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## Article

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# Does operational disclosure curb textual tone manipulation by corporate management?

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## ABSTRACT

Information disclosure regulations play a crucial role in shaping the information disclosure behaviour of company management, influencing the information environment of capital markets, and subsequently impacting the efficiency of resource allocation. Drawing on a quasi-experimental approach involving the phased implementation of the Industry Information Disclosure Guidelines (IIDG) and utilising data from Chinese listed companies spanning 2010–2021, we delve into the governance effects of the IIDG on company management's textual tone manipulation and its mechanisms. Our findings reveal a significant reduction in the degree of textual tone manipulation in firm management discussions and analyses following the IIDG implementation. This is achieved through various channels, including enhanced disclosure of quantitative information related to firms' operations, increased comparability of textual information across firms, and heightened investor attention. The governance effect is more pronounced when management has stronger incentives to manipulate the tone of the text and when there is more room for manipulation. Moreover, the IIDG has a spillover effect, extending to the suppression of tone-of-text manipulation in sections of the annual report beyond the management discussion and analysis. Additionally, investors penalise firms that continue to engage in tone manipulation after the IIDG implementation, as evidenced by a negative market reaction. We not only furnish micro-level evidence regarding the effectiveness of the IIDG as regulatory measures for disclosure but also introduces new perspectives on governing textual tone manipulation.

## KEYWORDS

IIDG; operating information disclosure; textual tone manipulation

## 1. Introduction

With the continuous emergence of new business forms and the ongoing increase in the number of industry categories, listed companies reflect more and more uniqueness in terms of business models, product characteristics, risk factors, accounting treatment and other aspects. Given this context, it is increasingly difficult for the previous broader

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disclosure standards to highlight the industry's heterogeneity. As a practical initiative, stock exchanges have tried to implement the IIDG in batches, i.e. to put forward more targeted disclosure requirements for listed companies in different industries in the hope of improving the effectiveness of information disclosure and better protecting the interests of investors. In October 2020, the State Council's Opinions on Further Improving the Quality of Listed Companies once again pointed out to continue to 'improve the information disclosure standards of sub-industries and enhance the pertinence and effectiveness of information disclosure'. So, an ensuing question is, how will the regulatory policy of the IIDG affects companies' disclosure behaviour? What is the mechanism of action?

At the same time, more and more information users realise that textual information, which is crucial for understanding company accounting information and assessing company value and future development prospects, is gradually alienating into a new means for company management to manipulate information disclosure to the detriment of investors due to its ambiguity and lack of disclosure standards (Huang et al., 2014; Lin et al., 2022; H. Wang & Wang, 2018; Zeng et al., 2018) In this context, how to govern management's text manipulation behaviour has become an important and realistic topic that needs to be addressed at present. Therefore, based on the perspective of textual tone manipulation, this paper investigates the IIDG's economic effect and mechanisms. On the one hand, according to the 'motivational view' of information disclosure (Leuz & Wysocki, 2016), it is difficult to change management's disclosure behaviour by simple guideline changes when the motivation for disclosure remains unchanged. Coupled with the relatively flexible form of textual disclosure and management's greater discretion and more strategic responses, making it challenging to curb the manipulation of textual tone in the disclosure of operating information brought about by the IIDG. On the other hand, the IIDG not only requires companies to disclose more operation-related quantitative information to strengthen the cross-validation between textual and quantitative information, but also improve the comparability of textual information among companies in the same industry by stipulating uniform disclosure standards and formats, and attract investors and other market participants to pay attention to the company so as to play a supervisory role either directly or indirectly. All these will greatly reduce the space for management to manipulate textual information and weaken textual tone manipulation. In summary, it remains an empirical question to determine whether and how the increase in operating information disclosure resulting from the IIDG impacts tone manipulation.

