and presentation – in the IR framework.

The IR disclosure score index (*IR*) is an unweighted index and is derived from dividing the score obtained for each firm by the maximum score [equal to 40 observations based on Lee and Yeo's (2016) checklist].[2] Using the integrated reports of each company, we complete a checklist, where the answers are 'comply'/'non-comply'/'not applicable'. To check for robustness, we create an alternative IR disclosure score index (*IR_R*) based on Demmer et al. (2019). *IR_R* is defined as the absolute difference between the full-sample median of the IR disclosure scores and firm *i*'s IR disclosure score, divided by firm *i*'s IR disclosure score.

The goodwill impairment disclosure score (GWDS) index is an unweighted index and is derived by scaling the total score obtained for each firm by the maximum score (equal to 37 observations). It is based on the checklists developed by EY (2018) and KPMG (2019b).[3] Using the annual and integrated reports of each firm, we complete a checklist consisting of the answers 'comply' or 'non-comply/not applicable'. To check for robustness, we create an alternative GWDS index (*GWDS_R*), which is based on Street and Gray (2002) and Amiraslani et al. (2013). Following Street and Gray (2002), for each of six subsamples, we calculate an unweighted index. Then, we estimate the ratio of the number of subsample unweighted indexes to the number of subsamples. We use six subsamples:

1 business combination

2 fair value of acquisition date

3 amendments to IFRS 3

4 goodwill

5 IAS 36

6 impairment of assets.

This approach applies equal weighting to each reporting item and avoids the problem of assigning more weight to subsamples with a larger number of requirements (Amiraslani et al., 2013).

UNTIMPAIR an indicator variable for untimely impairment. *UNTIMELY IMPAIR* = 1 for companies with $BTM_{t-2} < 1$, $BTM_{t-1} > 1$, and $GOODWILL_{t-1} > 0$, and 0 otherwise [Ramanna and Watts, (2012), p.757]. *ROA* is the ratio of net income before interest and taxes (*NI*) to total assets (*TA*) at the end of fiscal year $t - 1$. *LEV* is a proxy for leverage equal to total liabilities (*TLIAB*) to total assets at the end of fiscal year $t - 1$. *SIZE* is the

natural logarithm of total assets at the end of fiscal year *t*. *MBV* is market to book value of equity. *SPREAD* is ask minus bid price scaled by average ask plus bid price. *GW*/*TA* is the ratio of goodwill to total assets. *CAPINT* is calculated as gross property, plant and equipment, scaled by total assets. *TURNAVG* is the level of liquidity measured by the average daily share turnover. e_{it} is the error term.

In equation (1), α_2 is expected to be positive if earnings manipulation affects goodwill impairment losses, supporting H_1. α_6, α_7 and α_8 are expected to be negative. α_5 illustrates the overall response of the dependent variable to bad news. We expect this coefficient to be negative for firms reporting timely impairments.

3.2.2 Voluntary IR adoption and credit ratings

To test H_{2a}, we use equation (2). The dependent variable is voluntary IR adoption (*VOLIR*), which is an indicator variable equal to 1 for voluntary IR adopters and 0 for mandatory IR adopters. All other variables are defined as in equation (1). Consistent with prior studies, we use several control variables that are likely to be correlated with the voluntarily adoption of IR (Barth et al., 2017; Obeng et al., 2020).

$$\begin{aligned} VOLIR_{i,t} = {} & \alpha_0 + \alpha_1 IMPAIR_{i,t} + \alpha_2 R_{i,t} + a_3 BDR_{i,t} + \alpha_4 R_{i,t} \times BDR_{i,t} + \alpha_5 GWDS_{i,t} \\ & + \alpha_6 ROA_{i,t-1} + \alpha_7 LEV_{i,t-1} + \alpha_8 SIZE_{i,t} + \alpha_9 MBV_{i,t} + \alpha_{10} SPREAD_{i,t} \\ & + \alpha_{11} GW/TA_{i,t} + \alpha_{12} CAPINT_{i,t} + \alpha_{13} TURNAVG_{i,t} + \alpha_{14} RQ_{i,t} \\ & + \alpha_{15} ENFORCE_{i,t} + e_{it} \end{aligned} \tag{2}$$

In equation (2), we assess α_1, which should be negative if goodwill impairment affects companies' voluntary adoption of IR, supporting H_{2a}. Noh et al. (2019) suggest that the provision of voluntary disclosures is linked to the quality of disclosures that companies intend to report. It follows that companies that experience goodwill impairments are likely to defer the voluntary adoption of IR and to display low goodwill impairment disclosure quality. Thus, companies will be likely to voluntarily adopt IR in the absence of bad news.

Moreover, we assess α_5, which will be positive if goodwill impairment disclosure quality affects companies that are likely to voluntarily adopt IR, confirming H_{2a}. Given that the IR framework is based on principles, managers have freedom and significant latitude in preparing their integrated reports. It is possible for companies' reports to be integrated but not informative. This is because managers may use this discretion to set the company's goals and provide opportunistic rather than informative disclosures. Moreover, companies may hide information because of proprietary costs (e.g., Dye, 1986; Wagenhofer, 1990).

H_{2b} hypothesis is investigated using equation (3) as follows:

$$\begin{aligned} CR_{i,t} = {} & \alpha_0 + \alpha_1 PREPOST_{i,t} + \alpha_2 VOLIR_{i,t} + a_3 IR_{i,t} + \alpha_4 GWDS_{i,t} + \alpha_5 GWDS_{i,t} \\ & \times PREPOST_{i,t} + \alpha_6 IR \times VOLIR_{i,t} + \alpha_7 GWDS_{i,t} \times VOLIR_{i,t} + \alpha_8 ROA_{i,t-1} \\ & + \alpha_9 LEV_{i,t-1} + \alpha_{10} SIZE_{i,t} + \alpha_{11} MBV_{i,t} + \alpha_{12} SPREAD_{i,t} + \alpha_{13} GW/TA_{i,t} \\ & + \alpha_{14} CAPINT_{i,t} + \alpha_{15} TURNAVG_{i,t} + \alpha_{16} RQ_{i,t} + \alpha_{17} ENFORCE_{i,t} + e_{it} \end{aligned} \tag{3}$$

Based on Chan et al. (2013) and Noh et al. (2019), equation (3) examines the effects of voluntary IR adoption on credit ratings for firms with high IR compliance and goodwill

impairment disclosure quality. The credit rating measures the level of creditworthiness and can be viewed as the probability of default. There are three main credit rating agencies: Standard and Poor's (S&P, 2003), Fitch and Moody's Investing Service. In line with previous studies (e.g., Liu and Jiraporn, 2010; Attig et al., 2013; Chan et al., 2013; Sun and Zhang, 2017), as dependent variable (*CR*) we use S&P ratings. The S&P rating includes 22 levels, from AAA (the highest rating) to D (the lowest).[4] In line with Klock et al. (2005), our CR index (*CR*) is calculated as the numeric credit rating code, i.e., 22 for AAA, 21 for AA+, etc., divided by 22, which is the total number of rating levels. To check for robustness, we create an alternative credit rating index (*CR_R*) based on Brown et al. (2015). We re-estimate this index by considering ten grade categories, i.e., highest grade, high grade, upper medium grade, medium grade, lower medium grade, speculative grade, poor standing grade, highly speculative grade, lowest quality grade and in default. The alternative credit rating index is calculated as the numeric grade of the credit rating code, e.g., 10 for the highest grade, 9 for the high grade, etc., divided by 10, which is the total number of grade rating levels. All other variables are defined as in equations (1) and (2). Positive coefficients on *IR* × *VOLIR* and *GWDS* × *VOLIR* would show evidence consistent with H_{2b}.

3.2.3 IR compliance and earnings manipulation

H_3 is tested using equation (4) as follows:

$$\begin{aligned} IR_{i,t} = {} & \alpha_0 + \alpha_1 IMPAIR_{i,t} + \alpha_2 DAC_{i,t} + a_3 IMPAIR_{i,t} \times DAC_{i,t} + \alpha_4 GWDS_{i,t} \\ & + \alpha_5 IMPAIR_{i,t} \times GWDS_{i,t} + \alpha_6 ROA_{i,t-1} + \alpha_7 LEV_{i,t-1} + \alpha_8 SIZE_{i,t} + \alpha_9 MBV_{i,t} \\ & + \alpha_{10} SPREAD_{i,t} + \alpha_{11} GW/TA_{i,t} + \alpha_{12} CAPINT_{i,t} + \alpha_{13} TURNAVG_{i,t} \\ & + \alpha_{14} RQ_{i,t} + \alpha_{15} ENFORCE_{i,t} + e_{it} \end{aligned} \tag{4}$$

All variables are defined as in equation (1). IR informativeness results from a long-term orientation and an emphasis on integrated thinking. The business model and strategy in an integrated report give managers an incentive for better alignment, dragging goodwill impairment disclosure quality upwards (Obeng et al., 2020). We consider whether greater IR compliance is associated with lower earnings manipulation practices and higher goodwill impairment disclosure quality. Hence, in equation (4), we expect α_2 and α_3 to be negative, and the coefficients on the independent variables, α_4 and α_5, to be positive.

3.2.4 Goodwill impairment and credit ratings

H_{4a} is tested using equation (5) as follows:

$$\begin{aligned} CR_{i,t} = {} & \alpha_0 + \alpha_1 PREPOST_{i,t} + \alpha_2 IR_{i,t} + \alpha_3 GWDS_{i,t} + \alpha_4 GWDS_{i,t} \times PREPOST_{i,t} \\ & + \alpha_5 IMPAIR_{i,t} + \alpha_6 ROA_{i,t-1} + \alpha_7 LEV_{i,t-1} + \alpha_8 SIZE_{i,t} + \alpha_9 MBV_{i,t} \\ & + \alpha_{10} SPREAD_{i,t} + \alpha_{11} GW/TA_{i,t} + \alpha_{12} ALTMAN_{i,t} + \alpha_{13} CAPINT_{i,t} \\ & + \alpha_{14} TURNAVG_{i,t} + \alpha_{15} RQ_{i,t} + \alpha_{16} ENFORCE_{i,t} + e_{it} \end{aligned} \tag{5}$$

Based on H_{4a}, we expect α_2, α_3 and α_4 to be positive. We expect the long-term effects of IR disclosure quality on credit rating estimations to be positive. By enhancing the information disclosed, IR should have similarly beneficial effects by mitigating the uncertainty and estimation risks in the valuation of a firm's performance (Lambert

et al., 2007; Zhou et al., 2017), thereby potentially positively affecting the firm's creditworthiness. The greater level of transparency and connectivity of financial as well as non-financial information provided by IR will likely encourage the management to adopt a long-term value-creation strategy, to the benefit of investors (Lys et al., 2015).

Ashbaugh-Skaife et al. (2006), Chan et al. (2013) and Sun and Zhang (2017) test the impact of firm size and profitability (measured by *ROA*) on credit ratings. They find that firms with lower *ROA* have higher default risk. Moreover, firm size should be inversely related to risk. Ashaugh-Skaife et al. (2006) and Kisgen (2006) state that corporate governance significantly affects the credit rating of a company. Kisgen (2006, 2009), Liu (2011), Chan et al. (2013) and Sun and Zhang (2017) find a negative relation between leverage and credit ratings. Beatty and Weber (2006) provide evidence suggesting that firms' equity market considerations affect their preference for above-the-line versus below-the-line accounting treatment by managers, and that it and firms' debt and compensation contracting affect their decisions to accelerate or delay expense recognition. Firms with greater capital intensity are assumed to be less risky for lenders (Chan et al., 2013). Similarly to Sun and Zhang (2017), we use *MBV*, *TURNAVG* and *ALTMAN* as control variables. We estimate Altman's (1993) Z-score as follows. All other variables are defined as in equations (1) and (3).

$$\begin{aligned} ALTMAN_{i,t} = {} & 1.2\left(WC_{i,t} / TA_{i,t}\right) + 1.4\left(RE_{i,t} / TA_{i,t}\right) + 3.3\left(EBIT_{i,t} / TA_{i,t-1}\right) \\ & + (0.6\left(MV_{i,t} / TL_{i,t}\right) + 1.0\left(REV_{i,t} / TA_{i.t}\right) \end{aligned} \tag{6}$$

where *WC*/*TA* is working capital divided by total assets. *RE*/*TA* is retained earnings divided by total assets. *EBIT*/*TA* is earnings before interest and tax divided by total assets. *MV*/*TL* is market value of equity divided by total liabilities. *REV*/*TA* is total sales divided by total assets.

