

# Bankruptcy in the UK: Do Managers Talk the Talk Before Walking the Walk?

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**This study examines whether managers employ annual report textual disclosures as a conduit to communicate the probability of future corporate bankruptcy or to intentionally mislead stakeholders owing to impression management incentives. We conduct various examinations around the information content of the tone conveyed by textual disclosures in unstructured UK annual reports and the probability of corporate bankruptcy. We document that firms that communicate a more net positive tone are associated with lower bankruptcy risk. Importantly, this association is found to be stronger for firms whose managers have a lower incentive to mislead investors owing to better board monitoring, stringent stock market regulation, and Big 4 audits. We also offer complementary evidence that firms conveying a more net positive tone exhibit higher future performance and earnings persistence, and lower future performance volatility. These firms are also less likely to exhibit extreme corporate policies and to receive a qualified auditor's opinion. Overall, this study sheds light on whether managers tend to inform or misinform (bury their heads in the sand) about corporate bankruptcy.**

'It was a genuine case of déjà vu when Flybe cancelled all its flights and went into administration.'

Nick Trend (2023), *The Telegraph*

## Introduction

In recent years, the UK's reputation as a world-leading destination for investment has been undermined by sudden large-scale company collapses, which have unprecedented impacts on employees, taxpayers, and the Government. UK company insolvencies rose by a fifth to hit a 13-year high by the end of 2022 (Anghel, 2022). 'Heads in the sand' market participants blame corporate managers and directors and argue that 'a company that recognises the need for advice and support at an early stage will have a wider range of options available to it and a much better prospect of avoiding insolvency' (Alberti, 2022). Considering public concern in the UK about the usefulness of corporate disclosures in signalling the probability of bankruptcy, this paper investigates whether the corporate disclosure tone predicts corporate bankruptcy.

Loughran and McDonald (2016, p. 1188) pose an important question regarding whether 'textual artifacts provide an additional attribute that predicts bankruptcies'. Textual disclosures, which could contain value-relevant incremental information, receive less attention.<sup>1</sup> In practice, J.P. Morgan, a \$3.7 trillion global leader in financial services, has invested in a system that can detect positive and negative tones of corporate transcripts in order to convey worrying signals to its managers (Wigglesworth, 2018). Given the growing interest in the informativeness of corporate textual disclosures, this study aims to investigate whether the soft information embedded in UK firms' unstructured annual reports matters in assessing firm financial solvency.

The literature on textual disclosures focuses predominantly on highly regulated and structured disclosures

<sup>1</sup>Altman and Hotchkiss (2006, pp. 237–238) highlight the importance of qualitative information and argue that 'almost all of the statistical credit scoring models ... involve the combination of a set of quantifiable financial indicators of firm performance ... mainly financial ratios and capital market values, one should not underestimate the importance of qualitative measures in the process'.

(e.g., the US 10-K filings). Mayew, Sethuraman and Venkatachalam (2015) document that the tone of the Management Discussion and Analysis (MD&A) section in the 10-K filings can predict the bankruptcy risk of US firms. However, the information content of the disclosures in unstructured and less regulated annual reports is under-researched. In the first large-sample analysis of the disclosure attributes of unstructured annual reports of non-US firms in 42 countries, Lang and Stice-Lawrence (2015) document that textual disclosure is associated with greater stock liquidity, institutional ownership, and analyst coverage. The extent to which corporate disclosure can predict bankruptcy largely depends on managerial incentives. In particular, managers may use disclosures to either inform or intentionally misinform investors (Healy and Palepu, 2001; Merkl-Davies and Brennan, 2007). It is documented that tone reduces information asymmetry (Davis, Piger and Sedor, 2012; Kothari, Li and Short, 2009; Lang and Lundholm, 2000), but tone can also be used to manage investors' impressions (Davis and Tama-Sweet, 2012; Huang *et al.*, 2014; Illia, Sonpar and Bauer, 2014).

Therefore, we argue that the narratives in UK annual reports could include, in particular, incremental information indicating a firm's future financial health. In contrast, if managers use these narratives to strategically manipulate outsiders' impressions about a firm's prospects, the information embedded in the narratives would be misleading and a noisy indicator of future solvency. Accordingly, whether corporate disclosure tone can predict bankruptcy is an empirical question. Furthermore, it is also worth investigating whether such predictability depends on managerial incentives to engage in impression management.

In the UK, the tone conveyed by textual disclosures can communicate incremental information content regarding corporate bankruptcy, and thus our empirical analyses for UK annual reports advance the literature, for several reasons. UK company and securities laws allow much greater discretion over both the content and the format of firms' annual reports than the US Securities and Exchange Commission (SEC) rules (Athanasakou *et al.*, 2020; Clatworthy and Jones, 2003). Indeed, there is substantial heterogeneity in the content and structure of UK annual report narratives across firms (FRC, 2012). Therefore, managers of UK companies are expected to employ annual report textual disclosures as a channel for conveying messages about their firm's health, especially because the UK's outlets of corporate communication are less rich than those of the United States (Elsayed, Elshandidy and Ahmed, 2023). Furthermore, UK firms are exposed to less shareholder litigation risk than their US counterparts (Seetharaman, Gul and Lynn, 2002). Besides, UK companies are managed under a less severe law enforcement compared with the enforcement applied to

US companies (Muñoz-Izquierdo, Segovia-Vargas and Pascual-Ezama, 2019). That is, managers of UK firms are more likely to release greater information content (or alternatively engage in impression management) because they are less likely to be concerned about litigation exposure and regulatory sanctions, which affects their disclosure tones differently compared with the situation in the United States (Elsayed, Elshandidy and Ahmed, 2023). Prior research indicates that UK companies are managed under a corporate governance regime that has fundamental differences from that prevailing in the United States. In the UK, a principles-based approach is employed, giving managers more flexibility to frame narrative disclosures than in the United States, where the rules-based approach is applied, and the UK's insolvency law is creditor-friendly compared with the United State's Chapter 11 debtor-friendly code (e.g. Elsayed, Elshandidy and Ahmed, 2022, 2023; Yekini, Wisniewski and Millo, 2016).<sup>2</sup>

Thus, considering public concern in the UK about the association between managers' disclosure in the annual report narratives and the possibility of bankruptcy, as well as the above differences between the context in the UK and the United States, it seems reasonable to see the novelty of contribution provided by our paper as an expansion of the US-based literature in the area of textual disclosures and corporate bankruptcy. We focus on a particular linguistic attribute, namely net positive tone, defined as the difference between frequencies of positive and negative words divided by the total number of positive and negative words (e.g. Huang *et al.*, 2014; Henry and Leone, 2016). To this end, we utilize Loughran and McDonald's (2011) wordlist to measure the net positive tone because of the validity and reliability it shows in the UK context (e.g. Yekini, Wisniewski and Millo, 2016; Bassyouny and Abdelfattah, 2022). To gain in-depth insights, we examine the predictive ability of the net positive tone in the entire annual report, as well as the key narrative sections, including the Chairman's Statement, Performance Commentary, and Business Review Section. This advances the literature by giving comprehensive evidence-based insights into the credibility of tone communicated by the unstructured textual disclosures in the UK annual reports in corporate bankruptcy prediction.

To examine empirically whether disclosure tone is useful to predict corporate bankruptcy, we use a wide range of direct and indirect bankruptcy measures as dependent variables. The dependent variable in our main analysis is the actual corporate bankruptcy, a dummy variable that takes the value of one if a firm goes bankrupt in the next fiscal year and zero otherwise. The empirical results show that a more net

<sup>2</sup>Please refer to Online Appendix A.1 for further details on bankruptcy in the UK setting.

positive tone is associated with a lower probability of bankruptcy in the next 1–3 years. The tone of various narrative sections of the annual reports, namely the Chairman's Statement, Performance Commentary, and Business Review Section, all exhibit significant incremental predictive power over an extensive list of firm fundamentals. These results suggest that firms that convey a more net positive tone in their annual report narratives are less likely to face bankruptcy 1–3 years ahead.

Next, we conduct cross-sectional analyses to compare the predictive power of tone across subsamples of firms with high versus low managerial incentives to engage in impression management. Managerial incentives for impression management are heterogeneous and could be curbed by a range of internal and external factors. Specifically, impression management incentives tend to be weaker with a more independent board (Armstrong, Core and Guay, 2014), stronger stock market regulations (i.e. the Main Market relative to the Alternative Investment Market, AIM) (Gerakos, Lang and Maffett, 2013), and Big 4 audits (Francis and Wang, 2008; Guillamón-Saorín et al., 2016). These factors can, therefore, moderate the tone of management in the annual report narratives. We find that tone can better predict bankruptcy for firms with a more independent board of directors, listed in the Main Market relative to the AIM, and audited by the Big 4 audit firms. These results imply that the predictive power of tone is stronger for firms whose managers are less likely to be involved in impression management (i.e. who have lower incentives) to intentionally mislead investors.

Our main results are highly robust to alternative dependent variables capturing the probability of the firm being financially distressed, as indicated by the Z-score (Altman, 1968) and O-score (Ohlson, 1980). We find consistent evidence that firms with a more net positive tone are significantly less likely to be in financial distress and are thus much less likely to go bankrupt in the near future. We support our analysis by examining the predictability of tone in relation to corporate bankruptcy from a different angle, specifically by investigating the association between tone and firm future performance, corporate policies, and the possibility of receiving a qualified auditor's opinion. We find that a higher net positive tone is associated with higher future performance and earnings persistence, and with a lower volatility of future stock returns and earnings. We further show that firms conveying a higher net positive tone are less likely to exhibit extreme corporate policies and receive a qualified auditor's opinion. Overall, our results are highly robust to various direct and indirect measures of corporate insolvency and the inclusion of an extensive list of controls.