Specifically, this paper constructs a staggered difference-in-differences model based on a quasi-experiment in which the IIDG is implemented in batches, and measures the degree of tone manipulation using the text of management discussions and analyses (MD&A) of listed companies from 2010 to 2021. On this basis, this study finds that the degree of tone manipulation of MD&A texts decreases significantly after the implementation of the IIDG. The mediation effect test suggests that the IIDG works by compressing the scope for tone manipulation through mechanisms such as increased quantitative disclosure of information related to firms' operational activities, intra-peer comparability of textual information, and investor attention. Further, measuring the incentives and space for management to manipulate the textual tone across multiple dimensions (business characteristics, information environment, and external monitoring), the governance effect is found to be more pronounced in samples where there is stronger motivation and a larger

space for tone manipulation. The paper also finds that the increased disclosure of operating information as a result of the IIDG has a spillover effect, i.e. it can similarly constrain the manipulation of textual tone in sections of the annual report other than the MD&A. In addition, the study shows that after the implementation of the IIDG, investors penalise those firms that still engage in text tone manipulation (negative market reaction). To ensure the reliability of the empirical findings, the paper conducts parallel trend tests, robustness tests using matched post-sample and balanced panel data, replacement of the textual tone manipulation metric, and placebo tests based on stochastic simulations, all of which leave the findings unchanged.

The contribution of this paper is mainly in the following three aspects. Firstly, this paper expands the literature on how to govern management's text tone manipulation behaviour. It is more difficult to govern management's text tone manipulation behaviour than accounting information manipulation (earnings management). Xie and Lin (2015) theoretically analysed the role of repeated games, ex post reliability, and institutional arrangements such as legal, regulatory, and market information inter-mediation in promoting management tone credibility, but did not provide empirical evidence. Levy et al. (2018) found that the risk of lawsuits can constrain management's use of optimistic tone. Based on a new perspective, this paper further finds that operational disclosure can play a governance role to reduce the extent of management's textual tone manipulation. Secondly, this paper extends the research related to industry disclosure regulation by advancing it from accounting numbers and financial behaviour to the level of textual information. It has been found that the industry disclosure regulation plays a role in improving the quality of corporate accounting information, reducing the risk of stock price collapse, and increasing commercial credit financing (Z. Liu & Liu, 2021; Shi, 2022; L. Zhao & Huang, 2022). Choosing textual information as a different perspective, this paper finds that although the IIDG do not directly restrict management's discretion in textual information disclosure, the measure exerts a governance effect by compressing the space for management to manipulate the textual tone, and the effect can spill over to other parts of the annual report text. Thirdly, this paper also provides new empirical evidence on the intrinsic mechanism of the role of non-financial information, especially operating information disclosure. Currently, the role of non-financial information is still controversial in academia (Brazel et al., 2009; Cheng et al., 2012; Hu & Tan, 2013; Ye & Liu, 2021). Based on a quasi-experimental scenario in which the IIDG are implemented in batches, this paper finds that operating disclosure works through mechanisms such as increasing quantitative information related to operations, textual information comparability, and investor attention.

The structure of this paper is as follows: [section 1](#) serves as the introduction; the subsequent section provides a literature review; [section 3](#) discusses the institutional background and the hypothesis development; the fourth section details the design of empirical research; [section 5](#) analyzes empirical results, incorporating benchmark regression outcomes and robustness tests; the sixth section explores additional research, encompassing mechanism tests, cross-sectional analysis and the tests of spillover effects. The conclusion section offers a summary and insights.

## 2. Literature review

### 2.1. Related research on text intonation manipulation

Corporate information formally consists of both quantitative accounting figures and qualitative textual descriptions (F. Li, 2008). With the advancement of natural language processing, machine learning, and other technologies, research based on qualitative text descriptions has gained increasing attention. Among these, tone is one of the most basic and important features of text description (Huang et al., 2014). Compared with accounting figures, textual tone disclosure is flexible in form and less regulated, and therefore more easily manipulated by management (Davis & Tama-Sweet, 2012; Huang et al., 2014; Lin et al., 2022; H. Wang & Wang, 2018; Zeng et al., 2018). Combing through the existing studies, the studies related to tone manipulation in this paper mainly include the motivation, specific performance and governance mechanism of textual tone manipulation.