Jorion and Zhang (2007) state that previous studies on credit ratings largely ignore the prior value of the rating (prior rating). The omission of the prior rating may cause biased results. For example, when a company is downgraded from A+ to BBB+, this should provide more information content than a downgrade from A+ to A. Based on previous studies (Jorion and Zhang, 2007; Sun and Zhang, 2017), we use Jorion and Zhang's (2007) methodology to provide additional evidence that the differences in credit ratings can be affected by the differences in goodwill impairment losses and other control variables. Specifically, we use as the dependent variable the change in credit rating (ΔCR) from year $t-1$ to year t, and as independent variables the change in goodwill impairment losses ($\Delta IMPAIR$) from year $t-1$ to year t and the changes in various control variables:

$$\begin{aligned} \Delta CR_{i,t} = {} & \alpha_0 + \alpha_1 PREPOST_{i,t} + \alpha_2 \Delta \ln\left(1 + IR_{i,t}\right) + \alpha_3 \Delta \ln\left(1 + GWDS_{i,t}\right) \\ & + \alpha_4 \Delta GWDS_{i,t} \times PREPOST_{i,t} + \alpha_5 \Delta IMPAIR_{i,t} + \alpha_6 \Delta ROA_{i,t-1} \\ & + \alpha_7 \Delta LEV_{i,t-1} + \alpha_8 \Delta \ln\left(1 + SIZE_{i,t}\right) + \alpha_9 \Delta MBV_{i,t} + \alpha_{10} \Delta SPREAD_{i,t} \\ & + \alpha_{11} \Delta (GW / TA)_{i,t} + \alpha_{12} \Delta ALTMAN_{i,t} + \alpha_{13} \Delta CAPINT_{i,t} \\ & + \alpha_{14} \Delta TURNAVG_{i,t} + \alpha_{15} \Delta RQ_{i,t} + \alpha_{16} \Delta ENFORCE_{i,t} + e_{it} \end{aligned} \tag{7}$$

where $\Delta(1 + CR)$ is measured, i.e., as the natural log of one plus the credit rating index for firm i in quarter t minus the natural log of one plus the credit rating index for firm i measured in the same fiscal quarter in the prior year. *PREPOST* is a dummy variable

that takes 1 for firm years of IR implementation, and 0 for firm years of non-IR implementation. $\Delta(1 + IR_{i,t})$ is measured, i.e., as the natural log of one plus the IR disclosure score index for firm *i* in quarter *t* minus the natural log of one plus the IR disclosure score index for firm *i* measured in the same fiscal quarter in the prior year. $\Delta(1 + GWDS)$ is measured, i.e., as the natural log of one plus the GWDS index for firm *i* in quarter *t* minus the natural log of one plus the GWDS index for firm *i* measured in the same fiscal quarter in the prior year.

$\Delta IMPAIR$ is measured as goodwill impairment divided by lagged total assets (*TA*) for firm *i* in quarter *t* minus the goodwill impairment divided by lagged total assets for firm *i* measured in the same fiscal quarter in the prior year. ΔROA is measured as the ratio of net income before interest and taxes to total assets for firm *i* in quarter *t* minus the ratio of net income before interest and taxes to total assets for firm *i* measured in the same fiscal quarter in the prior year. ΔLEV is measured as the ratio of total liabilities (*TLIAB*) to total assets for firm *i* in quarter *t* minus the total liabilities to total assets for firm *i* measured in the same fiscal quarter in the prior year. $\Delta\ln(1 + SIZE)$ is measured as the natural log of one plus total assets for firm *i* in quarter *t* minus the natural log of one plus total assets for firm *i* measured in the same fiscal quarter in the prior year. ΔMBV is measured as the market to book value of equity for firm *i* in quarter *t* minus the market to book value of equity for firm *i* measured in the same fiscal quarter in the prior year.

$\Delta SPREAD$ is measured as ask minus bid price scaled by average ask plus bid price for firm *i* in quarter *t* minus the ask minus bid price scaled by average ask plus bid price for firm *i* measured in the same fiscal quarter in the prior year. $\Delta(GW/TA)$ is measured as goodwill to total assets for firm *i* in quarter *t* minus the goodwill to total assets for firm *i* measured in the same fiscal quarter in the prior year. $\Delta ALTMAN$ is measured as Altman's (1993) Z-score for firm *i* in quarter *t* minus the Altman's (1993) Z-score for firm *i* measured in the same fiscal quarter in the prior year. $\Delta CAPINT$ is measured as the ratio of gross property, plant and equipment, scaled by total assets for firm *i* in quarter *t* minus the ratio of gross property, plant and equipment, scaled by total assets for firm *i* measured in the same fiscal quarter in the prior year. $\Delta TURNAVG$ is measured as the average daily share turnover for firm *i* in quarter *t* minus the average daily share turnover for firm *i* measured in the same fiscal quarter in the prior year. ΔRQ is measured as the regulatory quality for firm *i* in quarter *t* minus the regulatory quality for firm *i* measured in the same fiscal quarter in the prior year. $\Delta ENFORCE$ is measured as the public enforcement index for firm *i* in quarter *t* minus the public enforcement index for firm *i* measured in the same fiscal quarter in the prior year.

Previous studies (e.g., Kisgen, 2006; Sun and Zhang, 2017) find that companies are more worried about rating changes from one rating cluster to another than they are about rating changes within a rating category.[5] Brown et al. (2015) find that companies in credit rating categories near to the investment-speculative borderline use more aggressive earnings manipulation techniques to increase their reported income. A rating cluster refers to that part of the credit rating name excluding the minus and plus signs (Kisgen, 2006). For example, the AA (high grade) credit rating cluster refers to firms with ratings of AA+, AA or AA–. The effect of a credit rating downgrade on a company's ability to access the credit market should not be the same across all ratings. For instance, the impact of a downgrade from BBB+ to BBB– may not be the same as the impact of a downgrade from AAA to A+. Companies that experience downgrades are likely to display less IR compliance and lower quality in their goodwill impairment disclosures. In contrast, they are expected to exhibit greater goodwill impairment losses. The equation

below is based on Sun and Zhang (2017). The dependent variable that captures the credit ratings downgrade (*DOWNGRADE*) is an indicator variable that takes the value of 1 if a firm experiences a credit rating downgrade compared to the prior year, and 0 otherwise. All other variables are defined as in equations (1) and (6).

$$\begin{aligned} DOWNGRADE_{i,t} = {} & \alpha_0 + \alpha_1 PREPOST_{i,t} + a_2 IR_{i,t} + \alpha_3 GWDS_{i,t} + \alpha_4 GWDS_{i,t} \\ & \times PREPOST_{i,t} + \alpha_5 IMPAIR_{i,t} + \alpha_6 ROA_{i,t-1} + \alpha_7 LEV_{i,t-1} \\ & + \alpha_8 SIZE_{i,t} + \alpha_9 MBV_{i,t} + \alpha_{10} SPREAD_{i,t} + \alpha_{11} GW / TA_{i,t} \\ & + \alpha_{12} ALTMAN_{i,t} + \alpha_{13} CAPINT_{i,t} + \alpha_{14} TURNAVG_{i,t} + \alpha_{15} RQ_{i,t} \\ & + \alpha_{16} ENFORCE_{i,t} + e_{it} \end{aligned} \tag{8}$$

H_{4b} is tested using *n* equation (9) as follows:

$$\begin{aligned} CR_{i,t} = {} & \alpha_0 + \alpha_1 PREPOST_{i,t} + \alpha_2 IMPAIR_{i,t} + a_3 IR_{i,t} + \alpha_4 GWDS_{i,t} + \alpha_5 GWDS_{i,t} \\ & \times IR_{i,t} + \alpha_6 IR \times IMPAIR_{i,t} + \alpha_7 GWDS_{i,t} \times IMPAIR_{i,t} + \alpha_8 ROA_{i,t-1} + \alpha_9 LEV_{i,t-1} \\ & + \alpha_{10} SIZE_{i,t} + \alpha_{11} MBV_{i,t} + \alpha_{12} SPREAD_{i,t} + \alpha_{13} GW / TA_{i,t} + \alpha_{14} ALTMAN_{i,t} \\ & + \alpha_{15} CAPINT_{i,t} + \alpha_{16} TURNAVG_{i,t} + \alpha_{17} RQ_{i,t} + \alpha_{18} ENFORCE_{i,t} + e_{it} \end{aligned} \tag{9}$$

All variables are defined as in equations (1), (3) and (6). Positive coefficients on $IR_{i,t} \times IMPAIR_{i,t}$ and $GWDS_{i,t} \times IMPAIR_{i,t}$ would provide empirical evidence consistent with H_{4b}.

4 Results

Section 4 presents the descriptive statistics and the results of our empirical analysis.

4.1 Descriptive statistics

Table 2 summarises the descriptive statistics. Panel A reports the descriptive statistics for the dependent variables. The average for the credit rating index (*CR*) is 0.728 (st. dev. 0.135). The average for the dummy variable of voluntary IR adoption (*VOLUNTARY*) is 0.418 (st. dev. 0.493). The average for goodwill impairment loss (*IMPAIR*) is –0.008 (st. dev. 0.038). The average for the IR disclosure score quality index (*IR*) is 0.701 (st. dev. 0.131). The respective average for the alternative credit rating index (*CR_R*) and alternative IR disclosure score index (*IR_R*) are 0.746 (st. dev. 0.134) and 0.752 (st. dev. 0.135), respectively. Panel B reports the descriptive statistics for the control variables. The average for the goodwill impairment disclosure score index (*GWDS*) is 0.715 (st. dev. 0.128). The average for the annual stock return (*R*) is 0.041 (st. dev. 0.468). The average for the spread (*SPREAD*) is 0.001 (st. dev. 0.0001). The average for the Altman Z-score (*ALTMAN*) is 2.460 (st. dev. 1.500). The average for the market to book ratio (*MBV*) is 2.607 (st. dev. 4.073). Panel C depicts the descriptive statistics for the fundamental variables. The average for total assets (*TA*) is 103,081 (st. dev. 128,521). The average for total liabilities (*TLIAB*) is 75,407 (st. dev. 98,925).

Table 2 Descriptive statistics

Variable	*Mean*	*Median*	*Std. dev.*	*Max.*	*Min.*	*N*
Panel A: depended variables						
CR	0.728	0.700	0.135	1.000	0.301	3,984
CR_R	0.746	0.703	0.134	1.000	0.301	3,984
VOLIR	0.418	0.000	0.493	1.000	0.000	3,984
IMPAIR	–0.008	–0.007	0.038	0.000	–0.013	1,111
IR	0.701	0.700	0.131	0.975	0.125	3,965
IR_R	0.752	0.750	0.135	1.000	0.125	3,965
Panel B: control variables						
PREPOST	0.795	1.000	0.403	1.000	0.000	3,976
GWDS	0.715	0.715	0.128	0.937	0.100	3,961
GWDS_R	0.703	0.739	0.152	0.958	0.100	3,961
R	0.090	0.041	0.468	0.412	–0.488	3,849
UNTIMPAIR	0.096	0.000	0.295	1.000	0.000	3,984
ROA($t-1$)	0.456	0.510	0.342	1.230	0.000	3,914
LEV($t-1$)	0.223	0.205	0.347	1.849	0.001	3,984

Notes: This table presents the descriptive statistics. *CR* is a credit rating index. *CR_R* is an alternative credit rating index based on Brown et al. (2015). *VOLIR* is an indicator variable that takes 1 for voluntary IR adopters and 0 for mandatory IR adopters. *IMPAIR* is goodwill impairment divided by lagged total assets. *IR* is the IR disclosure score index. *IR_R* is the alternative IR disclosure score index (*IR_R*) based on Demmer et al. (2019). *PREPOST* is a dummy variable that takes 1 for firm years of IR implementation, and 0 for firm years of non-IR implementation. *GWDS* is the goodwill impairment disclosure score index. *GWDS_R* is an alternative goodwill impairment disclosure score index, which is based on Street and Gray (2002) and Amiraslani et al. (2013). *R* is the annual stock return. *UNTIMPAIR* an indicator variable for untimely impairment. *UNTIMELY IMPAIR* = 1 for companies with $BTM_{t-2} < 1$, $BTM_{t-1} > 1$, and $GOODWILL_{t-1} > 0$, and 0 otherwise [Ramanna and Watts, (2012), p.757]. *BTM* is book to market value. *ROA*($t-1$) is the ratio of net income before interest and taxes to total assets at the end of fiscal year $t-1$. *LEV*($t-1$) is a proxy for leverage equal to total liabilities to total assets at the end of fiscal year $t-1$. *CAPITN* is calculated as gross property, plant and equipment, scaled by total assets. *TURNAVG* is the level of liquidity measured by the average daily share turnover. *ALTMAN* captures the default risk and is measured using Altman's (1993) Z-score. MBV is market to book value of equity. *SPREAD* is ask minus bid price scaled by average ask plus bid price. Regulatory quality (*RQ*) reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Estimate of governance (ranges from approximately –2.5 (weak) to 2.5 (strong) governance performance). Public enforcement index (*ENFORCE*). Index of the effectiveness of law enforcement of investor protection through sanctions such as fines and prison terms. Higher values indicate better enforcement (Djankov et al., 2008). *NI* is the net income. *TA* is the total assets. *TLIAB* is the total liabilities. *SALES* is the net sales. *GW* is the goodwill.