Our results are strikingly robust and speak directly to stakeholders: managers do not bury their heads in the

sand; rather, the tone conveyed by textual disclosures informs of the possibility of corporate bankruptcy. Importantly, regulators, auditors, and investors can incorporate the results of our paper in models of early warning systems that can help identify companies that are beginning to experience turbulence in order to avoid sudden, tragic, and costly collapses. Our results further contribute to the literature in several ways. We contribute to the ongoing debate that revolves around the question of whether textual disclosure is a channel for incremental information content or managerial attempts to carry out impression management (Merkl-Davies, Brennan and McLeay, 2011). Specifically, we provide novel evidence suggesting that the tone of the textual disclosures in UK annual reports contains incremental information indicative of firm future bankruptcy, especially when the managerial incentives for impression management are low.

We contribute to the growing literature on the information content of corporate disclosure tone. For example, our study complements the study of Mayew, Sethuraman and Venkatachalam (2015) concerning the predictive ability of the tone of highly regulated and structured disclosures (i.e. the MD&A sections of the US 10-K filings), and of Elshandidy (2020) concerning corporate failure terms. In this, our findings shed light on an important issue in the corporate disclosure literature related to 'management motives for making a voluntary disclosure and their credibility' (Healy and Palepu, 2001, p. 420). Our study indicates that while, on average, the tone of the textual disclosures in the UK annual reports is informative, this informativeness varies across firms owing to managerial incentives for impression management.

In addition, we add to the literature on the disclosure attributes of unstructured annual reports (e.g., Smith and Taffler, 2000; Lang and Stice-Lawrence, 2015), which often focuses on the information content of a single section (e.g. the Chairman's Statement) or of the annual report as a whole. We provide new evidence that the tone of the main sections of UK annual reports is informative and moves largely in the same vein as the aggregate tone of the entire report. Specifically, we document consistent inferences from textual analysis of the Chairman's Statement, Performance Commentary, Business Review Section, and all verbal sections in the annual report.

We contribute to the longstanding literature on bankruptcy prediction by suggesting that not only accounting numbers but also 'words have power'<sup>3</sup>: disclosure tone has significant incremental predictive

<sup>3</sup>The quote was once said by poet, playwright, and activist Maya Angelou.

power over a wide range of quantitative firm fundamentals. This finding supports the premises of Loughran and McDonald (2016) and Li (2010b) that a linguistic analysis of corporate disclosures may be useful for bankruptcy prediction. Thus, bankruptcy prediction models should incorporate text-based information derived from various narrative components of annual reports. Overall, this study confirms the importance of ‘hardening (quantifying) soft information’ (Liberti and Petersen, 2019) in the highly discretionary and unstructured corporate disclosures in predicting corporate bankruptcy.

The paper proceeds as follows. The following section reviews the corporate disclosure tone literature and develops the hypotheses. This is followed by a description of the sample, key variables, empirical models, and summary statistics. The next section presents the main results on tone and bankruptcy risk and examines the cross-sectional heterogeneity in the predictive power of tone. Complementary evidence is then provided, before the conclusions are given in the final section.<sup>4</sup>

## Related literature and hypotheses

### *Prior studies on corporate disclosure tone*

A growing literature in accounting and finance focuses on the implications of the linguistic tone (i.e. the use of positive and negative words) of various types of corporate disclosures (e.g. annual report/10-K filings, MD&As, earnings conference calls, earnings press releases).<sup>5</sup> Although there is increasing evidence to suggest that corporate disclosure tone is associated with corporate decisions and outcomes, the existing literature focuses predominantly on the tone of highly structured and regulated corporate disclosures in the United States, where the environment is different in many aspects relative to other jurisdictions such as the UK, as noted earlier.<sup>6</sup>

<sup>4</sup>The online appendix attached to this paper gives further analyses and robustness checks.

<sup>5</sup>Previous studies focus on various types of textual information: MD&As in the 10-K (e.g. Davis and Tama-Sweet, 2012; Feldman et al., 2010; Huang et al., 2014; Li, 2010a), earnings press releases (e.g. Davis et al., 2012; Henry, 2008; Henry and Leone, 2016; Hilary et al., 2016; Huang et al., 2014), earnings conference calls (e.g. Blau et al., 2015; Davis et al., 2015; Larcker and Zakolyukina, 2012; Price et al., 2012), and the 10-K (Ahmed and Elshandidy, 2016).

<sup>6</sup>For example, disclosure tone has significant impacts on the cost of capital and analyst forecasts (Kothari et al., 2009), firm performance (Andreou, Harris and Philip, 2020), and market pricing (e.g. Davis, Piger and Sedor, 2012; Feldman et al., 2010; Henry, 2008; Huang et al., 2014; Li, 2010a). In addition, disclosure tone is also related to earnings quality (Li, 2010a), financial misreporting (Larcker and Zakolyukina, 2012), shareholder litigation (Rogers, Buskirk and Zechman, 2011), and financing decisions (Ataullah et al., 2018; Vivian and Xu, 2018).

Despite the importance of corporate disclosures, there has been a limited examination of the information content of the tone of unstructured and discretionary disclosures in corporate annual reports, particularly in the UK setting, which is characterized by numerous high-profile bankruptcies and marked differences from the United States (as previously discussed). This study fills this void in the literature by examining the predictive power of the tone in corporate bankruptcy. To gain an in-depth understanding of the possible relationship between tone and corporate bankruptcy, we review the literature regarding two main perspectives of tone: incremental information versus impression management.

*Incremental information.* Disclosure tone could contain incremental information that reduces the information asymmetry between managers and outside investors. In an early review of the corporate disclosure literature, Healy and Palepu (2001, p. 420) point out that ‘even in an efficient capital market, managers have superior information to outside investors on their firms’ expected future performance’. Lang and Lundholm (2000) investigate corporate voluntary disclosure around the seasoned equity offerings and the market reaction, and find that firms with a consistent level of disclosure experience less negative abnormal returns at the announcement date. This evidence suggests that voluntary disclosure reduces information costs associated with equity offerings. Kothari, Li and Short (2009) provide further evidence that disclosures can mitigate information asymmetry. They find that positive management disclosure is negatively associated with both the cost of equity and return volatility.

On the other hand, Tetlock, Saar-Tsechansky and Macskassy (2008) examine the information content of firm-specific news stories and document that negative words in the news can predict firms’ earnings and stock returns. They find that negative words are associated with lower future earnings for the firm, and that investors also incorporate negative tone into stock prices. Tetlock, Saar-Tsechansky and Macskassy (2008, p. 1438) argue that ‘quantifying language provides novel information about firms’ earnings and returns’. This important conclusion could be generalized to the information content of corporate disclosures. Indeed, several studies (Li, 2010a; Feldman et al., 2010) suggest that textual information in the MD&As can predict a firm’s future performance, which is perhaps not surprising considering that MD&As are heavily regulated.

Furthermore, Davis, Piger and Sedor (2012) examine the information content of earnings press releases. They argue that language in the earnings press releases is used by managers to signal the expected future performance of their firm. Consistent with this proposition, they find that optimistic language in earnings press



releases is associated with significantly higher future returns on assets and also generates a positive market reaction. These findings support the view that managers' optimistic language conveys credible information about expected future performance to outside investors. Thus, the literature suggests that the tone of certain types of corporate disclosures can reduce information asymmetry and inform investors about certain firm fundamentals.

Yet research on disclosure tone and bankruptcy is limited, particularly in the UK (Keasey and Watson, 1991). Arguably, textual disclosures can provide useful content in relation to corporate bankruptcy. For example, Cecchini *et al.* (2010) use computational linguistics tools to create dictionaries of keywords that can predict bankruptcy, based on the MD&As of the US 10-K reports. Similarly, Shirata and Sakagami (2008) employ text mining to a limited sample (44 observations) from Japan and conclude that annual reports may contain meaningful information on a company's solvency prospects. Boo and Simnett (2002) employ a limited sample (140 observations) of Australian public firms and suggest that the information content of management's prospective comments is useful for assessing the future viability. Tennyson, Ingram and Dugan (1990) examine the president's letters and the management analysis in a limited sample (46 observations) of 10-Ks to identify various themes (e.g. internal operations, growth and expansion) and link them to bankrupt and non-bankrupt firms. Still in the United States, prior research suggests that textual disclosures are an official channel for managers to reduce litigation exposure if a firm goes bankrupt (Holder-Webb and Cohen, 2007; Hanley and Hoberg, 2012). Gandhi, Loughran and McDonald (2019) show a link between disclosure tone and the probability of firm delisting from a US exchange (NYSE, Amex, or Nasdaq). Using a sample of limited German companies, Lohmann and Ohliger (2020) suggest that the structural and linguistic characteristics of annual reports provide valuable information to predict the prospect of financially distressed firms. Owing to some limitations in their analysis, they call for future research to conduct investigations into bankruptcy, particularly while considering the managerial incentives to (mis)inform the investors.

Although the above studies suggest that textual disclosures can provide useful content in relation to corporate bankruptcy, they suffer from some inherent problems (e.g. small sample sizes, focusing on only a few industries, and subjectivity bias owing to employing manual content analysis) that prevent generalizability. Inferences from machine learning studies are also problematic, because we cannot disentangle and understand the effect of the explanatory variable of interest, and they are always viewed as a 'black box procedure' because little is known about the rules and filters used to analyse

the contexts of documents (Loughran and McDonald, 2016). As indicated earlier, much of the existing literature focuses on the United States, a setting that is different from the UK in terms of bankruptcy approach and textual disclosure regulation. Moreover, unlike our paper, these studies focus on the information content of a single section and, thus, offer limited evidence, as Dyer, Lang and Stice-Lawrence (2017) document that textual disclosure on risk factors is not confined to a single section of the annual report but spreads and interweaves across all the sections. Overall, particularly in the UK setting, our paper is important to complement these studies because it is imperative to provide direct evidence on incremental information conveyed by the tone of different sections in UK annual report narratives and corporate bankruptcy. It also responds to calls by prior research (e.g., Lohmann and Ohliger, 2020) to consider managerial incentives while investigating corporate bankruptcy, which leads us to the following discussion.