Firstly, the motivation for textual tone manipulation is closely related to the management utility function. It has been found that management's motivation to use unusually positive tone is stronger when it is more sensitive to stock prices, such as prior to new stock offerings, mergers and acquisitions, and the exercise of stock options (Arslan-Ayaydin et al., 2016; Huang et al., 2014; Tama-Sweet, 2009). Conversely, prior to granting stock options, management instead reduces unusually positive tone in order to keep costs down (Huang et al., 2014). A similar phenomenon is observed in the Chinese scenario. For example, studies have shown that the more positive the tone of the annual report, the larger the size of shares sold by insiders, such as company executives and their relatives, and the smaller the size of net stock purchases after the release of the annual report (Zeng et al., 2018), which increases the risk of a future stock price collapse (Zhou et al., 2019). In addition, the unusually positive tone of management discussions and analyses has been used to mislead bond investors and thus influence pricing (Lin et al., 2022). Secondly, in terms of evidence of textual tone manipulation, Davis and Tama-Sweet (2012) found that management discloses less pessimistic and more optimistic language in MD&A texts in order to weaken its low level of accounting earnings when the earnings just meets or exceeds market expectations. Larcker and Zakolyukina (2012) cleverly used quarterly earnings calls and subsequent financial restatement data to categorise executives into 'truthful' and 'deceptive', based on which they find that the latter use more extremely positive words and less anxious words. Huang et al. (2014) further decomposed textual tone into normal tone and abnormally positive tone, and found that abnormally positive tone is positively associated with poor earnings and operating cash flow performance over the next one to three years, as well as with the probability of future earnings restatements. As far as the governance of textual tone manipulation is concerned, it has also been explored in some literature. For example, Xie and Lin (2015) theoretically argued that repeated games, ex post verifiability, and institutional arrangements such as legal, regulatory, and market information intermediation all contribute to the credibility of management tone in earnings presentations. Levy et al. (2018) based on the scenario of the Gantler v. Stephens, found that non-board officers who are appointed by investors in litigation The increased risk of being named as a defendant is associated with a more negative tone in their speeches on earnings calls and earlier disclosure of bad news.

## **2.2. Related research on operational information disclosure**

Operational information is an important component of a company's non-financial information, which can alleviate information asymmetry and enhance transparency (Brazel et al., 2009; F. Li, 2010; Xue et al., 2010; Ye & Liu, 2021). In recent years, with the continuous emergence of emerging business models and big data technology, the integration of business and finance has become a trend, and the relationship between operational information and accounting information has once again attracted attention. For example, Brazel et al. (2009) found that auditors use non-financial information such as the number of retail stores, warehouse capacity, or employee surveys to detect financial fraud and improve audit quality. Dechow et al. (2011) found that a significant decrease in the number of employees can predict financial misreporting in listed companies. Based on samples from China, Cheng et al. (2012) studied information about future development prospects and found that non-financial information has an 'institutional dependence' feature on investment efficiency. More specifically, Ye and Liu (2021) manually collected indicators such as production and sales growth rates and inventory growth rates of listed companies in China, and found that this operational information helps identify corporate fraud risks. Recently, some scholars have attempted to study the impact of changes in the disclosure of operational information by Chinese listed companies on accounting earnings quality (Z. Liu & Liu, 2021), stock price collapse risk (L. Zhao & Huang, 2022), and business credit financing (Shi, 2022) in scenarios where the IIDG is implemented in batches. They discovered that mandatory disclosure of operational information has 'information effects' and 'governance effects' on accounting information.

In summary, on the one hand, existing research indicates that corporate management, in order to achieve specific objectives, strategically employs excessively optimistic language to manipulate textual information, thereby misleading information users. However, the question of which mechanisms can effectively govern the managerial manipulation of textual tone awaits new answers from different perspectives. On the other hand, the mandatory disclosure of operational information required by the phased implementation of the IIDG has attracted increasing attention. However, related studies mainly focus on the impact on the quality of company accounting earnings and financial behaviour. It remains unclear how and whether it affects the quality of textual information, requiring further exploration.