Table 2 Descriptive statistics (continued)

Variable	*Mean*	*Median*	*Std. dev.*	*Max.*	*Min.*	*N*
Panel B: control variables						
CAPINT	0.653	0.565	0.499	1.672	0.000	3,984
TURNAVG	0.981	0.877	0.681	1.556	0.000	3,940
ALTMAN	2.460	2.340	1.500	5.001	0.000	3,914
MBV	2.607	1.402	3.173	26.251	0.171	3,984
SPREAD	0.001	0.001	0.0001	0.001	0.001	3,894
RQ	0.865	1.217	0.128	2.096	–0.907	3,984
ENFORCE	1.071	0.988	0.105	1.690	–0.667	3,984
Panel C: fundamental variables						
NI	20,483	19,617	159,069	248,923	–27,110	3,984
TA	103,081	89,545	128,521	228,962	13,400	3,984
TLIAB	75,407	63,402	98,925	195,085	12,430	3,984
SALES	99,833	87,560	115,569	213,858	21,585	3,984
GW	199.226	137.943	853.954	997.894	0.000	3,984

Notes: This table presents the descriptive statistics. *CR* is a credit rating index. *CR_R* is an alternative credit rating index based on Brown et al. (2015). *VOLIR* is an indicator variable that takes 1 for voluntary IR adopters and 0 for mandatory IR adopters. *IMPAIR* is goodwill impairment divided by lagged total assets. *IR* is the IR disclosure score index. *IR_R* is the alternative IR disclosure score index (*IR_R*) based on Demmer et al. (2019). *PREPOST* is a dummy variable that takes 1 for firm years of IR implementation, and 0 for firm years of non-IR implementation. *GWDS* is the goodwill impairment disclosure score index. *GWDS_R* is an alternative goodwill impairment disclosure score index, which is based on Street and Gray (2002) and Amiraslani et al. (2013). *R* is the annual stock return. *UNTIMPAIR* an indicator variable for untimely impairment. *UNTIMELY IMPAIR* = 1 for companies with $BTM_{t-2} < 1$, $BTM_{t-1} > 1$, and $GOODWILL_{t-1} > 0$, and 0 otherwise [Ramanna and Watts, (2012), p.757]. *BTM* is book to market value. $ROA(t-1)$ is the ratio of net income before interest and taxes to total assets at the end of fiscal year $t-1$. $LEV(t-1)$ is a proxy for leverage equal to total liabilities to total assets at the end of fiscal year $t-1$. *CAPITN* is calculated as gross property, plant and equipment, scaled by total assets. *TURNAVG* is the level of liquidity measured by the average daily share turnover. *ALTMAN* captures the default risk and is measured using Altman's (1993) Z-score. MBV is market to book value of equity. *SPREAD* is ask minus bid price scaled by average ask plus bid price. Regulatory quality (*RQ*) reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Estimate of governance (ranges from approximately –2.5 (weak) to 2.5 (strong) governance performance). Public enforcement index (*ENFORCE*). Index of the effectiveness of law enforcement of investor protection through sanctions such as fines and prison terms. Higher values indicate better enforcement (Djankov et al., 2008). *NI* is the net income. *TA* is the total assets. *TLIAB* is the total liabilities. *SALES* is the net sales. *GW* is the goodwill.

Table 3 Pearson correlation matrix

	CR	*IR*	*GWDS*	*IMPAIR*	*VOLIR*	*PREPOST*	*DAC*	*R*	*BDR*	*UNTIMPAIR*	*ROA(t–1)*	*LEV(t–1)*	*SIZE*	*MBV*	*SPREAD*	*GW/TA*	*CAPITN*	*TURNAVG*	*ALTMAN*
CR	*1.00*																		
IR	0149***	*1.00*																	
GWDS	0.132***	0.087***	*1.00*																
IMPAIR	–0.103***	–0.009**	–0.000**	*1.00*															
VOLIR	0.228***	0.197***	0.041***	–0.141***	*1.00*														
PREPOST	0.130***	0.191***	0.102***	0.065*	0.037***	*1.00*													
DAC	–0.029	–0.043***	–0.055*	0.009**	0.007	–0.001	*1.00*												
R	0.094***	0.040**	0.042**	–0.006	0.025	–0.026***	–0.016	*1.00*											
BDR	–0.029	–0.023***	–0.026***	0.105***	–0.047	–0.032***	0.030	–0.64***	*1.00*										
UNTIMPAIR	–0.027	–0.001***	–0.024**	0.122***	–0.18***	–0.092***	0.148***	–0.17***	0.011***	*1.00*									
ROA(*t* – 1)	0.161***	0.132***	0.147***	–0.056***	0.006**	0.026	–0.072**	0.163***	–0.24***	–0.25***	*1.00*								
LEV(*t* – 1)	–0.011	–0.018	–0.033***	0.141***	0.015	0.005	0.010	0.030	0.045	–0.000	–0.12***	*1.00*							
SIZE	0.146***	0.140***	0.156***	–0.239***	0.060***	0.251***	–0.028	0.037	–0.062**	–0.19***	0.057*	–0.033	*1.00*						
MBV	0.132***	0.103***	0.138***	–0.234***	0.05***	–0.229***	0.013	0.153***	–0.16***	–0.25***	0.183***	–0.047	0.094***	*1.00*					
SPREAD	0.208***	0.244***	0.198***	–0.146***	0.085***	0.166***	–0.012	0.016	–0.018	–0.16***	0.040	–0.028	0.059***	0.057***	*1.00*				
GW/TA	0.159***	0.220***	0.324***	–0.189***	0.095***	0.129***	–0.056*	–0.007	–0.034	–0.027	0.002	–0.041	0.03***	0.29***	0.095***	*1.00*			
CAPITN	0.160***	0.185***	0.175***	–0.115***	0.248***	0.132***	–0.031	0.040	–0.061*	–0.13***	0.093***	–0.021	0.278***	0.197***	0.223***	0.213***	*1.00*		
TURNAVG	0.000***	0.041	0.057**	–0.049	0.284*	0.058	0.047	0.034	–0.042	0.052*	0.057**	0.024	0.245***	0.252***	0.262***	0.012	0.201***	*1.00*	
ALTMAN	0.001***	0.041**	0.079**	–0.013	0.120***	0.045	–0.019	0.015*	–0.002	–0.011	0.014	0.018	0.027	0.018	0.063**	0.016	0.036	0.149***	*1.00*

Notes: This table presents the Pearson's correlation matrix. *CR* is a credit rating index. *IR* is the IR disclosure score index. *GWDS* is the goodwill impairment disclosure score index. *IMPAIR* is goodwill impairment divided by lagged total assets. *VOLIR* is an indicator variable that takes 1 for voluntary IR adopters and 0 for mandatory IR adopters. *PREPOST* is a dummy variable that takes 1 for firm years of IR implementation, and 0 for firm years of non-IR implementation. *DAC* is discretionary accruals. It is estimated by the Jones (1991) model. *DAC* are the residuals that are derived from the estimation of the accruals equation (DeFond and Subramanyam, 1998; Bartov et al., 2001; Kothari et al., 2005; Garza-Gomez et al., 2006). *R* is the annual stock return. *BDR* is an indicator variable that takes 1 for negative returns and 0 otherwise. *UNTIMPAIR* an indicator variable for untimely impairment. *UNTIMELY IMPAIR* = 1 for companies with $BTM_{t-2} < 1$, $BTM_{t-1} > 1$, and $GOODWILL_{t-1} > 0$, and 0 otherwise [Ramanna and Watts, (2012), p.757]. *BTM* is book to market value. *ROA*(*t* – 1) is the ratio of net income before interest and taxes to total assets at the end of fiscal year *t* – 1. *LEV*(*t* – 1) is a proxy for leverage equal to total liabilities to total assets at the end of fiscal year *t* – 1. *SIZE* is the natural logarithm of total assets at the end of fiscal year. *MBV* is market to book value of equity. *SPREAD* is ask minus bid price scaled by average ask plus bid price. *GW/TA* is the ratio of goodwill to total assets. *CAPITN* is calculated as gross property, plant and equipment, scaled by total assets. *TURNAVG* is the level of liquidity measured by the average daily share turnover. *ALTMAN* captures the default risk and is measured using Altman's (1993) Z-score. Coefficient p-values are two-tailed. ***p < 0.01, **p < 0.05 and *p < 0.1.

Table 4 Goodwill impairment losses, earnings manipulation, IR and goodwill impairment disclosure quality indexes

Panel A – equation (1)			*Panel B – robust analysis of equation (1)*		
Dependent variable: IMPAIR			*Dependent variable: IMPAIR*		
Variable	*Coefficients*	*Z-stat.*	*Variable*	*Coefficients*	*Z-stat.*
Intercept	0.0944***	3.3680	Intercept	0.0924***	3.0839
PREPOST	–0.0031*	–1.6729	*PREPOST*	–0.0032**	–1.7278
DAC	0.0004***	2.9534	*DAC*	0.0003***	2.9420
R	2.87E–05	1.3066	*R*	2.97E–05	1.3509
BDR	–0.0178***	–3.0083	*BDR*	–0.0001**	–2.4416
R ∗ BDR	–0.0002***	–2.6769	*R ∗ BDR*	–0.0002***	–2.6679
IR	–0.0018***	–2.9882	*IR*	–0.0064***	–2.7309
GWDS	–0.0356***	–2.6403	*GWDS*	–0.0210**	–1.9883
GWDS ∗ PREPOST	–0.0045*	–1.7491	*GWDS ∗ PREPOST*	–0.0044*	–1.7369

Notes: This table presents the estimation results of goodwill impairment losses on earnings manipulation, *IR* and goodwill impairment disclosure quality indexes. The dependent variable is *IMPAIR*, which is goodwill impairment divided by lagged total assets. *IR* is the IR disclosure score index. *IR_R* is the alternative IR disclosure score index (*IR_R*) based on Demmer et al. (2019). *GWDS* is the goodwill impairment disclosure score index. *GWDS_R* is an alternative goodwill impairment disclosure score index, which is based on Street and Gray (2002) and Amiraslani et al. (2013). *PREPOST* is a dummy variable that takes 1 for firm years of IR implementation, and 0 for firm years of non-IR implementation. *DAC* is discretionary accruals. It is estimated by the Jones (1991) model. *DAC* are the residuals that are derived from the estimation of the accruals equation (DeFond and Subramanyam, 1998; Bartov et al., 2001; Kothari et al., 2005; Garza-Gomez et al., 2006). *R* is the annual stock return. *BDR* is an indicator variable that takes 1 for negative returns and 0 otherwise. *UNTIMPAIR* an indicator variable for untimely impairment. *UNTIMELY IMPAIR* = 1 for companies with $BTM_{t-2} < 1$, $BTM_{t-1} > 1$, and $GOODWILL_{t-1} > 0$, and 0 otherwise [Ramanna and Watts, (2012), p.757]. *BTM* is book to market value. $ROA(t-1)$ is the ratio of net income before interest and taxes to total assets at the end of fiscal year $t-1$. $LEV(t-1)$ is a proxy for leverage equal to total liabilities to total assets at the end of fiscal year $t-1$. *SIZE* is the natural logarithm of total assets at the end of fiscal year. *MBV* is market to book value of equity. *SPREAD* is ask minus bid price scaled by average ask plus bid price. *GW/TA* is the ratio of goodwill to total assets. *CAPITN* is calculated as gross property, plant and equipment, scaled by total assets. *TURNAVG* is the level of liquidity measured by the average daily share turnover. Regulatory quality (*RQ*) reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Estimate of governance [ranges from approximately –2.5 (weak) to 2.5 (strong) governance performance]. Public enforcement index (*ENFORCE*). Index of the effectiveness of law enforcement of investor protection through sanctions such as fines and prison terms. Higher values indicate better enforcement (Djankov et al., 2008). Z-statistics reported in parentheses are based on standard errors corrected for heteroskedasticity and clustered by firm. The extreme values of all continuous variables are winsorised at the 1 and 99 percentiles. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively (two-tailed).

Table 4 Goodwill impairment losses, earnings manipulation, IR and goodwill impairment disclosure quality indexes (continued)

Panel A – equation (1)			*Panel B – robust analysis of equation (1)*		
Dependent variable: IMPAIR			*Dependent variable: IMPAIR*		
Variable	*Coefficients*	*Z-stat.*	*Variable*	*Coefficients*	*Z-stat.*
UNTIMPAIR	0.0071**	2.3632	*UNTIMPAIR*	0.0071**	2.3602
ROA(t – 1)	–0.0024***	–3.2183	*ROA*(t – 1)	–0.0023***	–3.2120
LEV(t – 1)	3.11E–06**	2.3028	*LEV*(t – 1)	3.12E–06**	2.3132
SIZE	0.0098***	3.2278	*SIZE*	0.0079***	3.1693
MBV	–0.0092***	–3.0744	*MBV*	–0.0089***	–3.6225
SPREAD	–1.3880***	–3.0579	*SPREAD*	–2.0819***	–2.9325
GW/TA	–0.0006***	–3.0354	*GW/TA*	–0.0006***	–2.9737
CAPINT	–0.0064**	–2.3084	*CAPINT*	–0.0064**	–2.3153
TURNAVG	–0.0032*	–1.9576	*TURNAVG*	–0.0031*	–1.9270

Notes: This table presents the estimation results of goodwill impairment losses on earnings manipulation, *IR* and goodwill impairment disclosure quality indexes. The dependent variable is *IMPAIR*, which is goodwill impairment divided by lagged total assets. *IR* is the IR disclosure score index. *IR_R* is the alternative IR disclosure score index (*IR_R*) based on Demmer et al. (2019). *GWDS* is the goodwill impairment disclosure score index. *GWDS_R* is an alternative goodwill impairment disclosure score index, which is based on Street and Gray (2002) and Amiraslani et al. (2013). *PREPOST* is a dummy variable that takes 1 for firm years of IR implementation, and 0 for firm years of non-IR implementation. *DAC* is discretionary accruals. It is estimated by the Jones (1991) model. *DAC* are the residuals that are derived from the estimation of the accruals equation (DeFond and Subramanyam, 1998; Bartov et al., 2001; Kothari et al., 2005; Garza-Gomez et al., 2006). *R* is the annual stock return. *BDR* is an indicator variable that takes 1 for negative returns and 0 otherwise. *UNTIMPAIR* an indicator variable for untimely impairment. *UNTIMELY IMPAIR* = 1 for companies with $BTM_{t-2} < 1$, $BTM_{t-1} > 1$, and $GOODWILL_{t-1} > 0$, and 0 otherwise [Ramanna and Watts, (2012), p.757]. *BTM* is book to market value. *ROA*(t – 1) is the ratio of net income before interest and taxes to total assets at the end of fiscal year t – 1. *LEV*(t – 1) is a proxy for leverage equal to total liabilities to total assets at the end of fiscal year t – 1. *SIZE* is the natural logarithm of total assets at the end of fiscal year. *MBV* is market to book value of equity. *SPREAD* is ask minus bid price scaled by average ask plus bid price. *GW/TA* is the ratio of goodwill to total assets. *CAPITN* is calculated as gross property, plant and equipment, scaled by total assets. *TURNAVG* is the level of liquidity measured by the average daily share turnover. Regulatory quality (*RQ*) reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Estimate of governance [ranges from approximately –2.5 (weak) to 2.5 (strong) governance performance]. Public enforcement index (*ENFORCE*). Index of the effectiveness of law enforcement of investor protection through sanctions such as fines and prison terms. Higher values indicate better enforcement (Djankov et al., 2008). Z-statistics reported in parentheses are based on standard errors corrected for heteroskedasticity and clustered by firm. The extreme values of all continuous variables are winsorised at the 1 and 99 percentiles. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively (two-tailed).