*Impression management.* Disclosure tone could be driven by managerial incentives for impression management (i.e. managerial opportunism) and consequently misinform investors about firm future performance. In the presence of agency conflicts between managers and investors, self-interested managers have the incentive to engage in opportunistic disclosure choices and biased reporting in order to maximize their personal wealth (Merkl-Davies and Brennan, 2007; Huang *et al.*, 2014). Huang *et al.* (2014) provide comprehensive evidence that managers engage in tone management to strategically and intentionally manage investors' perception of firm performance. They define tone management as 'the choice of the tone level in the qualitative text that is incommensurate with the concurrent quantitative information' (Huang *et al.*, 2014, p. 1083). Tone management can be considered a specific form of impression management, and it has been observed in several empirical studies. Specifically, Huang *et al.* (2014) document that the tone of earnings press releases becomes more positive when firms issue new equity or conduct mergers and acquisitions, and more negative when granting stock options. These observed managers' attempts to hype the stock before major corporate events reflect managerial incentives to strategically manage the impression of outside investors.

Davis and Tama-Sweet (2012) examine managers' disclosure choices across two alternative outlets (i.e. earnings press releases vs. MD&As). Given that the market usually processes the information in earnings press releases more efficiently than that in the 10-K filings (e.g. Stice, 1991; Levi, 2008) and thus reacts more to the earnings press releases, managers have the incentive to strategically manipulate the language, especially in earnings press releases. Consistent with this conjecture,

they document that managers do engage in strategic reporting and that the levels of optimistic (pessimistic) language are higher (lower) in earnings press releases relative to MD&As. On the other hand, they find that pessimistic language in the MD&As is associated with lower future earnings, suggesting that the MD&As contain incremental information to the language in the earnings press releases. These findings suggest that whether corporate disclosures inform or misinform investors also partly depends on the type of disclosure. For example, Clatworthy and Jones (2003) find systematic patterns in the Chairman's Statements that can be attributable to impression management. Moreover, Allee and Deangelis (2015) find that managers deliberately change tone dispersion (i.e. how positive and negative words are spread out in conference calls) to manage the impression of investors.

To sum up, the literature provides mixed evidence on the information content of the tone of various types of corporate disclosures in the United States (e.g. MD&As, earnings press releases, earnings conference calls) and suggests that managers may have both an incentive to provide credible information and reduce information asymmetry, and an incentive to provide misleading information and engage in impression management.

Importantly, it should be noted that the information content of tone may well depend on the *type* of disclosure and on the *institutional environment* within which the disclosures are produced. This study thus aims to make an important contribution to the corporate disclosure literature by examining the information content of the tone of an underexplored type of disclosure: the narrative sections in UK annual reports. Given that the textual disclosures in UK annual reports are subject to, *inter alia*, substantially lower litigation risk (relative to US corporate disclosures), the informativeness of this type of disclosure is of particular interest to the users of annual reports and regulators.

### Hypotheses

The extant corporate disclosure literature suggests that the predictive power of tone largely depends on whether tone communicates incremental information or reflects impression management incentives. Healy and Palepu (2001, p. 420) posit that '*managers trade-off between making accounting decisions and disclosures to communicate their superior knowledge of firm's performance to investors, and to manage reported performance for contracting, political or corporate governance reasons*'. Specifically, if the disclosure tone conveys incremental soft information, above and beyond that captured by the firm's accounting numbers, a more net positive tone is likely to reduce information asymmetry and thus signal that the firm is less subject to bankruptcy risk. In contrast, if self-interested managers have the incen-

tive to manage outsiders' impressions by strategically manipulating the tone, a more net positive tone is less likely to be related to the firm's financial solvency.

In brief, disclosure tone could reflect managers' private information about firm fundamentals or managerial incentives for impression management, and thus disclosure tone can either inform or misinform investors about the firm's future performance (Huang *et al.*, 2014). Consistent with our aforementioned discussion (in the section 'Incremental information'), if the tone is used to inform investors and reduce information asymmetry, we would expect that a more net positive tone is associated with a lower probability of corporate bankruptcy. We thus form our first testable hypothesis:

H1: More net positive tone is associated with a lower probability of bankruptcy.

However, the informativeness of tone would depend on the extent to which managers engage in tone management (e.g. Davis and Tama-Sweet, 2012; Huang *et al.*, 2014). If the tone is driven by the managers' incentive of impression management (i.e. hyping), a tone would be a noisy predictor of or fail to predict corporate bankruptcy. This particular incentive problem with corporate disclosure has long been recognized. For example, Frost (1997) finds that the voluntary disclosures made by managers of financially distressed UK firms are overly optimistic, while the stock market discounts the positive disclosure tone of these firms. Indeed, both the incentive to reduce information asymmetry and the incentive to manage impression could co-exist (Huang *et al.*, 2014), and it is thus an empirical question regarding which incentive dominates.

It could be argued that the disclosure tone of some firms is more informative than that of others, and the relationship between tone and corporate bankruptcy, as described in H1, can be heterogeneous across firms. Specifically, consistent with our aforementioned discussion (in the section 'Impression management'), the stronger the managerial incentives for impression management, the weaker the ability of tone to predict corporate bankruptcy. We thus hypothesize that the predictive power of tone depends on the extent to which tone is strategically inflated to manipulate investors' impressions:

H2: The predictive power of tone is stronger for firms with a lower managerial incentive to engage in impression management.

### Data, variables, and statistics

To test whether the tone of UK textual disclosure predicts corporate bankruptcy, we first obtain the UK

Annual Report Narrative Disclosure Scores (including, for example, tone and length of various narrative components of the annual report) developed in the Corporate Financial Information Environment (CFIE) project.<sup>7</sup> We then merge this disclosure scores data with the firm financial and accounting data from the Refinitiv Eikon Worldscope and Datastream. We further merge the date of death and death-type information from the London Share Price Database (LSPD). We keep firm-year observations with non-missing tone measures and several firm characteristics, including firm size, leverage, liquidity, profitability, market-to-book, dividend, cash, firm age, and insider ownership. We also construct a board independence measure and a past M&A intensity measure using the BoardEx and Thompson One Banker databases, respectively. We winsorize all continuous variables at the 1% and 99% levels to mitigate the influence of extreme values. The final sample consists of 1,424 UK-listed firms and about 6,900 observations over the period 2003–2014.<sup>viii</sup>

To examine the incremental information content of disclosure tone in predicting bankruptcy, following previous studies (e.g. Mayew, Sethuraman and Venkatachalam, 2015), we estimate a discrete-time logit model using maximum-likelihood methods as follows.<sup>9</sup>

$$\Pr(\text{Bankruptcy}_{it+1}) = \alpha + \beta \text{Tone}_{it} + \Omega \mathbf{X}_{it} + \epsilon_{it}, \quad (1)$$

where  $\text{Bankruptcy}_{it+1}$  is the key dependent variable that takes the value of one if a firm goes bankrupt, as reported in the LSPD database, in year  $t + 1$ , and zero otherwise. Specifically, similar to previous studies on UK firms' bankruptcy (e.g. Agarwal and Taffler, 2008),  $\text{Bankruptcy}_{it+1}$  takes the value of one if the LSPD death type is liquidation/voluntary liquidation, a receiver appointed, in administration/administrative receivership, or cancelled assumed valueless, and zero otherwise.<sup>10</sup>

<sup>7</sup>We are very grateful to the CFIE project team for generously sharing the UK Annual Report Narrative Disclosure Scores dataset. See El-Haj *et al.* (2020) for more details on how the tone of various sections of UK annual reports is constructed.

<sup>viii</sup>The CFIE data are available until 2017. We, however, end our sample in 2014 because we predict bankruptcy in the year ahead. This is important to avoid the effect of a set of unusual confounding events (e.g. Brexit events) that took place in the UK in 2016 and onwards. This is also important to avoid measurement error endogeneity bias resulting from atypical bankruptcy incidents (please refer to Elsayed, Elshandidy and Ahmed, 2022 for more details).

<sup>9</sup>Our results are robust to the use of two alternative logistic estimators, namely the random effects (RE) logit and population averaged (PA) logit models.

<sup>10</sup>All firms presented by LSPD died regardless of the death type. Thus, the practice of prior research is to set one for the bankruptcy dummy variable if the firm sits in any of the categories defined by LSPD database. We also traced the bankrupted firms and confirmed their death. In line with prior research (e.g., Shumway, 2001), this implies that data on

We provide complementary evidence by examining the relationship between tone and the probability of being financially distressed. We use two well-established accounting-based financial distress indicators as alternative dependent variables, namely  $Z\text{-Score\_Distress}$  and  $O\text{-Score\_Distress}$ .  $Z\text{-Score\_Distress}$  is a dummy variable that is equal to one if the Altman (1968) Z-score is below 1.81 and zero otherwise (Sudarsanam and Lai, 2001).  $O\text{-Score\_Distress}$  is a dummy variable that is equal to one if the Ohlson (1980) O-score is above 0.5 and zero otherwise. In the robustness tests (reported in Online Appendix A.6), we use additional financial distress measures based on the Piotroski (2000) financial strength measure (i.e. F-score) and the interest coverage (Asquith, Gertner and Scharfstein, 1994), respectively.