Table 4 Goodwill impairment losses, earnings manipulation, IR and goodwill impairment disclosure quality indexes (continued)

Panel A – equation (1)			*Panel B – robust analysis of equation (1)*		
Dependent variable: IMPAIR			*Dependent variable: IMPAIR*		
Variable	*Coefficients*	*Z-stat.*	*Variable*	*Coefficients*	*Z-stat.*
RQ	–0.0290***	–2.9764	*RQ*	–0.0362***	–2.6651
ENFORCE	–0.0132**	–2.4337	*ENFORCE*	–0.0139**	–2.5726
Industry and year eff.	Yes/yes		Industry and year eff.	Yes/yes	
Adj. R^2	41.6707%		Adj. R^2	41.5449%	
Sample size	N = 1,011		Sample size	N = 1,011	
Firm count	N = 186		Firm count	N = 186	

Notes: This table presents the estimation results of goodwill impairment losses on earnings manipulation, *IR* and goodwill impairment disclosure quality indexes. The dependent variable is *IMPAIR*, which is goodwill impairment divided by lagged total assets. *IR* is the IR disclosure score index. *IR_R* is the alternative IR disclosure score index (*IR_R*) based on Demmer et al. (2019). *GWDS* is the goodwill impairment disclosure score index. *GWDS_R* is an alternative goodwill impairment disclosure score index, which is based on Street and Gray (2002) and Amiraslani et al. (2013). *PREPOST* is a dummy variable that takes 1 for firm years of IR implementation, and 0 for firm years of non-IR implementation. *DAC* is discretionary accruals. It is estimated by the Jones (1991) model. *DAC* are the residuals that are derived from the estimation of the accruals equation (DeFond and Subramanyam, 1998; Bartov et al., 2001; Kothari et al., 2005; Garza-Gomez et al., 2006). *R* is the annual stock return. *BDR* is an indicator variable that takes 1 for negative returns and 0 otherwise. *UNTIMPAIR* an indicator variable for untimely impairment. *UNTIMELY IMPAIR* = 1 for companies with $BTM_{t-2} < 1$, $BTM_{t-1} > 1$, and $GOODWILL_{t-1} > 0$, and 0 otherwise [Ramanna and Watts, (2012), p.757]. *BTM* is book to market value. *ROA*($t - 1$) is the ratio of net income before interest and taxes to total assets at the end of fiscal year $t - 1$. *LEV*($t - 1$) is a proxy for leverage equal to total liabilities to total assets at the end of fiscal year $t - 1$. *SIZE* is the natural logarithm of total assets at the end of fiscal year. *MBV* is market to book value of equity. *SPREAD* is ask minus bid price scaled by average ask plus bid price. *GW/TA* is the ratio of goodwill to total assets. *CAPITN* is calculated as gross property, plant and equipment, scaled by total assets. *TURNAVG* is the level of liquidity measured by the average daily share turnover. Regulatory quality (*RQ*) reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Estimate of governance [ranges from approximately –2.5 (weak) to 2.5 (strong) governance performance]. Public enforcement index (*ENFORCE*). Index of the effectiveness of law enforcement of investor protection through sanctions such as fines and prison terms. Higher values indicate better enforcement (Djankov et al., 2008). Z-statistics reported in parentheses are based on standard errors corrected for heteroskedasticity and clustered by firm. The extreme values of all continuous variables are winsorised at the 1 and 99 percentiles. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively (two-tailed).

The Pearson correlation matrix is presented in Table 3. The IR disclosure score index (*IR*) and the goodwill impairment disclosure score index (*GWDS*) are both negatively correlated with goodwill impairment loss (*IMPAIR*). Voluntary IR adoption (*VOLIR*)

appears to be positively correlated with the IR disclosure score index (*IR*) and the goodwill impairment disclosure score index (*GWDS*), and negatively with goodwill impairment loss (*IMPAIR*). The IR disclosure score index (*IR*) and the goodwill impairment disclosure score index (*GWDS*) are positively correlated with the credit rating index (*CR*), supporting the informativeness of a high quality of disclosure of IR and goodwill impairment. The discretionary accruals (*DAC*) are negatively correlated with the IR disclosure score index (*IR*). We find that companies with higher goodwill impairment have a smaller size, display higher leverage and lower financial performance (*ROA*), and engage in greater earnings manipulation.

4.2 Goodwill impairment and earnings manipulation

The regression results from equation (1) are presented in Table 4, confirming H_1. In Panel A, we observe that companies with goodwill impairment losses are likely to use earnings manipulation and display lower IR compliance and goodwill impairment disclosure quality. The variables of interest (i.e., *DAC* and $R \times BDR$) have significantly positive and negative coefficients, respectively. The findings suggest that bad news pressures managers to manipulate earnings by decreasing goodwill impairment losses in order to meet or exceed earnings forecasts. Moreover, managers are more likely to behave opportunistically in avoiding the timely recognition of goodwill impairment and managing earnings upward due to personal concerns about compensation and reputation. The negative coefficients on *IR*, *GWDS* and $GWDS \times PREPOST$ show that companies with impairment are likely to report limited disclosures on goodwill and display a lower level of IR compliance. *SIZE* and $LEV(t-1)$ exhibit positive associations with the level of impairment. Consistent with previous studies (e.g., Han et al., 2020; Iatridis et al., 2021), more profitable companies [higher $ROA(t-1)$], those with better liquidity (higher *TURNAVG*) and those that are more capital intensive exhibit lower levels of impairment.

The robustness check presented in Panel B of Table 4 supports H_1. We use the alternative *GWDS_R* and *IR_R* scores. The coefficient on *DAC* is positive and that on $R \times BDR$ is negative. *IR*, *GWDS* and $GWDS \times PREPOST$ have negative coefficients. The variables that negatively affect IMPAIR are firm performance (*ROA*), spread (*SPREAD*), the market to book value of equity (*MBV*) and the liquidity ratio (*TURNAVG*). This suggests that high earnings manipulation and low *IR* and *GWDS* affect goodwill impairment significantly. Our results are aligned with the results of previous studies (Beatty and Weber, 2006; AbuGhazaleh et al., 2011; Ramanna and Watts, 2012; Giner and Pardo, 2015; Han et al., 2020; Iatridis et al., 2021).

4.3 Voluntary IR adoption and credit ratings

Table 5 presents the results of equation (2), confirming H_{2a}. We find that companies are likely to voluntarily adopt IR when goodwill impairment is low and goodwill impairment disclosure quality is high. In Panel A, the variables of interest (i.e., *IMPAIR* and *GWDS*) have negative and positive coefficients, respectively, suggesting that managers are likely to voluntarily adopt IR when both their financial and non-financial positions are good. Moreover, we find a negative coefficient on $R \times BDR$ for firms reporting timely impairments. We observe a negative response of the level of impairment to negative returns to the manager's decision to adopt IR voluntarily. Our study is aligned to Ramanna and Watts (2012), Li and Sloan (2015) and Sun and Zhang (2017), which show

that managers tend to manipulate goodwill impairment or to adopt foggy financial reporting practices to avoid declines in the stock price and in their compensation and credit ratings. Hence, credit rating agencies should evaluate the quality of goodwill impairment disclosures when assessing a company's creditability. The robustness check presented in Table 5 supports H_{2a}. In Panel B, we estimate equation (2) again, using the above-mentioned *GWDS_R* variable. The results are similar to those of our basic analysis presented in Panel A.

Table 5 Voluntary IR adoption and goodwill impairment

Panel A – equation (2)			*Panel B – robust analysis of equation (2)*		
Dependent variable: VOLIR			*Dependent variable: VOLIR*		
Variable	*Coefficients*	*Z-stat.*	*Variable*	*Coefficients*	*Z-stat.*
Intercept	0.9364***	3.6166	Intercept	0.9594***	3.0889
IMPAIR	–0.1698***	–3.0678	*IMPAIR*	–0.1520***	–2.7774
R	0.0054	0.9836	*R*	0.0064	1.1366
BDR	–0.1457**	2.3084	*BDR*	–0.1343**	–2.1127
R ∗ *BDR*	–0.0420**	–2.2667	*R* ∗ *BDR*	–0.0505**	–2.1929
GWDS	0.1664***	3.5464	*GWDS*	0.1723***	4.3567
ROA(*t* – 1)	0.0193	1.1262	*ROA*(*t* – 1)	0.0281	1.4179
LEV(*t* – 1)	–0.0009	–1.3004	*LEV*(*t* – 1)	–0.0014	–1.0265
SIZE	0.1438	0.8516	*SIZE*	0.0129	0.9450
MBV	0.5884*	1.6791	*MBV*	0.6013*	1.7615

Notes: This table presents the estimation results of voluntary IR adoption and drivers of goodwill impairment. The dependent variable *VOLIR* is an indicator variable that takes 1 for voluntary IR adopters and 0 for mandatory IR adopters. *IMPAIR* is goodwill impairment divided by lagged total assets. *IR* is the IR disclosure score index. *IR_R* is the alternative IR disclosure score index (*IR_R*) based on Demmer et al. (2019). *GWDS* is the goodwill impairment disclosure score index. *GWDS_R* is an alternative goodwill impairment disclosure score index, which is based on Street and Gray (2002) and Amiraslani et al. (2013). *R* is the annual stock return. *BDR* is an indicator variable that takes 1 for negative returns and 0 otherwise. *ROA*(*t* – 1) is the ratio of net income before interest and taxes to total assets at the end of fiscal year *t* – 1. *LEV*(*t* – 1) is a proxy for leverage equal to total liabilities to total assets at the end of fiscal year *t* – 1. *SIZE* is the natural logarithm of total assets at the end of fiscal year. *MBV* is market to book value of equity. *SPREAD* is ask minus bid price scaled by average ask plus bid price. *GW/TA* is the ratio of goodwill to total assets. *CAPITN* is calculated as gross property, plant and equipment, scaled by total assets. *TURNAVG* is the level of liquidity measured by the average daily share turnover. Regulatory quality (*RQ*) reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Estimate of governance [ranges from approximately –2.5 (weak) to 2.5 (strong) governance performance]. Public enforcement index (*ENFORCE*). Index of the effectiveness of law enforcement of investor protection through sanctions such as fines and prison terms. Higher values indicate better enforcement (Djankov et al., 2008). Z-statistics reported in parentheses are based on standard errors corrected for heteroskedasticity and clustered by firm. The extreme values of all continuous variables are winsorised at the 1 and 99 percentiles. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively (two-tailed).

Table 5 Voluntary IR adoption and goodwill impairment (continued)

Panel A – equation (2)			*Panel B – robust analysis of equation (2)*		
Dependent variable: VOLIR			*Dependent variable: VOLIR*		
Variable	*Coefficients*	*Z-stat.*	*Variable*	*Coefficients*	*Z-stat.*
SPREAD	0.6871***	3.0424	*SPREAD*	0.6229***	2.9281
GW/TA	–0.0938	–0.9627	*GW/TA*	–0.1143	–0.8283
CAPINT	0.9157***	3.3880	*CAPINT*	1.0900***	2.8400
TURNAVG	0.5523	1.2286	*TURNAVG*	0.7139	1.1157
RQ	2.86E–06***	–2.9554	*RQ*	9.03E–05***	–2.7021
ENFORCE	0.1033***	–3.8382	*ENFORCE*	0.2913***	–3.3014
Industry and year eff.	Yes/yes		Industry and year eff.	Yes/yes	
Pseudo R^2	27.6205%		Pseudo R^2	27.9049%	
Sample size	N = 1,080		Sample size	N = 1,080	
Firm count	N = 194		Firm count	N = 194	

Notes: This table presents the estimation results of voluntary IR adoption and drivers of goodwill impairment. The dependent variable *VOLIR* is an indicator variable that takes 1 for voluntary IR adopters and 0 for mandatory IR adopters. *IMPAIR* is goodwill impairment divided by lagged total assets. *IR* is the IR disclosure score index. *IR_R* is the alternative IR disclosure score index (*IR_R*) based on Demmer et al. (2019). *GWDS* is the goodwill impairment disclosure score index. *GWDS_R* is an alternative goodwill impairment disclosure score index, which is based on Street and Gray (2002) and Amiraslani et al. (2013). *R* is the annual stock return. *BDR* is an indicator variable that takes 1 for negative returns and 0 otherwise. *ROA*(t – 1) is the ratio of net income before interest and taxes to total assets at the end of fiscal year t – 1. *LEV*(t – 1) is a proxy for leverage equal to total liabilities to total assets at the end of fiscal year t – 1. *SIZE* is the natural logarithm of total assets at the end of fiscal year. *MBV* is market to book value of equity. *SPREAD* is ask minus bid price scaled by average ask plus bid price. *GW/TA* is the ratio of goodwill to total assets. *CAPITN* is calculated as gross property, plant and equipment, scaled by total assets. *TURNAVG* is the level of liquidity measured by the average daily share turnover. Regulatory quality (*RQ*) reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Estimate of governance [ranges from approximately –2.5 (weak) to 2.5 (strong) governance performance]. Public enforcement index (*ENFORCE*). Index of the effectiveness of law enforcement of investor protection through sanctions such as fines and prison terms. Higher values indicate better enforcement (Djankov et al., 2008). Z-statistics reported in parentheses are based on standard errors corrected for heteroskedasticity and clustered by firm. The extreme values of all continuous variables are winsorised at the 1 and 99 percentiles. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively (two-tailed).

H_{2b} tests the association between voluntary IR adoption and credit ratings, and how this relation is affected by the quality of IR compliance and goodwill impairment disclosure quality. Panel A of Table 6 illustrates the findings from equation (3), confirming H_{2b}. *IR* × *VOLIR* and *GWDS* × *VOLIR* have positive coefficients, suggesting that they improve credit ratings. Voluntary IR disclosure and a high level of goodwill impairment disclosure quality could serve as complements (Ball et al., 2012; Li and Yang, 2016). After all, IR provides detailed information about firms' performance and managers may

choose to publish supplementary information voluntarily in order to better inform investors. On the other hand, if IR is compulsory, it could reduce the benefits of voluntary disclosure. Furthermore, managers can opportunistically provide voluntary accounting information about 'good news' to offset the loss of accounting information that comes from complicated mandatory accounting disclosures (Noh et al., 2019).

Table 6 Voluntary IR adoption and credit rating index

Panel A – equation (3)			*Panel B – robust analysis of equation (3)*		
Dependent variable: CR			*Dependent variable: CR_R*		
Variable	*Coefficients*	*Z-stat.*	*Variable*	*Coefficients*	*Z-stat.*
Intercept	0.3174***	3.1984	Intercept	0.0653***	2.8119
PREPOST	0.0260***	3.0700	*PREPOST*	0.0321***	4.2605
VOLIR	0.8702***	3.6982	*VOLIR*	0.5760***	3.1233
IR	0.2756***	3.2971	*IR*	0.2120***	3.5948
GWDS	1.9575***	2.9478	*GWDS*	1.0632***	3.1221
GWDS ∗ *PREPOST*	0.0160***	3.1179	*GWDS* ∗ *PREPOST*	0.0575***	2.9212
IR ∗ *VOLIR*	0.0250***	2.4433	*IR* ∗ *VOLIR*	0.0083***	2.8701
GWDS ∗ *VOLIR*	1.2178***	4.0141	*GWDS* ∗ *VOLIR*	0.7649***	3.0655
ROA(*t* – 1)	0.0002	0.6276	*ROA*(*t* – 1)	0.0444***	2.6833

Notes: This table presents the estimation results of voluntary IR adoption, IR and goodwill impairment disclosure quality indexes on credit ratings. In Panel A, the dependent variable is *CR*, which is a credit rating index. In Panel B, *CR_R*, which is an alternative credit rating index based on Brown et al. (2015). *VOLIR* is an indicator variable that takes 1 for voluntary IR adopters and 0 for mandatory IR adopters. *PREPOST* is a dummy variable that takes 1 for firm years of IR implementation, and 0 for firm years of non-IR implementation. *IR* is the IR disclosure score index. *IR_R* is the alternative IR disclosure score index based on Demmer et al. (2019). *GWDS* is the goodwill impairment disclosure score index. *GWDS_R* is an alternative goodwill impairment disclosure score index, which is based on Street and Gray (2002) and Amiraslani et al. (2013). *ROA*(*t* – 1) is the ratio of net income before interest and taxes to total assets at the end of fiscal year *t* – 1. *LEV*(*t* – 1) is a proxy for leverage equal to total liabilities to total assets at the end of fiscal year *t* – 1. *SIZE* is the natural logarithm of total assets at the end of fiscal year. *MBV* is market to book value of equity. *SPREAD* is ask minus bid price scaled by average ask plus bid price. *GW*/*TA* is the ratio of goodwill to total assets. *CAPITN* is calculated as gross property, plant and equipment, scaled by total assets. *TURNAVG* is the level of liquidity measured by the average daily share turnover. Regulatory quality (*RQ*) reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Estimate of governance [ranges from approximately –2.5 (weak) to 2.5 (strong) governance performance]. Public enforcement index (*ENFORCE*). Index of the effectiveness of law enforcement of investor protection through sanctions such as fines and prison terms. Higher values indicate better enforcement (Djankov et al., 2008). Z-statistics reported in parentheses are based on standard errors corrected for heteroskedasticity and clustered by firm. The extreme values of all continuous variables are winsorised at the 1 and 99 percentiles. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively (two-tailed).

Table 6 Voluntary IR adoption and credit rating index (continued)

Panel A – equation (3)			*Panel B – robust analysis of equation (3)*		
Dependent variable: CR			*Dependent variable: CR_R*		
Variable	*Coefficients*	*Z-stat.*	*Variable*	*Coefficients*	*Z-stat.*
LEV(*t* – 1)	–0.0002*	–1.7971	*LEV*(*t* – 1)	–0.0002	–1.6353
SIZE	–0.0005	–0.9254	*SIZE*	–6.29E–05	–0.0383
MBV	0.0090***	2.7064	*MBV*	0.0002	0.2419
SPREAD	0.94176***	3.2032	*SPREAD*	0.5493	0.6994
GW/TA	0.0005	0.7398	*GW/TA*	0.1914***	3.0065
CAPINT	–0.0053	1.4579	*CAPINT*	0.0027**	2.1022
TURNAVG	–0.0058***	–0.6436	*TURNAVG*	–0.0033	–1.6009
RQ	2.45E–05***	2.9679	*RQ*	1.72E–05*	1.7398
ENFORCE	0.0279***	2.8184	*ENFORCE*	0.0039***	2.8193
Industry and year eff.	Yes/yes		Industry and year eff.	Yes/yes	
Adj. R^2	22.2960%		Adj. R^2	29.2165%	
Sample size	N = 3,780		Sample size	N = 3,460	
Firm count	N = 498		Firm count	N = 498	

Notes: This table presents the estimation results of voluntary IR adoption, IR and goodwill impairment disclosure quality indexes on credit ratings. In Panel A, the dependent variable is *CR*, which is a credit rating index. In Panel B, *CR_R*, which is an alternative credit rating index based on Brown et al. (2015). *VOLIR* is an indicator variable that takes 1 for voluntary IR adopters and 0 for mandatory IR adopters. *PREPOST* is a dummy variable that takes 1 for firm years of IR implementation, and 0 for firm years of non-IR implementation. *IR* is the IR disclosure score index. *IR_R* is the alternative IR disclosure score index based on Demmer et al. (2019). *GWDS* is the goodwill impairment disclosure score index. *GWDS_R* is an alternative goodwill impairment disclosure score index, which is based on Street and Gray (2002) and Amiraslani et al. (2013). *ROA*(*t* – 1) is the ratio of net income before interest and taxes to total assets at the end of fiscal year *t* – 1. *LEV*(*t* – 1) is a proxy for leverage equal to total liabilities to total assets at the end of fiscal year *t* – 1. *SIZE* is the natural logarithm of total assets at the end of fiscal year. *MBV* is market to book value of equity. *SPREAD* is ask minus bid price scaled by average ask plus bid price. *GW/TA* is the ratio of goodwill to total assets. *CAPITN* is calculated as gross property, plant and equipment, scaled by total assets. *TURNAVG* is the level of liquidity measured by the average daily share turnover. Regulatory quality (*RQ*) reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Estimate of governance [ranges from approximately –2.5 (weak) to 2.5 (strong) governance performance]. Public enforcement index (*ENFORCE*). Index of the effectiveness of law enforcement of investor protection through sanctions such as fines and prison terms. Higher values indicate better enforcement (Djankov et al., 2008). Z-statistics reported in parentheses are based on standard errors corrected for heteroskedasticity and clustered by firm. The extreme values of all continuous variables are winsorised at the 1 and 99 percentiles. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively (two-tailed).

For robustness, we estimate equation (3) using *CR_R* as the dependent variable. Moreover, we use the above-mentioned *GWDS_R* and *IR_R* scores. The results are presented in Panel B of Table 6 and confirm H_{2b}. *IR_R* × *VOLUNTARY* and *GWDS_R* × *VOLUNTARY* are found to have positive coefficients. The interpretation power of these results is the same as for the initial equation and supports our inference that voluntary IR adoption providing good news can be used opportunistically in order to offset bad financial news.

Table 7 Credit ratings, IR and GWDS disclosure score indexes

Panel A – equation (4)			*Panel B – robust analysis of equation (4)*		
Dependent variable: IR			*Dependent variable: IR_R*		
Variable	*Coefficients*	*Z-stat.*	*Variable*	*Coefficients*	*Z-stat.*
Intercept	0.1380***	3.4135	Intercept	0.1174***	3.3401
IMPAIR	–0.0125***	–3.2460	*IMPAIR*	–0.1297**	–2.4964
DAC	–0.0002***	–2.9691	*DAC*	–0.0001*	–1.7432
IMPAIR ∗ *DAC*	–0.0050**	–2.3662	*IMPAIR* ∗ *DAC*	–0.0025**	–2.0022
GWDS	0.6951***	3.0841	*GWDS*	0.4463***	2.9423
IMPAIR ∗ *GWDS*	0.0034***	2.9551	*IMPAIR* ∗ *GWDS*	0.0093***	2.6139
ROA(*t* – 1)	–0.0001	1.0344	*ROA*(*t* – 1)	0.0170**	2.3852

Notes: This table presents the estimation results of IR disclosure quality on earnings manipulation and goodwill impairment drivers. In Panel A, the dependent variable is *IR*, which is the IR disclosure score index. In Panel B, the dependent variable is *IR_R* is the alternative IR disclosure score index based on Demmer et al. (2019). *IMPAIR* is goodwill impairment divided by lagged total assets. *DAC* is discretionary accruals. It is estimated by the Jones (1991) model. *DAC* are the residuals that are derived from the estimation of the accruals equation (DeFond and Subramanyam, 1998; Bartov et al., 2001; Kothari et al., 2005; Garza-Gomez et al., 2006). *PREPOST* is a dummy variable that takes 1 for firm years of IR implementation, and 0 for firm years of non-IR implementation. *GWDS* is the goodwill impairment disclosure score index. *GWDS_R* is an alternative goodwill impairment disclosure score index, which is based on Street and Gray (2002) and Amiraslani et al. (2013). *ROA*(*t* – 1) is the ratio of net income before interest and taxes to total assets at the end of fiscal year *t* – 1. *LEV*(*t* – 1) is a proxy for leverage equal to total liabilities to total assets at the end of fiscal year *t* – 1. *SIZE* is the natural logarithm of total assets at the end of fiscal year. *MBV* is market to book value of equity. *SPREAD* is ask minus bid price scaled by average ask plus bid price. *GW*/*TA* is the ratio of goodwill to total assets. *CAPITN* is calculated as gross property, plant and equipment, scaled by total assets. *TURNAVG* is the level of liquidity measured by the average daily share turnover. Regulatory quality (*RQ*) reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Estimate of governance [ranges from approximately –2.5 (weak) to 2.5 (strong) governance performance]. Public enforcement index (*ENFORCE*). Index of the effectiveness of law enforcement of investor protection through sanctions such as fines and prison terms. Higher values indicate better enforcement (Djankov et al., 2008). Z-statistics reported in parentheses are based on standard errors corrected for heteroskedasticity and clustered by firm. The extreme values of all continuous variables are winsorised at the 1 and 99 percentiles. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively (two-tailed).