The main variable of interest in examining the predictive ability is  $\text{Tone}_{it}$ . Following the prior literature (e.g. Huang *et al.*, 2014; Henry and Leone, 2016), the tone variable is constructed as the net positive tone, calculated as the difference between the numbers of positive and negative words divided by the total number of positive and negative words.<sup>11</sup> These calculations are based on the wordlists developed by Loughran and McDonald (2011) specifically for the analysis of corporate disclosures. The variety of narrative disclosures available in UK annual reports allows us to examine the predictive power of the tone of various narrative components. Our key tone measures are  $\text{Tone\_All}$ ,  $\text{Tone\_Chair}$ ,  $\text{Tone\_Perform}$ , and  $\text{Tone\_Review}$ . These tone measures are constructed based on different parts or combinations of the narrative sections of the annual report, namely All Sections, Chairman's Statement, Performance Commentary, and Business Review Section, respectively.

We further examine the predictive ability of lagged tone measures from years  $t - 1$  and  $t - 2$  to predict corporate bankruptcy and financial distress in year  $t + 1$ . If managers use tone to genuinely inform investors about a firm's prospects and convey bankruptcy probability, we expect the coefficient on net positive tone to be significantly negative in our tests. However, if the tone is driven by managers' incentives to manipulate investors' impressions, we do not expect to find significant predictive power.

$\mathbf{X}_{it}$  is a vector of control variables. Following Loughran and McDonald (2014), we control for disclosure length ( $\text{Length}$ ) as a proxy for the complexity of the disclosure. Financially distressed firms may make their narrative sections lengthier and more com-

bankrupted firms are available and used up to the bankruptcy event.

<sup>11</sup>Similarly, Davis, Piger and Sedor (2012) use net positive tone as a measure of the net signal about managers' expected future performance.

plex so that it is more difficult for investors to process the information. *Length* is the natural logarithm of the number of words for certain annual report sections based on which the tone measure is constructed. We also control for a wide range of firm characteristics that might be associated with financial distress. In addition to leverage, liquidity, and profitability, which have been used as controls in previous studies (Zmijewski, 1984; Shumway, 2001), we further control for firm size, market-to-book, dividend, cash, firm age, and insider ownership.<sup>12</sup>

Panel A of Table 1 presents the summary statistics of the key dependent and independent variables. The mean of *Bankruptcy* is 0.014. Among the tone measures, *Tone\_All* has an average of 0.138 and a standard deviation of 0.152, while *Tone\_CEO* and *Tone\_Chair* have relatively higher averages (0.401 and 0.374), and *Tone\_Chair* has the highest standard deviation (0.217). The averages of firm size and firm age are 11.098 and 2.915, respectively, suggesting that our sample is reasonably representative of UK-listed firms.

Panel B of Table 1 presents the correlations between bankruptcy (financial distress) and tone measures. The correlations between *Bankruptcy* and several financial distress indicators (e.g. *Z\_Score\_Distress*, *O\_Score\_Distress*, *Int\_Cov\_DistressI*) are around 0.1, suggesting that these accounting number-based distress measures are far from flawless. The tone measures are negatively associated with bankruptcy and financial distress measures. The correlations among four tone measures are high, ranging from 0.64 to 0.92. The correlations between *Tone\_Chair* and other tone measures (*Tone\_Perform*, *Tone\_Review*) are relatively low (around 0.65), indicating that the Chairman's Statements may contain some distinctive information content. The correlations between all the tone measures and the bankruptcy and financial distress measures are negative. *Tone\_Chair* has the most significant negative correlations with all financial distress measures.<sup>13</sup>

Panel C of Table 1 reports the results of the univariate analysis of the tone of firm-years with and without bankruptcy, respectively. Column (1) indicates whether

the comparison is based on the full sample (i.e. Unmatched) or the matched sample (i.e. Matched). To construct the matched sample, we conduct propensity score matching on all the control variables in the baseline model in Table 2 and industry and year dummies. For each firm-year with bankruptcy, we identify a matched firm-year without bankruptcy based on a one-to-one nearest neighbour matching with a calliper of 0.01. Columns (2) and (3) show the average tone of firm-years with bankruptcy (*Bankruptcy* = 1) and of those without bankruptcy (*Bankruptcy* = 0), respectively. Column (4) shows the differences between these two columns. We find that the average tone of firm-years with bankruptcy is statistically significantly lower, indicating a negative relationship between tone and the likelihood of corporate bankruptcy.

## Disclosure tone and corporate bankruptcy

### *Disclosure tone and bankruptcy prediction*

Table 2 presents our main regression results on the ability of the tone of various narrative sections of the annual reports to predict bankruptcy. Controlling for both year and industry fixed effects, we first run standard logit regression to test tone predictive ability in the year preceding bankruptcy (*Bankruptcy<sub>t+1</sub>*). In Column (1), the coefficient on *Tone\_All* (which captures the sentiment of all the narrative sections in the UK annual reports) is negative and statistically significant at the 1% level. This finding is consistent with *H1*, in that a more net positive tone indicates a lower probability of bankruptcy.

In Columns (2)–(4), we use alternative tone measures that are constructed based on a particular narrative component of the annual reports, namely *Tone\_Chair*, *Tone\_Perform*, and *Tone\_Review*, respectively. Collectively, the coefficients on these tone measures are negative and statistically significant at a 1% level. To compare the predictive ability of all models, we use the receiver operating characteristic (ROC) curve (see e.g. Kim and Skinner, 2012), where the area under the curve measures a model's ability to discriminate. The area under the corresponding ROC curve (AUC) of the logit models in Columns (1)–(4) ranges from 0.849 to 0.860, suggesting an excellent predictive and discriminatory ability of these models.<sup>14</sup>

To better understand the economic magnitude of the impact of *Tone\_All* on the likelihood of bankruptcy,

<sup>12</sup>In addition to the aforementioned main analysis on the relationship between tone and bankruptcy risk, we also provide complementary evidence by replacing the bankruptcy and financial distress measures in Equation (1) with a range of indirect indicators of financial distress. Specifically, we examine the relationship between tone and firm future performance and risk. Some indirect measures (e.g. delisting, dividend, ROA, loan loss provisions) are used to gauge financial distress in Gandhi, Loughran and McDonald's (2019) study on annual report (i.e. 10-K forms) sentiment and the financial distress of US banks.

<sup>13</sup>As discussed in Online Appendix A.2, the transition matrix of tone indicates that our tone measures, especially the tone of Chairman's Statements, are reasonably time-varying.

<sup>14</sup>An AUC of between 0.7 and 0.8 indicates acceptable predictive ability, and an AUC above 0.8 indicates the model's excellent ability to predict bankruptcy (see footnote 27 in Kim and Skinner, 2012).



Table 1. Descriptive statistics and correlations.

Panel A: Summary statistics								
Variable	N	Mean	SD	Min	P25	Median	P75	Max
Bankruptcy	6910	0.014	0.116	0.000	0.000	0.000	0.000	1.000
Z-Score_Distress	6905	0.301	0.459	0.000	0.000	0.000	1.000	1.000
O-Score_Distress	6840	0.096	0.295	0.000	0.000	0.000	0.000	1.000
F-Score_Distress	6561	0.159	0.366	0.000	0.000	0.000	0.000	1.000
Int_Cov_Distress1	5881	0.364	0.481	0.000	0.000	0.000	1.000	1.000
Int_Cov_Distress2	6906	0.326	0.469	0.000	0.000	0.000	1.000	1.000
Tone_All	6910	0.138	0.152	-0.556	0.042	0.142	0.237	0.701
Tone_Chairman	6393	0.374	0.217	-0.216	0.238	0.396	0.532	0.750
Tone_Perform	6218	0.298	0.192	-0.214	0.181	0.318	0.437	0.652
Tone_Review	5687	0.285	0.198	-0.204	0.155	0.301	0.430	0.657
Firm Size	6910	11.098	2.499	4.127	9.533	11.106	12.899	15.994
Leverage	6910	0.179	0.189	0.000	0.012	0.137	0.275	0.961
Liquidity	6910	2.098	2.520	0.172	0.966	1.390	2.101	20.672
Profitability	6910	0.030	0.283	-1.708	0.017	0.096	0.157	0.378
Market-to-Book	6910	1.865	1.608	0.536	1.032	1.381	2.059	11.727
Dividend	6910	0.578	0.494	0.000	0.000	1.000	1.000	1.000
Cash	6910	0.164	0.186	0.000	0.038	0.096	0.216	0.897
Firm Age	6910	2.915	1.037	0.000	2.197	2.833	3.689	4.762
Insider Ownership	6910	0.002	0.008	0.000	0.000	0.000	0.001	0.077

  

Panel B: Correlations										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. Bankruptcy	1.00									
2. Z_Score_Distress	0.10	1.00								
3. O_Score_Distress	0.13	0.28	1.00							
4. F_Score_Distress	0.06	0.22	0.35	1.00						
5. Int_Cov_Distress1	0.10	0.43	0.36	0.36	1.00					
6. Int_Cov_Distress2	0.08	0.35	0.44	0.33	0.60	1.00				
7. Tone_All	-0.06	-0.22	-0.15	-0.18	-0.28	-0.20	1.00			
8. Tone_Chair	-0.09	-0.26	-0.19	-0.24	-0.36	-0.24	0.68	1.00		
9. Tone_Perform	-0.07	-0.24	-0.14	-0.20	-0.29	-0.20	0.81	0.67	1.00	
10. Tone_Review	-0.07	-0.23	-0.11	-0.18	-0.28	-0.18	0.78	0.64	0.92	1.00

  