Table 7 Credit ratings, IR and GWDS disclosure score indexes (continued)

Panel A – equation (4)			*Panel B – robust analysis of equation (4)*		
Dependent variable: IR			*Dependent variable: IR_R*		
Variable	*Coefficients*	*Z-stat.*	*Variable*	*Coefficients*	*Z-stat.*
LEV(*t* – 1)	0.0001	1.4629	*LEV*(*t* – 1)	3.01E–05	1.3792
SIZE	–0.0017**	–2.2356	*SIZE*	–0.0041**	–3.9642
MBV	0.0027*	1.7984*	*MBV*	0.0004	1.1501
SPREAD	–0.2513	–1.2008	*SPREAD*	–0.6332**	–1.9305
GW/TA	0.2708*	1.7923	*GW/TA*	0.4568***	2.8197
CAPINT	0.0014*	1.6802	*CAPINT*	0.0002	0.7446
TURNAVG	0.0927**	2.3138	*TURNAVG*	0.0021	1.5291
RQ	0.0002**	2.2307	*RQ*	1.67E–05*	1.7386
ENFORCE	0.0011*	1.9160	*ENFORCE*	0.0015**	2.0284
Industry and year eff.	Yes/yes		Industry and year eff.	Yes/yes	
Adj. R^2	34.3856%		Adj. R^2	37.1312%	
Sample size	N = 1,013		Sample size	N = 1,013	
Firm count	N = 186		Firm count	N = 186	

Notes: This table presents the estimation results of IR disclosure quality on earnings manipulation and goodwill impairment drivers. In Panel A, the dependent variable is *IR*, which is the IR disclosure score index. In Panel B, the dependent variable is *IR_R* is the alternative IR disclosure score index based on Demmer et al. (2019). *IMPAIR* is goodwill impairment divided by lagged total assets. *DAC* is discretionary accruals. It is estimated by the Jones (1991) model. *DAC* are the residuals that are derived from the estimation of the accruals equation (DeFond and Subramanyam, 1998; Bartov et al., 2001; Kothari et al., 2005; Garza-Gomez et al., 2006). *PREPOST* is a dummy variable that takes 1 for firm years of IR implementation, and 0 for firm years of non-IR implementation. *GWDS* is the goodwill impairment disclosure score index. *GWDS_R* is an alternative goodwill impairment disclosure score index, which is based on Street and Gray (2002) and Amiraslani et al. (2013). *ROA*(*t* – 1) is the ratio of net income before interest and taxes to total assets at the end of fiscal year *t* – 1. *LEV*(*t* – 1) is a proxy for leverage equal to total liabilities to total assets at the end of fiscal year *t* – 1. *SIZE* is the natural logarithm of total assets at the end of fiscal year. *MBV* is market to book value of equity. *SPREAD* is ask minus bid price scaled by average ask plus bid price. *GW/TA* is the ratio of goodwill to total assets. *CAPITN* is calculated as gross property, plant and equipment, scaled by total assets. *TURNAVG* is the level of liquidity measured by the average daily share turnover. Regulatory quality (*RQ*) reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Estimate of governance [ranges from approximately –2.5 (weak) to 2.5 (strong) governance performance]. Public enforcement index (*ENFORCE*). Index of the effectiveness of law enforcement of investor protection through sanctions such as fines and prison terms. Higher values indicate better enforcement (Djankov et al., 2008). Z-statistics reported in parentheses are based on standard errors corrected for heteroskedasticity and clustered by firm. The extreme values of all continuous variables are winsorised at the 1 and 99 percentiles. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively (two-tailed).

Table 8 Credit rating index and downgrade

Panel A – equation (5)			*Panel B – equation (7)*			*Panel C – equation (8)*			*Panel D – equation (9)*		
Variable	*Coefficients*	*Z-stat.*	*Variable*	*Coefficients*	*Z-stat.*	*Variable*	*Coefficients*	*Z-stat.*	*Variable*	*Coefficients*	*Z-stat.*
Intercept	0.2258***	3.1921	Intercept	0.1188***	3.6188	Intercept	0.2181***	3.2208	Intercept	0.2712***	2.8378
PREPOST	0.0037***	3.4475	*PREPOST*	0.5983***	3.5062	*PREPOST*	–0.1231**	–2.3497	*PREPOST*	0.0472**	2.4286
IR	0.0492***	2.6733	Δln(1 + *IR*)	0.2693*	1.9840	*IR*	–0.0906***	–3.2814	*IR*	0.5921***	3.0147
GWDS	0.2618***	4.8116	Δln(1 + *GWDS*)	1.0313***	2.8303	*GWDS*	–0.6420***	–2.8443	*GWDS*	0.4970***	3.1997
*GWDS * PREPOST*	0.0039***	3.0769	Δln(1 + *GWDS*) * *PREPOST*	1.1963***	3.3094	*GWDS * PREPOST*	–0.0999*	–1.6847	*GWDS * IR*	0.0457***	3.6663
IMPAIR	–0.4294***	–3.1131	Δ*IMPAIR*	–0.0024***	–3.2845	*IMPAIR*	2.0974***	3.4165	*IMPAIR*	–0.2378**	–2.4530
ROA(*t* – 1)	0.0002	1.5460	Δ*ROA*	0.0005	2.9797	*ROA*(*t* – 1)	–0.0006**	–2.2922	*IR * IMPAIR*	1.0773***	3.0493
LEV(*t* – 1)	–7.97E–05**	–2.0829	Δ*LEV*	–0.0004	–0.7887	*LEV*(*t* – 1)	0.0010***	3.3196	*GWDS * IMPAIR*	0.0393***	2.9993
SIZE	–0.0013*	–1.8342	Δln(1 + *SIZE*)	–0.4906*	–1.7137	*SIZE*	–0.0116***	–3.8548	*ROA*(*t* – 1)	0.0306**	2.5353
MBV	0.0002	0.3384	Δ*MBV*	0.0021***	3.2399	*MBV*	–0.0080***	–2.8057	*LEV*(*t* – 1)	–0.0010*	–1.8253
SPREAD	0.1217***	2.6283	Δ*SPREAD*	0.0595***	3.0037	*SPREAD*	0.1268	0.8948	*SIZE*	0.0041	0.9810

Notes: In Panels A and D, the dependent variable is *CR*, which is a credit rating index. In Panel B, the dependent variable is Δln(1 + *CR*) is measured as the natural log of one plus the credit rating index for firm *i* in quarter *t* minus the natural log of one plus the credit rating index for firm i measured in the same fiscal quarter in the prior year. In Panel C, the dependent variable *DOWNGRADE* is an indicator variable that takes 1 if a firm experiences a broad credit rating downgrade or a one-notch downgrade from prior year, 0 otherwise. *IMPAIR* is goodwill impairment divided by lagged total assets. *PREPOST* is a dummy variable that takes 1 for firm years of IR implementation, and 0 for firm years of non-IR implementation. *GWDS* is the goodwill impairment disclosure score index. *ROA*(*t* – 1) is the ratio of net income before interest and taxes to total assets at the end of fiscal year *t* – 1. *LEV*(*t* – 1) is a proxy for leverage equal to total liabilities to total assets at the end of fiscal year *t* – 1. *SIZE* is the natural logarithm of total assets at the end of fiscal year. *MBV* is market to book value of equity. *SPREAD* is ask minus bid price scaled by average ask plus bid price. *GW*/*TA* is the ratio of goodwill to total assets. *ALTMAN* captures the default risk and is measured using Altman's (1993) Z-score. Δln(1 + *IR*) is measured as the natural log of one plus the IR disclosure score index for firm *i* in quarter *t* minus the natural log of one plus the IR disclosure score index for firm *i* measured in the same fiscal quarter in the prior year. Δ(1 + *GWDS*) is measured as the natural log of one plus the goodwill impairment disclosure score index for firm *i* in quarter *t* minus the natural log of one plus the goodwill impairment disclosure score index for firm *i* measured in the same fiscal quarter in the prior year. Δ*IMPAIR* is measured as goodwill impairment divided by lagged total assets for firm *i* in quarter *t* minus the goodwill impairment divided by lagged total assets for firm *i* measured in the same fiscal quarter in the prior year. Δ*ROA* is measured as the ratio of net income before interest and taxes to total assets for firm *i* in quarter *t* minus the ratio of net income before interest and taxes to total assets for firm *i* measured in the same fiscal quarter in the prior year. Δ*LEV* is measured as the ratio of total liabilities to total assets for firm *i* in quarter *t* minus the total liabilities to total assets for firm *i* measured in the same fiscal quarter in the prior year. Δln(1 + *SIZE*) is measured as the natural log of one plus total assets for firm *i* in quarter *t* minus the natural log of one plus total assets for firm *i* measured in the same fiscal quarter in the prior year. Δ*MBV* is measured as the market to book value of equity for firm *i* in quarter *t* minus the market to book value of equity for firm *i* measured in the same fiscal quarter in the prior year. Δ*SPREAD* is measured as ask minus bid price scaled by average ask plus bid price for firm *i* in quarter *t* minus the ask minus bid price scaled by average ask plus bid price for firm *i* measured in the same fiscal quarter in the prior year. Δ(*GW*/*TA*) is measured as goodwill to total assets for firm *i* in quarter *t* minus the goodwill to total assets for firm *i* measured in the same fiscal quarter in the prior year. Δ*ALTMAN* is measured as Altman's (1993) Z-score for firm *i* in quarter *t* minus the Altman's (1993) Z-score for firm *i* measured in the same fiscal quarter in the prior year. Δ*CAPINT* is measured as the ratio of gross property, plant and equipment, scaled by total assets for firm *i* in quarter *t* minus the ratio of gross property, plant and equipment, scaled by total assets for firm *i* measured in the same fiscal quarter in the prior year. Δ*TURNAVG* is measured as the average daily share turnover for firm *i* in quarter *t* minus the average daily share turnover for firm *i* measured in the same fiscal quarter in the prior year. Δ*RQ* is measured as the regulatory quality for firm *i* in quarter *t* minus the regulatory quality for firm *i* measured in the same fiscal quarter in the prior year. Δ*ENFORCE* is measured as the public enforcement index for firm *i* in quarter *t* minus the public enforcement index for firm *i* measured in the same fiscal quarter in the prior year. Z-statistics reported in parentheses are based on standard errors corrected for heteroskedasticity and clustered by firm. The extreme values of all continuous variables are winsorised at the 1 and 99 percentiles. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively (two-tailed). In Panel B, to facilitate interpretation, we standardise all variables by year-quarter to have a mean of zero and standard deviation one. When a variable is interacted with *PREPOST*, we standardise the variable and then interact it with *PREPOST*.

Table 8 Credit rating index and downgrade (continued)

Panel A – equation (5)			*Panel B – equation (7)*			*Panel C – equation (8)*			*Panel D – equation (9)*		
Variable	*Coefficients*	*Z -stat.*	*Variable*	*Coefficients*	*Z -stat.*	*Variable*	*Coefficients*	*Z -stat.*	*Variable*	*Coefficients*	*Z -stat.*
GW/TA	0.4218***	3.1194	Δ(*GW/TA*)	0.2183**	2.3888	*GW/TA*	–0.0009***	–4.2836	*MBV*	0.0005	1.2972
ALTMAN	0.0005	0.5727	Δ*ALTMAN*	0.0004***	3.4128	*ALTMAN*	–2.02E–05***	–5.2649	*SPREAD*	0.6071	1.4688
CAPINT	–0.0121**	–2.3885	Δ*CAPINT*	0.0001	0.4097	*CAPINT*	–0.0151**	–2.3015	*GW/TA*	0.0016**	2.1095
TURNAVG	0.0013***	2.6421	Δ*TURNAVG*	0.0414***	3.2363	*TURNAVG*	–0.0061	–1.6298	*CAPINT*	0.0239	1.3106
RQ	1.24E–05**	–2.0904	Δ*RQ*	4.53E–05	1.2227	*RQ*	6.66E–05***	3.0588	*TURNAVG*	0.0009	1.0763
ENFORCE	0.0086*	–1.7142	Δ*ENFORCE*	0.0384***	3.5989	*ENFORCE*	0.0384**	2.6498	*RQ*	1.75E–05*	1.7454
									ENFORCE	0.0023**	2.0431
Ind. and year eff.	Yes/yes		Ind. and year eff.	Yes/yes		Ind. and year eff.	Yes/yes		Ind. and year eff.	Yes/yes	
Adj. R^2	36.8023%		Adj. R^2	16.0493%		Adj. R^2	25.8505%		Adj. R^2	29.1540%	
Sample size	N = 1,043		Sample size	N = 1,378		Sample size	N = 1,080		Sample size	N = 1,084	
Firm count	N = 189		Firm count	N = 224		Firm count	N = 194		Firm count	N = 194	