Panel C: Comparing tone of firm-years with versus without bankruptcy					
	(1) Sample	(2) Bankruptcy = 1	(3) Bankruptcy = 0	(4) Difference	(5) T-stats
Tone_All	Unmatched	0.063	0.141	-0.078***	-4.95
	Matched	0.063	0.111	-0.048**	-2.04
Tone_Chair	Unmatched	0.206	0.377	-0.171***	-7.36
	Matched	0.206	0.326	-0.120***	-3.37
Tone_Perform	Unmatched	0.183	0.303	-0.120***	-5.37
	Matched	0.186	0.256	-0.069**	-1.98
Tone_Review	Unmatched	0.167	0.289	-0.123***	-5.07
	Matched	0.171	0.233	-0.063**	-1.98

This table presents the descriptive statistics of the main dependent and independent variables in Panel A, the correlations among these variables in Panel B, and the univariate analysis of tone of firm-years with versus without bankruptcy in Panel C. The sample consists of 1424 UK-listed firms and 6910 observations over the period 2003–2014. All the variables are defined in Appendix A.

we replace the tone variables with four tone dummies that take the value of one if *Tone\_All*, *Tone\_Chair*, *Tone\_Perform*, and *Tone\_Review*, respectively, is in the top quartile and zero otherwise, and then re-estimate the models in Columns (1)–(4). In untabulated results, we estimate the average marginal effects of these four tone dummies and find that firms with top-quartile *Tone\_All*,

*Tone\_Chair*, *Tone\_Perform*, and *Tone\_Review*, respectively, are 0.89, 2.65, 1.30, and 1.98 percentage points less likely to go bankrupt.<sup>15</sup>

<sup>15</sup>*Tone\_Chair* has the highest statistical and economic significance, partly because *Tone\_Chair* is more time-varying than other tone indices, suggesting that Chairman's Statements are

Table 2. Disclosure tone and bankruptcy prediction.

Dependent Var.	Bankruptcy <sub>t+1</sub>				Bankruptcy <sub>t+2</sub>	Bankruptcy <sub>t+3</sub>
	(1)	(2)	(3)	(4)	(5)	(6)
<b>Tone_All</b>	<b>-1.811***</b> (-2.59)				<b>-1.659**</b> (-1.98)	<b>-2.390**</b> (-2.54)
<b>Tone_Chair</b>		<b>-2.375***</b> (-4.40)				
<b>Tone_Perform</b>			<b>-2.005***</b> (-3.20)			
<b>Tone_Review</b>				<b>-2.102***</b> (-3.27)		
Length_All	-0.217 (-1.16)				-0.276 (-1.12)	-0.329 (-1.29)
Length_Chair		0.066 (0.36)				
Length_Perform			-0.072 (-0.54)			
Length_Review				-0.084 (-0.44)		
Firm Size	-0.054 (-0.71)	-0.078 (-1.20)	-0.021 (-0.29)	-0.038 (-0.48)	-0.010 (-0.11)	-0.035 (-0.37)
Leverage	1.730*** (3.43)	1.439*** (2.74)	1.869*** (3.11)	1.883*** (3.06)	1.747*** (2.83)	1.710*** (2.84)
Liquidity	-0.008 (-0.14)	-0.015 (-0.25)	-0.003 (-0.04)	0.015 (0.21)	0.003 (0.03)	-0.118 (-1.11)
Profitability	-1.358*** (-4.86)	-1.194*** (-3.64)	-1.387*** (-4.38)	-1.380*** (-3.98)	-1.679*** (-5.39)	-1.671*** (-4.41)
Market-to-Book	-0.183** (-2.29)	-0.179** (-2.05)	-0.150 (-1.43)	-0.146 (-1.18)	-0.122 (-1.35)	-0.150 (-1.43)
Dividend	-1.117*** (-3.60)	-1.033*** (-3.32)	-1.508*** (-4.44)	-1.464*** (-4.28)	-0.941** (-2.45)	-1.063*** (-2.61)
Cash	-1.043 (-1.36)	-0.711 (-0.94)	-1.033 (-1.15)	-0.996 (-1.03)	-1.797* (-1.76)	-0.974 (-0.80)
Firm Age	0.015 (0.13)	-0.022 (-0.18)	0.038 (0.30)	0.068 (0.51)	-0.045 (-0.31)	-0.231 (-1.34)
Insider Ownership	-100.573** (-2.53)	-116.574** (-2.20)	-201.572** (-2.06)	-225.250* (-1.94)	-100.615** (-2.02)	-219.443* (-1.79)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
<i>N</i>	6783	6279	6093	5572	4501	3931
pseudo <i>R</i> <sup>2</sup>	0.173	0.188	0.205	0.206	0.182	0.238

This table examines the effects of the tone of various sections of the annual report on the probability of bankruptcy in the future. The dependent variable in all columns is *Bankruptcy<sub>t+1</sub>*, a dummy variable that takes the value of one if a firm's death type is liquidation, voluntary liquidation, a receiver appointed/liquidation, in administration/administrative receivership, or cancelled assumed valueless in the LSPD database in the next fiscal year. The main independent variables are four tone measures, namely *Tone\_All*, *Tone\_Chair*, *Tone\_Perform*, and *Tone\_Review*. We predict bankruptcy in year  $t + 1$  in Columns (1)–(4), and bankruptcy in years  $t + 2$  and  $t + 3$  in Columns (5) and (6), respectively. We run the standard logit regressions in all columns. We control for a large set of firm characteristics, defined in Appendix A. We control for year and industry fixed effects in all columns, denoted as Year FE and Industry FE, respectively. *z*-statistics are reported in parentheses. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% level. An intercept is included but not reported.

In Columns (5)–(6), the dependent variables are *Bankruptcy<sub>t+2</sub>* and *Bankruptcy<sub>t+3</sub>*, indicating whether a firm goes bankrupt in years  $t + 2$  and  $t + 3$ , respectively. We find that *Tone\_All* still has significant predictive power at the 5% level. In untabulated results, we re-estimate the regression in Column (1) using the

penalized maximum likelihood regression proposed by Firth (1993) (henceforth *firthlogit*)<sup>16</sup> and find that the tone measures remain significant. To conclude, both the logit and *firthlogit* regressions show that our tone measures, 1, 2 or 3 years before the bankruptcy, have

relatively less subject to impression management. Similarly, Online Appendix Table A.8 shows that the average marginal effects of the continuous *Tone\_Chair* variable are the largest.

<sup>16</sup>The *firthlogit* estimator (Firth, 1993) can reduce bias, associated with the low prevalence of the outcome variable (i.e. bankruptcy), in maximum likelihood estimation.

significant incremental explanatory power for predicting future bankruptcy.

#### *Cross-sectional heterogeneity in the predictive power of tone*

Table 3 investigates the cross-sectional heterogeneity in the explanatory power of tone for predicting bankruptcy. When managers have less incentive to manipulate investor impressions, they are less likely to inflate tone and thus they increase the predictive ability of tone. Previous research shows that a better firm information environment can reduce impression management (Osma and Guillamón-Saorín, 2011). Therefore, to gain a more comprehensive understanding of the predictive ability of tone, it is important to consider factors related to the firm's information environment that drive managers' incentives to manage impressions.

Accordingly, we examine the moderating effects of three such factors, namely board independence, LSE Main Market listing, and Big 4 audits, on the predictive ability of tone. First, the predictive power of the tone of firms may depend on board independence. It is well documented that independent directors can improve the quality of financial reporting (e.g. Ferreira, Ferreira and Raposo, 2011; Ahmed and Duellman, 2007; Bertoni, Meoli and Vismara, 2023). Osma and Guillamón-Saorín (2011) show that higher board independence is negatively associated with impression management, which is partly captured by disclosure tone. Armstrong, Core and Guay (2014) provide causal evidence that firms facing an exogenous increase in board independence enhance corporate transparency to meet the informational demands of independent directors. They document that higher board independence increases analyst coverage and the frequency and precision of management forecasts, which in turn improves the firm information environment.

Second, we compare the predictive power of the tone of firms listed in the LSE Main Market and the AIM. Gerakos, Lang and Maffett (2013, p. 190) find that the post-listing performance of the AIM firms is worse than that of their counterparts on traditionally regulated exchanges, which is attributed to the fact that 'explicit listing, regulatory, and disclosure requirements on the AIM are limited relative to other major markets'. In addition, Nielsson (2013, p. 335) argues that 'the AIM market attracts small firms that – due to size – face disproportional regulatory costs'. Thus, owing to the higher regulatory and disclosure requirements on firms listed in the Main Market, the information environment of Main Market firms tends to be better.

Third, we compare the predictive power of the tone of firms with Big 4 versus non-Big 4 auditors. Previous studies show that Big 4 audits reduce earnings management (e.g., Becker *et al.*, 1998; Francis and Wang,

2008). It has also been recognized that earnings management and impression management are positively associated, suggesting that firms tend to engage in the manipulation of both accounting numbers and narratives to jointly influence outsiders' perceptions (Guillamón-Saorín *et al.*, 2016). It is plausible that if earnings management is restrained by Big 4 audits, then impression management is also less likely to be triggered. The literature thus suggests that Big 4 audits may improve the quality of firm information disclosures and the information environment.

Taken together, the factors of board independence, Main Market listing, and Big 4 audits are associated with managerial impression management and, thus, are likely to moderate the relationship between corporate tone and bankruptcy. In Table 3, we find that the coefficients on the interaction terms are all negative and statistically significant (except for Column 2 of Panel C and Column 1 of Panel D), suggesting that the predictive ability of our tone measures is stronger for firms with higher board independence (*High Board Independence*), listed in the LSE Main Market (*Main Market*), and audited by Big 4 audit firms (*Big4 Auditor*). These findings are consistent with the argument that tone becomes more informative, and thus more indicative of future bankruptcy, especially when the firms' information environment is better and managerial incentives for impression management are weaker, supporting *H2*.