Notes: In Panels A and D, the dependent variable is *CR*, which is a credit rating index. In Panel B, the dependent variable is Δln(1 + *CR*) is measured as the natural log of one plus the credit rating index for firm *i* in quarter *t* minus the natural log of one plus the credit rating index for firm i measured in the same fiscal quarter in the prior year. In Panel C, the dependent variable *DOWNGRADE* is an indicator variable that takes 1 if a firm experiences a broad credit rating downgrade or a one-notch downgrade from prior year, 0 otherwise. *IMPAIR* is goodwill impairment divided by lagged total assets. *PREPOST* is a dummy variable that takes 1 for firm years of IR implementation, and 0 for firm years of non-IR implementation. *GWDS* is the goodwill impairment disclosure score index. *ROA*(t – 1) is the ratio of net income before interest and taxes to total assets at the end of fiscal year t – 1. *LEV*(t – 1) is a proxy for leverage equal to total liabilities to total assets at the end of fiscal year t – 1. *SIZE* is the natural logarithm of total assets at the end of fiscal year. *MBV* is market to book value of equity. *SPREAD* is ask minus bid price scaled by average ask plus bid price. *GW/TA* is the ratio of goodwill to total assets. *ALTMAN* captures the default risk and is measured using Altman's (1993) Z-score. Δln(1 + *IR*) is measured as the natural log of one plus the IR disclosure score index for firm *i* in quarter *t* minus the natural log of one plus the IR disclosure score index for firm *i* measured in the same fiscal quarter in the prior year. Δ(1 + *GWDS*) is measured as the natural log of one plus the goodwill impairment disclosure score index for firm *i* in quarter *t* minus the natural log of one plus the goodwill impairment disclosure score index for firm *i* measured in the same fiscal quarter in the prior year. Δ*IMPAIR* is measured as goodwill impairment divided by lagged total assets for firm *i* in quarter *t* minus the goodwill impairment divided by lagged total assets for firm *i* measured in the same fiscal quarter in the prior year. Δ*ROA* is measured as the ratio of net income before interest and taxes to total assets for firm *i* in quarter *t* minus the ratio of net income before interest and taxes to total assets for firm *i* measured in the same fiscal quarter in the prior year. Δ*LEV* is measured as the ratio of total liabilities to total assets for firm *i* in quarter *t* minus the total liabilities to total assets for firm *i* measured in the same fiscal quarter in the prior year. Δln(1 + *SIZE*) is measured as the natural log of one plus total assets for firm *i* in quarter *t* minus the natural log of one plus total assets for firm *i* measured in the same fiscal quarter in the prior year. Δ*MBV* is measured as the market to book value of equity for firm *i* in quarter *t* minus the market to book value of equity for firm *i* measured in the same fiscal quarter in the prior year. Δ*SPREAD* is measured as ask minus bid price scaled by average ask plus bid price for firm *i* in quarter *t* minus the ask minus bid price scaled by average ask plus bid price for firm *i* measured in the same fiscal quarter in the prior year. Δ(*GW/TA*) is measured as goodwill to total assets for firm *i* in quarter *t* minus the goodwill to total assets for firm *i* measured in the same fiscal quarter in the prior year. Δ*ALTMAN* is measured as Altman's (1993) Z-score for firm *i* in quarter *t* minus the Altman's (1993). Z-score for firm *i* measured in the same fiscal quarter in the prior year. Δ*CAPINT* is measured as the ratio of gross property, plant and equipment, scaled by total assets for firm *i* in quarter *t* minus the ratio of gross property, plant and equipment, scaled by total assets for firm *i* measured in the same fiscal quarter in the prior year. Δ*TURNAVG* is measured as the average daily share turnover for firm *i* in quarter *t* minus the average daily share turnover for firm *i* measured in the same fiscal quarter in the prior year. Δ*RQ* is measured as the regulatory quality for firm *i* in quarter *t* minus the regulatory quality for firm *i* measured in the same fiscal quarter in the prior year. Δ*ENFORCE* is measured as the public enforcement index for firm *i* in quarter *t* minus the public enforcement index for firm *i* measured in the same fiscal quarter in the prior year. Z-statistics reported in parentheses are based on standard errors corrected for heteroskedasticity and clustered by firm. The extreme values of all continuous variables are winsorised at the 1 and 99 percentiles. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively (two-tailed). In Panel B, to facilitate interpretation, we standardise all variables by year-quarter to have a mean of zero and standard deviation one. When a variable is interacted with *PREPOST*, we standardise the variable and then interact it with *PREPOST*.

Table 9 Robust analysis – credit rating index and downgrade

Panel A – equation (5)			*Panel B – equation (7)*			*Panel C – equation (8)*			*Panel D – equation (9)*		
Variable	*Coefficients*	*Z-stat.*	*Variable*	*Coefficients*	*Z-stat.*	*Variable*	*Coefficients*	*Z-stat.*	*Variable*	*Coefficients*	*Z-stat.*
Intercept	0.16434***	3.1800	Intercept	0.1031***	3.1507	Intercept	0.2165***	2.7053	Intercept	0.2600***	2.7535
PREPOST	0.0271***	3.7806	*PREPOST*	0.4935***	3.1481	*PREPOST*	–0.3698***	–3.5134	*PREPOST*	0.1429***	2.9370
IR_R	0.04517**	2.1044	Δln(1 + *IR_R*)	0.1996**	2.3560	*IR_R*	–0.2235***	–3.4733	*IR_R*	0.5541***	3.0352
GWDS_R	0.8174***	3.3799	Δln(1 + *GWDS_R*)	1.0047***	2.9099	*GWDS_R*	–1.0105***	–2.9952	*GWDS_R*	0.4741***	3.2890
GWDS_R * *PREPOST*	0.0211**	2.4257	Δln(1 + *GWDS_R*) * *PREPOST*	1.1118***	3.6883	*GWDS_R* * *PREPOST*	–0.4669***	–3.3825	*GWDS_R* * *IR_R*	0.0922***	2.7670
IMPAIR	–0.7979***	–2.6389	Δ*IMPAIR*	–0.0081***	–3.0413	*IMPAIR*	0.0039***	–2.5873	*IMPAIR*	–0.1148*	–1.6774
ROA(–1)	0.0003*	1.9291	Δ*ROA*	0.0004***	3.3599	*ROA*(–1)	–0.0026**	–3.4084	*IR_R* * *IMPAIR*	0.5267***	2.9346
LEV(–1)	–0.0002***	–2.8887	Δ*LEV*	–0.0040*	–1.7574	*LEV*(–1)	0.0018***	3.6188	*GWDS_R* * *IMPAIR*	0.6064***	3.0276
SIZE	0.0048	0.8602	Δln(1 + *SIZE*)	–0.1901	1.5531	*SIZE*	–0.0482***	–2.7971	*ROA*(–1)	0.1539***	2.5917
MBV	0.0076*	1.7349	Δ*MBV*	0.0019	3.1413	*MBV*	–0.0491***	–3.1409	*LEV*(–1)	–7.82E–05	–1.0524
SPREAD	0.1138***	3.6422	Δ*SPREAD*	0.0712**	2.0716	*SPREAD*	–0.2266	–0.7653	*SIZE*	–0.0037***	–3.4355

Notes: In Panels A and D, the dependent variable is *CR_R*, which is an alternative credit rating index based on Brown et al. (2015). In Panel B, the dependent variable is Δln(1 + *CR_R*) is measured as the natural log of one plus the alternative credit rating index for firm *i* in quarter *t* minus the natural log of one plus the alternative credit rating index for firm *i* measured in the same fiscal quarter in the prior year. In Panel C, the dependent variable *DOWNGRADE* is an indicator variable that takes 1 if a firm experiences a broad bond rating downgrade or a one-notch downgrade from prior year, 0 otherwise. *IMPAIR* is goodwill impairment divided by lagged total assets. *PREPOST* is a dummy variable that takes 1 for firm years of IR implementation, and 0 for firm years of non-IR implementation. *IR_R* is the alternative IR disclosure score index based on Demmer et al. (2019). *GWDS_R* is an alternative goodwill impairment disclosure score index, which is based on Street and Gray (2002) and Amiraslani et al. (2013). *ROA*(–1) is the ratio of net income before interest and taxes to total assets at the end of fiscal year *t* – 1. *LEV*(–1) is a proxy for leverage equal to total liabilities to total assets at the end of fiscal year *t* – 1. *SIZE* is the natural logarithm of total assets at the end of fiscal year. *MBV* is market to book value of equity. *SPREAD* is ask minus bid price scaled by average ask plus bid price. *GW/TA* is the ratio of goodwill to total assets. *ALTMAN* captures the default risk and is measured using Altman's (1993) Z-score. Δln(1 + *IR_R*) is measured as the natural log of one plus the alternative IR disclosure score index for firm *i* in quarter *t* minus the natural log of one plus the alternative IR disclosure score index for firm *i* measured in the same fiscal quarter in the prior year. Δ(1 + *GWDS_R*) is measured as the natural log of one plus the alternative goodwill impairment disclosure score index for firm *i* in quarter *t* minus the natural log of one plus the alternative goodwill impairment disclosure score index for firm *i* measured in the same fiscal quarter in the prior year. Δ*IMPAIR* is measured as the goodwill impairment divided by lagged total assets for firm *i* in quarter *t* minus the goodwill impairment divided by lagged total assets for firm *i* measured in the same fiscal quarter in the prior year. Δ*ROA* is measured as the ratio of net income before interest and taxes to total assets for firm *i* in quarter *t* minus the ratio of net income before interest and taxes to total assets for firm *i* measured in the same fiscal quarter in the prior year. Δ*LEV* is measured as the ratio of total liabilities to total assets for firm *i* in quarter *t* minus the total liabilities to total assets for firm *i* measured in the same fiscal quarter in the prior year. Δln(1 + *SIZE*) is measured as the natural log of one plus total assets for firm *i* in quarter *t* minus the natural log of one plus total assets for firm *i* measured in the same fiscal quarter in the prior year. Δ*MBV* is measured as the market to book value of equity for firm *i* in quarter *t* minus the market to book value of equity for firm *i* measured in the same fiscal quarter in the prior year. Δ*SPREAD* is measured as ask minus bid price scaled by average ask plus bid price for firm *i* in quarter *t* minus the ask minus bid price scaled by average ask plus bid price for firm *i* measured in the same fiscal quarter in the prior year. Δ(*GW/TA*) is measured as goodwill to total assets for firm *i* in quarter *t* minus the goodwill to total assets for firm *i* measured in the same fiscal quarter in the prior year. Δ*ALTMAN* is measured as Altman's (1993) Z-score for firm *i* in quarter *t* minus the Altman's (1993) Z-score for firm *i* measured in the same fiscal quarter in the prior year. Δ*CAPINT* is measured as the ratio of gross property, plant and equipment, scaled by total assets for firm *i* in quarter *t* minus the ratio of gross property, plant and equipment, scaled by total assets for firm *i* measured in the same fiscal quarter in the prior year. Δ*TURNAVG* is measured as the average daily share turnover for firm *i* in quarter *t* minus the average daily share turnover for firm *i* measured in the same fiscal quarter in the prior year. Δ*RQ* is measured as the regulatory quality for firm *i* in quarter *t* minus the regulatory quality for firm *i* measured in the same fiscal quarter in the prior year. Δ*ENFORCE* is measured as the public enforcement index for firm *i* in quarter *t* minus the public enforcement index for firm *i* measured in the same fiscal quarter in the prior year. Z-statistics reported in parentheses are based on standard errors corrected for heteroskedasticity and clustered by firm. The extreme values of all continuous variables are winsorised at the 1 and 99 percentiles. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively (two-tailed). In Panel B, to facilitate interpretation, we standardise all variables by year-quarter to have a mean of zero and standard deviation one. When a variable is interacted with *PREPOST*, we standardise the variable and then interact it with *PREPOST*.

Table 9 Robust analysis – credit rating index and downgrade (continued)

Panel A – equation (5)			*Panel B – equation (7)*			*Panel C – equation (8)*			*Panel D – equation (9)*		
Variable	*Coefficients*	*Z-stat.*	*Variable*	*Coefficients*	*Z-stat.*	*Variable*	*Coefficients*	*Z-stat.*	*Variable*	*Coefficients*	*Z-stat.*
GW/TA	0.0005*	1.7611	Δ(*GW/TA*)	–0.0712**	–2.0782	*GW/TA*	0.0003	0.5404	*MBV*	0.0023*	0.5048
ALTMAN	–5.89E–05	0.1097	Δ*ALTMAN*	2.10E–05***	2.8621	*ALTMAN*	–3.62E–05***	–3.1412	*SPREAD*	0.8458	1.3079
CAPINT	0.0052	1.0151	Δ*CAPINT*	0.0322*	1.7620	*CAPINT*	–0.0577***	–3.1876	*GW/TA*	0.0065***	3.2644
TURNAVG	–0.0029*	–1.8762	Δ*TURNAVG*	0.0291***	2.8417	*TURNAVG*	–0.0194	–1.4092	*CAPINT*	0.1444***	2.8731
RQ	–2.41E–05	1.0131	Δ*RQ*	0.0001***	3.0331	*RQ*	0.0036	–1.0597	*TURNAVG*	0.0529	1.5140
ENFORCE	0.0012**	2.0057	Δ*ENFORCE*	0.0385***	2.9540	*ENFORCE*	0.0948**	2.5622	*RQ*	0.0001*	1.7493
									ENFORCE	0.2632*	1.8937
Ind. and year eff.	Yes/yes		Ind. and year eff.	Yes/yes		Ind. and year eff.	Yes/yes		Ind. and year eff.	Yes/yes	
Adj. R^2	24.3724%		Pseudo R^2	20.2985%		Pseudo R^2	26.4496%		Adj. R^2	31.3480%	
Sample size	N = 1,043		Sample size	N = 1,413		Sample size	N = 1,080		Sample size	N = 1,000	
Firm count	N = 189		Firm count	N = 231		Firm count	N = 194		Firm count	N = 183	