#### *Disclosure tone and financial distress*

We provide further evidence on the relationship between tone and financial distress risk. Table 4 examines whether a more net positive tone is associated with a lower probability of a firm being financially distressed. The dependent variable is *Z-Score\_Distress<sub>t+1</sub>* in Panel A, a dummy variable that takes the value of one if the Altman (1968) Z-score is below 1.81 and zero otherwise. The dependent variable is *O-Score\_Distress<sub>t+1</sub>* in Panel B, a dummy variable that takes the value of one if the Ohlson (1980) O-score is above 0.5 and zero otherwise. The independent variables in Columns (1) through (4) are *Tone\_All*, *Tone\_Chair*, *Tone\_Perform*, and *Tone\_Review*, respectively. We run the standard logit regressions in all columns with the same control variables as in Table 2. We find that all the tone measures have statistically significant negative impacts on *Z-Score\_Distress<sub>t+1</sub>* at a 1% level. In addition, *Tone\_All*, *Tone\_Chair*, and *Tone\_Perform* also have significant negative impacts on *O-Score\_Distress<sub>t+1</sub>* at the 1% or 10% level. These results are also consistent with the main results in Table 2 and further support our *H1* and suggest that a firm's more net positive tone indicates that the firm is less likely to go bankrupt in the near future.

Table 3. Cross-sectional heterogeneity in the predictive power of tone.

Panel A: Tone_All and Bankruptcy			
Dependent Var.	Bankruptcy <sub>t+1</sub>		
	(1)	(2)	(3)
Tone_All	-1.346** (-2.08)	-0.929 (-1.35)	-0.988 (-1.52)
<b>High Board Independence*Tone_All</b>	<b>-1.401*</b> (-1.73)		
<b>Main Market*Tone_All</b>		<b>-2.167**</b> (-2.48)	
<b>Big4 Auditor*Tone_All</b>			<b>-2.112**</b> (-2.55)
High Board Independence	-0.054 (-0.17)		
Main Market		0.624* (1.94)	
Big4 Auditor			0.654** (2.00)
Controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
<i>N</i>	6378	6783	6768
pseudo <i>R</i> <sup>2</sup>	0.185	0.189	0.189
Panel B: Tone_Chair and Bankruptcy			
	(1)	(2)	(3)
Tone_Chair	-1.511** (-2.14)	-1.365* (-1.90)	-1.128* (-1.66)
<b>High Board Independence*Tone_Chair</b>	<b>-1.571*</b> (-1.84)		
<b>Main Market*Tone_Chair</b>		<b>-2.032**</b> (-2.24)	
<b>Big4 Auditor*Tone_Chair</b>			<b>-2.542***</b> (-2.94)
High Board Independence	0.071 (0.21)		
Main Market		0.440 (1.31)	
Big4 Auditor			0.812** (2.48)
Controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
<i>N</i>	5899	6279	6264
pseudo <i>R</i> <sup>2</sup>	0.189	0.193	0.197
Panel C: Tone_Perform and Bankruptcy			
	(1)	(2)	(3)
Tone_Perform	-1.399* (-1.79)	-1.358* (-1.68)	-0.586 (-0.70)
<b>High Board Independence*Tone_Perform</b>	<b>-1.941*</b> (-1.94)		
<b>Main Market*Tone_Perform</b>		<b>-1.159</b> (-1.10)	
<b>Big4 Auditor*Tone_Perform</b>			<b>-2.420**</b> (-2.27)
High Board Independence	-0.087 (-0.26)		
Main Market		0.406 (1.12)	
Big4 Auditor			0.750** (1.97)



Table 3. (Continued)

Panel C: Tone_Perform and Bankruptcy			
	(1)	(2)	(3)
Controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
<i>N</i>	5625	6093	6084
pseudo <i>R</i> <sup>2</sup>	0.213	0.207	0.211
Panel D: Tone_Review and Bankruptcy			
	(1)	(2)	(3)
Tone_Review	−1.554* (−1.95)	−1.112 (−1.29)	−0.771 (−0.87)
High Board Independence*Tone_Review	−1.305 (−1.27)		
Main Market*Tone_Review		−1.719* (−1.64)	
Big4 Auditor*Tone_Review			−2.155* (−1.95)
High Board Independence	−0.260 (−0.76)		
Main Market		0.392 (1.02)	
Big4 Auditor			0.600 (1.51)
Controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
<i>N</i>	5150	5572	5566
pseudo <i>R</i> <sup>2</sup>	0.209	0.209	0.211

This table examines the cross-sectional heterogeneity in the relationship between tone and the probability of bankruptcy. The key independent variables are *Tone\_All*, *Tone\_Chair*, *Tone\_Perform*, and *Tone\_Review*, respectively, in Panels A–D. We focus on the effects of three moderating factors, related to board independence (*High Board Independence*), stock market (*Main Market*), and auditing (*Big4 Auditor*) on the predictive power of tone in Columns (1)–(3), respectively. *High Board Independence* is a dummy variable that takes the value of one if a firm's board independence is above the sample median, and zero otherwise. *Main Market* is a dummy variable that takes the value of one if a firm is listed on the Main Market, and zero if it is listed on the Alternative Investment Market (AIM). *Big4 Auditor* is a dummy variable that takes the value of one if a firm is audited by the big 4 accounting firms, and zero otherwise. *z*-statistics are reported in parentheses. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% level. An intercept is included but not reported.

## Complementary evidence: tone and firm future performance

To further investigate whether tone communicates reliable information from managers – and to support the main results that a more positive tone is negatively related to bankruptcy risk from a different perspective – we present additional evidence on the relationship between tone and a firm's future performance (which is inversely related to the probability of bankruptcy). Our empirical tests employ three aspects of firm future performance: the level of future performance, earnings persistence, and the volatility of future performance (or firm risk).

### Disclosure tone and firm performance

Table 5 examines whether a more net positive tone indicates a higher firm future performance. We use three

measures of firm performance, namely *Sales Growth* in Columns (1)–(2), *ROA* in Columns (3)–(4), and *Market-to-Book* in Columns (5)–(6). The main independent variable of interest is *Tone\_All* in the odd columns and *Tone\_Chair* in the even columns. We run ordinary least squares (OLS) regressions with both year and industry fixed effects. We find that both *Tone\_All* and *Tone\_Chair* are positively associated with significantly higher *Sales Growth*, *ROA*, and *Market-to-Book* in the next fiscal year. These effects are both statistically and economically significant. For example, in Column (3), the coefficient on *Tone\_All* is 0.217, meaning that a one-standard-deviation increase in *Tone\_All* is associated with a 3.3 percentage-point increase in *ROA* in year  $t + 1$ . The observed positive relationship between tone and firm future performance is consistent with our *HI* because better future performance reduces financial distress risk.

Table 4. Disclosure tone and financial distress.

Panel A: Tone and Z-Score				
Dependent Var.	Z-Score_Distress <sub>t+1</sub>			
	(1)	(2)	(3)	(4)
Tone_All	-2.048*** (-6.40)			
Tone_Chair		-1.844*** (-7.94)		
Tone_Perform			-1.675*** (-6.51)	
Tone_Review				-1.466*** (-5.92)
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
<i>N</i>	4790	4459	4322	4005
pseudo <i>R</i> <sup>2</sup>	0.306	0.301	0.307	0.318
Panel B: Tone and O-Score				
Dependent Var.:	O-Score_Distress <sub>t+1</sub>			
	(1)	(2)	(3)	(4)
Tone_All	-1.480*** (-2.82)			
Tone_Chair		-0.761* (-1.88)		
Tone_Perform			-1.148*** (-2.68)	
Tone_Review				-0.673 (-1.52)
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
<i>N</i>	4702	4380	4235	3922
pseudo <i>R</i> <sup>2</sup>	0.405	0.410	0.424	0.428

This table examines the effects of tone on financial distress. The dependent variable is *Z-Score\_Distress<sub>t+1</sub>* in Panel A. *Z-Score\_Distress<sub>t+1</sub>* is a dummy variable that takes the value of one if *Z-Score* is below 1.81, and zero otherwise. *Z-Score* is calculated following Altman (1968). The dependent variable is *O-Score\_Distress<sub>t+1</sub>* in Panel B. *O-Score\_Distress<sub>t+1</sub>* is a dummy variable that takes the value of one if *O-Score* is above 0.5, and zero otherwise. *O-Score* is calculated following Ohlson (1980). The independent variables are *Tone\_All* in Column (1), *Tone\_Chair* in Column (2), *Tone\_Perform* in Column (3), and *Tone\_Review* in Column (4). We run the standard logit regressions in all columns. We control for a large set of firm characteristics, defined in Appendix A. Year and industry fixed effects are denoted as Year FE and Industry FE, respectively. z-statistics are reported in parentheses. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% level. An intercept is included but not reported.

### Disclosure tone and earnings persistence

Table 6 examines whether the tone is informative about earnings persistence.<sup>17</sup> Higher earnings persistence can be considered as an indicator of financial solvency because firms are more able to meet future obligations and, thus, are less likely to go bankrupt. Our findings in the previous section, which show a positive association between tone and firm future performance, suggest that firms with a more net positive tone may be better po-

sitioned to maintain their profitability and, as a result, exhibit higher earnings persistence.

Our empirical model is similar to that of Skinner and Soltes (2011), which examines the implications of dividend payment for earnings persistence. The dependent variable is the operating profit in year  $t + 1$ , *Profitability<sub>t+1</sub>*, in Columns (1)–(2), and the operating profit in year  $t + 2$ , *Profitability<sub>t+2</sub>*, in Columns (3)–(4). The main variable of interest is the interaction between *Tone\_All\_High* and *Profitability* in Columns (1) and (3), and the interaction between *Tone\_Chair\_High* and *Profitability* in Columns (2) and (4). *Tone\_All\_High* (*Tone\_Chair\_High*) is a dummy variable that takes the value of one if *Tone\_All* (*Tone\_Chair*) is in the top

<sup>17</sup>Similarly, Li (2008) examines the effect of a different disclosure attribute, namely annual report readability, on earnings persistence.