Notes: In Panels A and D, the dependent variable is *CR_R*, which is an alternative credit rating index based on Brown et al. (2015). In Panel B, the dependent variable is Δln(1 + *CR_R*) is measured as the natural log of one plus the alternative credit rating index for firm *i* in quarter *t* minus the natural log of one plus the alternative credit rating index for firm *i* measured in the same fiscal quarter in the prior year. In Panel C, the dependent variable *DOWNGRADE* is an indicator variable that takes 1 if a firm experiences a broad bond rating downgrade or a one-notch downgrade from prior year, 0 otherwise. *IMPAIR* is goodwill impairment divided by lagged total assets. *PREPOST* is a dummy variable that takes 1 for firm years of IR implementation, and 0 for firm years of non-IR implementation. *IR_R* is the alternative IR disclosure score index based on Demmer et al. (2019). *GWDS_R* is an alternative goodwill impairment disclosure score index, which is based on Street and Gray (2002) and Amiraslani et al. (2013). *ROA*(–1) is the ratio of net income before interest and taxes to total assets at the end of fiscal year *t* – 1. *LEV*(–1) is a proxy for leverage equal to total liabilities to total assets at the end of fiscal year *t* – 1. *SIZE* is the natural logarithm of total assets at the end of fiscal year. *MBV* is market to book value of equity. *SPREAD* is ask minus bid price scaled by average ask plus bid price. *GW/TA* is the ratio of goodwill to total assets. *ALTMAN* captures the default risk and is measured using Altman's (1993) Z-score. Δln(1 + *IR_R*) is measured as the natural log of one plus the alternative IR disclosure score index for firm *i* in quarter *t* minus the natural log of one plus the alternative IR disclosure score index for firm *i* measured in the same fiscal quarter in the prior year. Δ(1 + *GWDS_R*) is measured as the natural log of one plus the alternative goodwill impairment disclosure score index for firm *i* in quarter *t* minus the natural log of one plus the alternative goodwill impairment disclosure score index for firm *i* measured in the same fiscal quarter in the prior year. Δ*IMPAIR* is measured as the goodwill impairment divided by lagged total assets for firm *i* in quarter *t* minus the goodwill impairment divided by lagged total assets for firm *i* measured in the same fiscal quarter in the prior year. Δ*ROA* is measured as the ratio of net income before interest and taxes to total assets for firm *i* in quarter *t* minus the ratio of net income before interest and taxes to total assets for firm *i* measured in the same fiscal quarter in the prior year. Δ*LEV* is measured as the ratio of total liabilities to total assets for firm *i* in quarter *t* minus the total liabilities to total assets for firm *i* measured in the same fiscal quarter in the prior year. Δln(1 + *SIZE*) is measured as the natural log of one plus total assets for firm *i* in quarter *t* minus the natural log of one plus total assets for firm *i* measured in the same fiscal quarter in the prior year. Δ*MBV* is measured as the market to book value of equity for firm *i* in quarter *t* minus the market to book value of equity for firm *i* measured in the same fiscal quarter in the prior year. Δ*SPREAD* is measured as ask minus bid price scaled by average ask plus bid price for firm *i* in quarter *t* minus the ask minus bid price scaled by average ask plus bid price for firm *i* measured in the same fiscal quarter in the prior year. Δ(*GW/TA*) is measured as goodwill to total assets for firm *i* in quarter *t* minus the goodwill to total assets for firm *i* measured in the same fiscal quarter in the prior year. Δ*ALTMAN* is measured as Altman's (1993) Z-score for firm *i* in quarter *t* minus the Altman's (1993) Z-score for firm *i* measured in the same fiscal quarter in the prior year. Δ*CAPINT* is measured as the ratio of gross property, plant and equipment, scaled by total assets for firm *i* in quarter *t* minus the ratio of gross property, plant and equipment, scaled by total assets for firm *i* measured in the same fiscal quarter in the prior year. Δ*TURNAVG* is measured as the average daily share turnover for firm *i* in quarter *t* minus the average daily share turnover for firm *i* measured in the same fiscal quarter in the prior year. Δ*RQ* is measured as the regulatory quality for firm *i* in quarter *t* minus the regulatory quality for firm *i* measured in the same fiscal quarter in the prior year. Δ*ENFORCE* is measured as the public enforcement index for firm *i* in quarter *t* minus the public enforcement index for firm *i* measured in the same fiscal quarter in the prior year. Z-statistics reported in parentheses are based on standard errors corrected for heteroskedasticity and clustered by firm. The extreme values of all continuous variables are winsorised at the 1 and 99 percentiles. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively (two-tailed). In Panel B, to facilitate interpretation, we standardise all variables by year-quarter to have a mean of zero and standard deviation one. When a variable is interacted with *PREPOST*, we standardise the variable and then interact it with *PREPOST*.

4.4 IR compliance and earnings manipulation

The literature suggests that the informativeness of goodwill impairment that stems from IR compliance can reduce earnings manipulation (Jo and Kim, 2007; Lobo and Zhou, 2001).

Panel A of Table 7 [equation (4)] confirms H_3, and suggests that IR compliance is likely to decrease earnings manipulation and increase the quality of goodwill impairment disclosure, even in the presence of goodwill impairment. *DAC* and *IMPAIR* × *DAC* have negative coefficients. Moreover, *GWDS* and *IMPAIR* × *GWDS* are positively related to IR compliance. The findings suggest that, even in the presence of goodwill impairment, a high level of IR compliance is associated with lower earnings manipulation and higher goodwill impairment disclosure quality. Companies with higher disclosure quality engage in less earnings manipulation and have less information asymmetry (Lobo and Zhou, 2001; Jo and Kim, 2007; Han et al., 2020; Obeng et al., 2020).

In line with Demmer et al. (2019), Panel B of Table 7 estimates equation (4) using *IR_R* as the dependent variable in a Tobit regression model. The findings of the robust analysis confirm H_3. *DAC* and *IMPAIR* × *DAC* have negative coefficients. *GWDS* and *IMPAIR* × *GWDS* are positively related to *IR_R*. Our results agree with previous studies (e.g., Frias-Aceituno et al., 2014; Garcia-Sanchez and Noguera-Gamez, 2017; Lee and Yeo, 2016), suggesting that the decision to prepare an integrated report decreases information asymmetry and leads to less earnings manipulation (Pavlopoulos et al., 2017; Obeng et al., 2020) and higher stock liquidity (Barth et al., 2017).

4.5 Goodwill impairment and credit ratings

Panel A of Table 8 presents the results of equation (5), confirming H_{4a}, i.e. that IR compliance and goodwill impairment disclosure quality increase credit ratings. *IR*, *GWDS* and *GWDS* × *PREPOST* have positive coefficients. Our results are aligned with Chan et al. (2013) and are consistent with the agency theory. When firms decide to provide a high level of IR and high goodwill impairment disclosure quality, and therefore reliable financial and non-financial information, this can improve their creditability, even in the presence of goodwill impairment losses.

As a robustness check of equation (5), we estimate it again using *CR_R* as the dependent variable. We also use the above-mentioned *GWDS_R* and *IR_R* variables. The results are presented in Panel A of Table 9 and confirm H_{4a}. *IR*, *GWDS* and *GWDS* × *PREPOST* are again found to have positive coefficients. The interpretation power of the results remains the same as in the initial equation and supports our inference that the high level of financial and non-financial information that derives from the high levels of IR and goodwill impairment disclosure quality helps investors to better evaluate firms' creditworthiness and associated risks.

Moreover, our results are robust to two alternative model specifications, which are estimated using equations (7) and (8). We illustrate the results of these two equations in Panels B and C, respectively. Equation (7) is based on Jorion and Zhang (2007) and equation (8) on Kisgen (2006). Again, H_{4a} is confirmed. In Panel B of Table 8, we present the results for the relationship between the IR disclosure score index, $\Delta\ln(1 + IR)$, the GWDS index, $\Delta\ln(1 + GWDS)$, and the interaction term between the dummy for the firm-year of IR implementation and the GWDS index, $\Delta\ln(1 + GWDS) \times PREPOST$, and the credit rating, $\Delta\ln(1 + CR)$. We observe again that, when we broaden our investigation

to include companies that have already adopted IR, our results show that the informativeness of IR compliance and goodwill impairment disclosure quality have a positive impact on creditworthiness. Panel B of Table 9 illustrates that, in the robustness check, the coefficients of $\Delta\ln(1 + IR\_R)$, $\Delta\ln(1 + GWDS\_R)$ and $\Delta\ln(1 + GWDS\_R) \times PREPOST$ are significant and positive just as in the results from the basic equation (7) in Table 8.

In Panel C of Table 8, we implement an additional test, using equation (5) but considering credit rating downgrade as the dependent variable. *IR*, *GWDS* and *GWDS* × *PREPOST* are all negatively related to credit rating downgrades. Our results imply that firms with credit rating downgrades are likely to display less IR compliance and lower quality in their goodwill impairment disclosures. In contrast, they are expected to exhibit greater goodwill impairment losses. The evidence suggests that our results are stronger when a firm experiences a broad credit rating change, consistent with prior research (Kisgen, 2006; Sun and Zhang, 2017). Panel C of Table 9 reports negative coefficients on *IR_R*, *GWDS_R* and *GWDS_R* × *PREPOST* with respect to the credit rating downgrade variable. The results of the robustness check shown in Panel C of Table 9 are aligned to those of the basic equation (8) shown in Panel C of Table 8.

Panel D of Table 8 presents the findings of equation (9), confirming H_{4b}, i.e., that goodwill impairment losses are not likely to affect credit ratings negatively for firms with high IR compliance and goodwill impairment disclosure quality. *IR* × *IMPAIR* and *GWDS* × *IMPAIR* are positively related to credit ratings. In an environment with greater IR compliance, goodwill impairment disclosure information is more sufficient, allowing analysts to capture reliable information and organise evaluations more effectively (Han et al., 2020). The transparency provided by higher goodwill impairment disclosure quality and IR compliance may also increase the efficiency of external market forces that discipline managerial behaviour and thus reinforce firm creditability. For example, IR may allow for healthy market competition (e.g., Alchian, 1950; Stigler, 1958), and permit market participants to exert more pressure on managers.

Panel D of Table 9 illustrates the findings of the robustness check of equation (9), confirming H_{4b}, i.e., that goodwill impairment losses are not likely to affect credit ratings negatively for firms with high IR compliance and goodwill impairment disclosure quality. *IR_R* × *IMPAIR* and *GWDS_R* × *IMPAIR* are positively related to credit ratings. Our evidence suggests that credit rating agencies use information about goodwill impairment losses when assessing firms' creditworthiness.

5 Conclusions

This study examines the effect of goodwill impairment disclosure quality and IR compliance on earnings manipulation and credit ratings. First, we argue that firms with goodwill impairment losses are likely to use earnings manipulation and display lower IR compliance and lower goodwill impairment disclosure quality. We suggest that managers use goodwill impairment as an earnings manipulation tool in order to improve their key financial numbers, and report that impairment is low when earnings manipulation is present.

Second, we test the impact of managerial discretion regarding goodwill impairment on the decision of the company to publish voluntary information related to IR. We claim that companies are likely to voluntarily adopt IR when goodwill impairment is low and

goodwill impairment disclosure quality is high. This study highlights that the voluntary implementation of IR gives companies the ability to publish integrated reports when both their financial and non-financial positions are good. This combined with the discretion regarding the timing and/or amount of reported goodwill impairment, means that the resulting goodwill impairment disclosure is unlikely to be informative (Amiraslani et al., 2013).

Finally, when we broaden our investigation to companies that have already adopted IR, we find that high levels of IR compliance are likely to decrease earnings manipulation and increase the quality of goodwill impairment disclosure, even in the presence of goodwill impairment (Baboukardos and Rimmel, 2016; Bernardi and Stark, 2018). Moreover, this study suggests that IR implementation, either voluntary or mandatory, and the disclosure of goodwill impairment losses, lead to higher credit ratings. Our study supports the need for firms to disclose goodwill impairment losses in order to reduce information asymmetry and uncertainty.

A central contribution of this study is that it highlights the effectiveness of IR with respect to financial reporting quality and credit ratings even in the light of bad news. Thus, this study improves stakeholders' understanding of the benefits of IR adoption and its role in creating value. This study has several practical implications. Our findings show that managers' voluntary IR disclosure decisions are influenced not only by their financial performance but also by their self-defined objectives. Given the hardship in verifying and confirming the validity of goodwill impairment, a high level of goodwill impairment disclosure and IR compliance can increase the informativeness of financial statements, discouraging earnings manipulation. We believe that our results are relevant for enforcement agencies, regulators, credit rating agencies, auditors and investors, regarding the implementation and potential shortcomings of the current goodwill impairment testing regime in relation to IR. The examination of the potentially opportunistic use of goodwill impairment as an earnings manipulation tool suggests that standard setters should continue conversations on improving the impairment approach. This study also suggests that firms should opt to be transparent and to disclose high-quality accounting information, as this can lead to improved decision making, positive credit ratings and positive market valuations.

Appendices/Supplementary materials are available on request by emailing the corresponding author.

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Notes

1 An integrated report is "a concise communication about how an organization's strategy, governance, performance and prospects, in the context of its external environment, lead to the creation of value over the short, medium and long term" [International Integrated Reporting Council, (2013), p.7].

2 The detailed IR compliance checklist is presented in Table A1 in Appendix.

3 The detailed goodwill impairment checklist is presented in Table A2 in Appendix.

4 The S&P classification of credit ratings and bond rating conversion is presented in Table A3 in Appendix.

5 The credit rating clusters are presented in Table A3 in Appendix.