Table 5. Disclosure tone and future firm performance.

Dependent Var.	Sales Growth <sub>t+1</sub> (Columns 1–2)		ROA <sub>t+1</sub> (Columns 3–4)		Market-to-Book <sub>t+1</sub> (Columns 5–6)	
	(1)	(2)	(3)	(4)	(5)	(6)
<b>Tone_All</b>	<b>0.434***</b> (9.42)		<b>0.217***</b> (5.73)		<b>0.726***</b> (4.58)	
<b>Tone_Chair</b>		<b>0.352***</b> (9.63)		<b>0.159***</b> (5.84)		<b>0.655***</b> (6.39)
Length_All	0.057*** (4.44)		−0.051*** (−5.88)		0.399*** (8.89)	
Length_Chair		0.004 (0.34)		−0.002 (−0.26)		0.059* (1.66)
Firm Size	−0.025*** (−4.59)	−0.014*** (−3.68)	0.039*** (8.59)	0.025*** (7.55)	−0.157*** (−7.70)	−0.075*** (−6.46)
Leverage	0.021 (0.76)	0.020 (0.73)	−0.009 (−0.14)	−0.015 (−0.24)	0.609*** (3.94)	0.580*** (8.55)
Liquidity	−0.004 (−0.90)	−0.002 (−0.53)	0.002 (0.87)	−0.000 (−0.03)	−0.057*** (−4.24)	−0.045*** (−5.28)
Profitability	0.034 (1.56)	0.031 (1.36)	0.055* (1.67)	0.050 (1.46)	0.179** (2.33)	0.162*** (5.13)
Market-to-Book	0.001 (0.25)	0.001 (0.16)	0.012 (1.60)	0.011 (1.40)		
Dividend	0.025** (2.11)	0.016 (1.35)	0.073*** (9.93)	0.071*** (8.96)	−0.027 (−0.56)	−0.030 (−0.58)
Cash	−0.004 (−0.07)	−0.011 (−0.20)	−0.067 (−1.57)	−0.093** (−2.08)	−2.891*** (13.86)	2.911*** (20.89)
Firm Age	−0.012** (−2.47)	−0.014*** (−2.61)	0.023*** (6.07)	0.022*** (5.54)	−0.071*** (−4.02)	−0.067*** (−2.98)
Insider Ownership	0.013 (1.62)	0.015* (1.83)	0.006*** (4.84)	0.008*** (4.23)	−0.079*** (−15.09)	−0.078** (−2.43)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	4792	4461	4792	4461	4808	4476
adj. R <sup>2</sup>	0.055	0.059	0.240	0.233	0.213	0.206

This table examines the effects of tone on future firm performance. The dependent variables are *Sales Growth<sub>t+1</sub>* in Columns (1)–(2), *ROA<sub>t+1</sub>* in Columns (3)–(4), and *Market-to-Book<sub>t+1</sub>* in Columns (5)–(6). *Sales Growth<sub>t+1</sub>* is the change of sales divided by the previous year's sales in year  $t + 1$ . *ROA<sub>t+1</sub>* is net income divided by total assets in year  $t + 1$ . *Market-to-Book<sub>t+1</sub>* is (total assets - common equity + market capitalization)/total assets in year  $t + 1$ . The independent variables are *Tone\_All* in the odd columns and *Tone\_Chair* in the even columns. We run OLS regressions in all columns. We control for a large set of firm characteristics, defined in Appendix A. Year and industry fixed effects are denoted as Year FE and Industry FE respectively. t-statistics are reported in parentheses. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% level. An intercept is included but not reported.

quartile and of zero otherwise. We find that the coefficients on the interaction between the high tone indicators and the current year's operating profit are positive and statistically significant at the 1% or 5% level, meaning that net positive tone indicates both 1-year-ahead and 2-year-ahead earnings persistence. These results suggest that the earnings of firms with a more net positive tone are more persistent, which lends further support to our *H1* because higher earnings persistence means lower financial distress risk.

#### Disclosure tone and firm risk

Table 7 examines whether a more net positive tone is associated with lower firm future risk. We use two measures of the volatility of firm future performance, namely *SD\_Return<sub>t+1</sub>* in Columns (1)–(2) and

*SD\_F3EBITDA<sub>t+1</sub>* in Columns (3)–(4). *SD\_Return<sub>t+1</sub>* is the standard deviation of the monthly stock return in the next fiscal year. *SD\_F3EBITDA<sub>t+1</sub>* is the standard deviation of the EBITDA/total assets in the next three years. The independent variables are *Tone\_All* in the odd columns and *Tone\_Chair* in the even columns. We run OLS regressions with both year and industry fixed effects.

We find that both *Tone\_All* and *Tone\_Chair* are associated with significantly lower *SD\_F3EBITDA<sub>t+1</sub>* and *SD\_Return<sub>t+1</sub>*. These effects are statistically significant at the 1% level and economically sizeable. For example, in Column (3), the coefficient on *Tone\_All* is  $-3.107$ , meaning that a one-standard-deviation increase in *Tone\_All* is associated with a 47.2 percentage-point decrease in *SD\_F3EBITDA<sub>t+1</sub>*. The observed negative relationship between tone and

Table 6. Disclosure tone and earnings persistence.

Dependent Var.	Profitability <sub>t+1</sub> (Columns 1–2)		Profitability <sub>t+2</sub> (Columns 3–4)	
	(1)	(2)	(3)	(4)
Tone_All_High	0.004 (0.46)		−0.005 (−0.48)	
<b>Tone_All_High*Profitability</b>	<b>0.129**</b> <b>(2.09)</b>		<b>0.168***</b> <b>(2.66)</b>	
Tone_Chair_High		−0.001 (−0.08)		−0.014 (−1.22)
<b>Tone_Chair_High*Profitability</b>		<b>0.174***</b> <b>(2.99)</b>		<b>0.233***</b> <b>(3.29)</b>
Firm Size	0.012*** (6.08)	0.011*** (5.49)	0.012*** (5.63)	0.011*** (4.94)
Leverage	−0.003 (−0.11)	−0.005 (−0.20)	0.026 (0.95)	0.033 (1.14)
Liquidity	−0.009*** (−3.94)	−0.009*** (−3.79)	−0.009*** (−3.33)	−0.009*** (−3.38)
Profitability	0.547*** (17.68)	0.559*** (17.95)	0.418*** (12.92)	0.422*** (12.84)
Market-to-Book	−0.002 (−0.61)	−0.002 (−0.71)	−0.008** (−2.05)	−0.008** (−1.97)
Dividend	0.028*** (4.44)	0.025*** (3.74)	0.034*** (4.67)	0.031*** (4.12)
Cash	−0.015 (−0.53)	−0.016 (−0.57)	−0.014 (−0.42)	−0.023 (−0.65)
Firm Age	0.009*** (3.00)	0.010*** (3.09)	0.012*** (3.70)	0.014*** (3.97)
Insider Ownership	−0.458 (−0.92)	−0.446 (−0.86)	−0.906 (−1.41)	−0.970 (−1.46)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
<i>N</i>	6362	5890	5795	5354
adj. <i>R</i> <sup>2</sup>	0.472	0.477	0.362	0.359

This table examines the effects of tone on earnings persistence. The dependent variable is the operating profit in year  $t + 1$ ,  $Profitability_{t+1}$ , in Columns (1)–(2), and the operating profit in year  $t + 2$ ,  $Profitability_{t+2}$ , in Columns (3)–(4).  $Profitability_{t+1}$  and  $Profitability_{t+2}$  are EBITDA divided by total assets in years  $t + 1$  and  $t + 2$ , respectively. The main variable of interest is the interaction between *Tone\_All\_High* and *Profitability* in Columns (1) and (3), and the interaction between *Tone\_Chair\_High* and *Profitability* in Columns (2) and (4). *Tone\_All\_High* (*Tone\_Chair\_High*) is a dummy variable that takes the value of one if *Tone\_All* (*Tone\_Chair*) is in the top quartile, and zero otherwise. We run the OLS regressions in all columns. We control for a large set of firm characteristics, defined in Appendix A. Year and industry fixed effects are denoted as Year FE and Industry FE, respectively. *t*-statistics are reported in parentheses. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% level. An intercept is included but not reported.

firm future risk is consistent with our *HI* because higher performance volatility contributes to financial distress.<sup>18</sup>

## Conclusion

Responding to growing calls by many stakeholders in the UK, this paper examines the incremental explanatory power of the linguistic tone of disclosures in UK

annual reports in predicting corporate bankruptcy. Because of the managerial incentive to engage in impression management, corporate disclosure tone could either inform or misinform annual report users about the probability of future bankruptcy. This paper finds that a more net positive tone is associated with a lower probability of bankruptcy. The tone of various narrative sections of the annual reports, namely the Chairman's Statement, Performance Commentary, and Business Review Section, all exhibit significant incremental predictive power over an extensive list of firm fundamentals. Our findings suggest that firms that convey a more net positive tone in their annual report narratives are less likely to face bankruptcy one to three years ahead.

Furthermore, our cross-sectional analyses show that the predictive power of tone is stronger for firms with lower managerial incentives to mislead investors, in

<sup>18</sup>We discuss and present several robustness checks in Online Appendices A.3 to A.7. These additional tests suggest that our main results are highly robust to various considerations, including extreme corporate policies, audit opinion; inclusion of additional controls related to corporate governance, managerial ability, labour unionization, and managerial overconfidence; and alternative measures of financial distress based on F-score and interest coverage.



Table 7. Disclosure tone and future firm risk.

Dependent Var.	SD_Return <sub>t+1</sub> (Columns 1–2)		SD_F3EBITDA <sub>t+1</sub> (Columns 3–4)	
	(1)	(2)	(3)	(4)
<b>Tone_All</b>	<b>−0.226***</b> (−6.43)		<b>−3.107***</b> (−3.92)	
<b>Tone_Chair</b>		<b>−0.172***</b> (−6.63)		<b>−1.866***</b> (−2.85)
Length_All	0.005 (0.61)		0.455** (2.21)	
Length_Chair		0.000 (0.08)		−0.114 (−0.53)
Firm Size	−0.015*** (−4.89)	−0.012*** (−4.97)	−0.478*** (−5.77)	−0.323*** (−4.82)
Leverage	0.020 (1.39)	0.022 (1.44)	0.378 (1.14)	0.444 (1.38)
Liquidity	−0.004*** (−2.63)	−0.003** (−2.15)	−0.055 (−1.13)	−0.028 (−0.58)
Profitability	−0.017 (−1.09)	−0.015 (−0.86)	−0.968*** (−2.86)	−1.077*** (−3.03)
Market-to-Book	−0.002 (−0.52)	−0.002 (−0.37)	0.235*** (2.77)	0.250*** (2.84)
Dividend	−0.122*** (−13.16)	−0.118*** (−12.32)	−1.849*** (−5.83)	−1.765*** (−5.23)
Cash	−0.005 (−0.17)	0.002 (0.08)	0.323 (0.39)	0.493 (0.57)
Firm Age	−0.030*** (−7.71)	−0.030*** (−7.42)	−0.563*** (−4.12)	−0.543*** (−3.71)
Insider Ownership	−0.004 (−0.61)	−0.006 (−0.68)	−0.147 (−0.53)	−0.207 (−0.76)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	4789	4458	3443	3195
adj. R <sup>2</sup>	0.307	0.309	0.218	0.214

This table examines the effects of tone on future firm risk. The dependent variables are  $SD\_Return_{t+1}$  in Columns (1)–(2), and  $SD\_F3EBITDA_{t+1}$  in Columns (3)–(4).  $SD\_Return_{t+1}$  is the standard deviation of the monthly stock return in the next fiscal year.  $SD\_F3EBITDA_{t+1}$  is the standard deviation of the EBITDA/total assets in the next three years. The independent variables are *Tone\_All* in the odd columns and *Tone\_Chair* in the even columns. We run the OLS regressions in all columns. We control for a large set of firm characteristics, defined in Appendix A. Year and industry fixed effects are denoted as Year FE and Industry FE, respectively. t-statistics are reported in parentheses. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% level. An intercept is included but not reported.

which case tone appears to be more informative and more indicative of bankruptcy risk. We also provide complementary evidence that tone predicts both the level and the volatility of firm future performance. We further show that firms conveying a higher net positive tone are less likely to exhibit extreme corporate policies and receive a qualified auditor's opinion. Overall, our results are robust to various direct and indirect bankruptcy measures and hold after a battery of sensitivity tests.

Our study advances the literature by showing that the tone of unstructured and less regulated corporate disclosure (in the UK) has significant incremental information content in predicting firm prospects, particularly when the managerial incentives for impression management are low. We also provide new evidence that the tone of the main sections of UK annual reports is informative and moves largely in the same vein as the aggregate tone of the entire report. This contributes to the ongoing debate that revolves around

the question of whether textual disclosure is a channel for incremental information content or managerial attempts to carry out impression management (e.g. Lohmann and Ohliger, 2020; Merkl-Davies, Brennan and McLeay, 2011). The practical implications of our results are timely and imperative in addressing public concern in the UK about whether corporate managers communicate useful information predictive of corporate bankruptcy. Our paper suggests that corporate managers in the UK do not bury their heads in the sand; rather, the tone conveyed by textual disclosures informs about the possibility of corporate bankruptcy. Thus, bankruptcy prediction models should indeed incorporate text-based information derived from various narrative components of annual reports.

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## Appendix A: Variable definitions

Variable	Definition	Data source
<b>Panel A: Bankruptcy and financial distress measures</b>		
Bankruptcy	Dummy = 1 if the LSPD death type is liquidation, voluntary liquidation, a receiver appointed/liquidation, in administration/administrative receivership, or cancelled assumed valueless, and zero otherwise	LSPD
Z-Score_Distress	Dummy = 1 if the Altman Z-score is below 1.81, indicating high financial distress risk [following Altman (1968), Z-score is calculated as $1.2*(\text{working capital/assets})+1.4*(\text{retained earnings/assets})+3.3*(\text{earnings before interest/assets})+0.6*(\text{market value of equity/total liabilities})+0.999*(\text{sales/assets})$ ], and zero otherwise	Worldscope
O-Score_Distress	Dummy = 1 if the Ohlson O-score is above 0.5, indicating high financial distress risk [following Ohlson (1980), O-score is calculated as $-1.32-0.407*\log(\text{assets})+0.603*(\text{total liabilities/assets})-1.43*(\text{working capital/assets})+0.0757*(\text{current assets/current liabilities})-2.37*(\text{net income/assets})-1.83*(\text{funds from operations/total liabilities})+0.285*(\text{dummy} = 1 \text{ if net income is negative in the past 2 years})-1.72*(\text{dummy} = 1 \text{ if total liabilities exceed total assets})-0.521*\text{change in net income}$ ], and zero otherwise	Worldscope
F-Score_Distress	Dummy = 1 if the F-score is below 3, indicating low financial strength, and zero otherwise [following Piotroski (2000), F-score is calculated as the sum of points for nine criteria related to profitability, leverage, liquidity and financing, operating efficiency respectively. One point will be given for meeting each criterion, so the F-score ranges between zero and nine]	Worldscope
Int_Cov_Distress1	Similar to in Asquith, Gertner and Scharfstein (1994), dummy = 1 if the interest coverage is below one in two consecutive years, or if in any one of the past 2 years the interest coverage is below 0.8, and zero otherwise	Worldscope
Int_Cov_Distress2	Dummy = 1 if a firm's interest coverage is negative in the past 2 Years, and zero otherwise	Worldscope
<b>Panel B: Corporate disclosure scores</b>		
Tone_All	(positive-negative)/(positive+negative) keywords, for the narrative component of the annual report	CFIE Project
Tone_Chair	(positive-negative)/(positive+negative) keywords, for Chairman's Statement	CFIE Project
Tone_Perform	(positive-negative)/(positive+negative) keywords, for aggregate performance commentary	CFIE Project
Tone_Review	(positive-negative)/(positive+negative) keywords, for aggregate business/financial/operating reviews	CFIE Project
Length_All	The natural logarithm of the number of words for the narrative component of the annual report	CFIE Project
Length_Chair	The natural logarithm of the number of words in Chairman's Statements	CFIE Project
Length_Perform	The natural logarithm of the number of words for aggregate performance commentary	CFIE Project
Length_Review	The natural logarithm of the number of words for aggregate business/financial/operating reviews	CFIE Project
<b>Panel C: Other dependent variables</b>		
Sales Growth	The change in sales divided by the sales in the previous year	Worldscope
ROA	Net income divided by total assets	Worldscope
SD_Return	The standard deviation of the monthly stock returns in the next 12 months	Datastream
SD_F3EBITDA	The standard deviation of the EBITDA/total assets in the next 3 years	Worldscope
Dividend_Cut	Dummy = 1 if a firm's common dividends is positive last year but zero this year	Worldscope
Employee_Cut	Dummy = 1 if the number of employees is cut by over 10% in the past year, and zero otherwise	Worldscope
Payable_Increase	Dummy = 1 if a firm's ratio of trade payables to total assets increases by over 5% in the past year, and zero otherwise	Worldscope
<b>Panel D: Controls and other variables</b>		
Firm Size	The natural logarithm of sales	Worldscope
Leverage	Total debt divided by total assets	Worldscope
Liquidity	Current assets divided by current liabilities	Worldscope

Continued



**Panel D: Controls and other variables**

Profitability	EBITDA divided by total assets	Worldscope
Market-to-Book	(total assets – common equity + market capitalization)/total assets	Worldscope
Dividend	Dummy = 1 if common dividends are positive, and zero otherwise	Worldscope
Cash	Cash and short-term investments divided by total assets	Worldscope
Firm Age	The natural logarithm of the number of years that elapsed since the date of incorporation	Worldscope
Insider Ownership	The number of closely held shares divided by the number of common shares outstanding	Worldscope
Board Independence	The percentage of independent directors on the board	BoardEx
High Board Independence	Dummy = 1 if the percentage of independent directors on the board is above the median of the sample distribution, and zero otherwise	BoardEx
Main Market	Dummy = 1 if a firm is listed on the Main Market, and zero if it is listed on the Alternative Investment Market (AIM)	Worldscope
Big4 Auditor	Dummy = 1 if a firm is audited by the big 4 accounting firms (Deloitte, E&Y, KPMG, and PwC), and zero otherwise	Worldscope
IFRS	Dummy = 1 if a firm follows the IFRS, and zero if it follows the local standard	Worldscope
Managerial Ability	A measure of managerial ability constructed based on the data envelopment analysis (DEA), following Demerjian et al. (2012)	Worldscope
Labour Unionization	Trade union membership as a proportion of employees in each industry year (based on SIC2 industry classification)	GOV.UK
Past_MA	The total number of M&A transactions in the past 5 years	Thompson One Banker
IAIR_D	Dummy = 1 if the industry-adjusted Capex (capital expenditures divided by total assets) is in the top quintile, and zero otherwise	Worldscope

This appendix provides the definitions and sources of the main variables used in our empirical analyses reported in the published article and online appendix.

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## Supporting Information

Additional supporting information can be found online in the Supporting Information section at the end of the article.