## **3. Institutional background and hypothesis development**

### **3.1. The IIDG and operational information disclosure**

In 2013, the Shenzhen Stock Exchange took the lead in introducing information disclosure guidelines for the film and pharmaceutical industries on the ChiNext board. The aim was to standardise and elaborate on the disclosure requirements for industry-specific operational information. By 2021, both the Shanghai and Shenzhen stock exchanges have successively issued dozens of industry-specific information disclosure guidelines in batches. The IIDG's main content companies to disclose operational information in five key aspects that best reflect the industry characteristics, investment value, and risk factors. These aspects include the industry's macroeconomic impact, customer market development, current status of key resources, profit strategy planning, and the execution of key

processes. For example, the guidelines for the jewellery industry require companies in that sector to disclose additional information on different business models, as well as details about stores and inventory. Similarly, the guidelines for the retail industry require listed companies to disclose operating income, operating costs, and gross profit margins according to business formats, regions, operating models, main categories of goods, and sales channels. They also require the disclosure of expense items related to industry characteristics, such as rent, advertising and promotional expenses, store decoration costs, logistics expenses, and information about customer characteristics or categories, the number of various types of members and their sales proportions, and the ratio of online customers to physical store customers.

The execution of the IIDG is also highly stringent. Except for very few cases with special reasons that can apply for non-disclosure, exchanges take regulatory measures such as inquiry letters for listed companies that do not disclose operational information as required. They require listed firms to respond and make corrections. According to statistics, in post-annual report regulatory inquiries in 2015, the Shanghai Stock Exchange raised more than 2,700 related questions to firms listed on the Shanghai Stock Exchange regarding compliance with the IIDG. This accounted for 77% of the total number of regulatory inquiries during the same period.<sup>1</sup>

### **3.2. Operational information disclosure and textual tone manipulation**

The manipulation of textual tone is a widespread phenomenon among listed companies, and its severity mainly depends on two aspects: (1) the strength of the management's motivation for tone manipulation and (2) the magnitude of the space available for management to manipulate the tone. Regarding motivational aspects, this includes both the management's desire to obtain lower financing costs through textual tone manipulation when issuing new stocks, bonds, or engaging in activities such as mergers and acquisitions (Arslan-Ayaydin et al., 2016; Huang et al., 2014; Lin et al., 2022; Tama-Sweet, 2009). It also includes instances where management, for personal gain, uses textual tone in coordination with the exercise of stock options (Huang et al., 2014), engages in insider trading (Zeng et al., 2018), or conceals bad news such as declining earnings (Zhou et al., 2019). In terms of the space available for manipulation, this encompasses the difficulty of manipulating textual information (Demers & Vega, 2011; Wang et al., 2018; Zeng et al., 2018), the probability of discovering the manipulation of textual information afterwards (Levy et al., 2018), and the severity of punishment imposed by external information users such as investors and regulators after discovering the manipulation of textual information (Davis & Tama-Sweet, 2012; Levy et al., 2018). So, how does the IIDG, as a regulatory policy increasing the disclosure of operational information, impact the textual information disclosure behaviour of listed companies? This paper, based on existing literature and relevant institutional backgrounds, will conduct a specific analysis from the two dimensions of motivation and space in textual tone manipulation.

On the one hand, the 'motivation view' of information disclosure (Ball et al., 2003; Burgstahler et al., 2006; Leuz & Wysocki, 2016) posits that motivation, rather than

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<sup>1</sup>[https://www.cs.com.cn/sylm/jsbd/201606/t20160605\\_4985001.html](https://www.cs.com.cn/sylm/jsbd/201606/t20160605_4985001.html).

accounting standards (or rules), is the fundamental determinant of differences in information disclosure practices among countries or companies. This is because, firstly, a set of limited standards cannot predict all the situations a company may face when applying these standards in the future, thus necessitating a certain degree of discretion for company management. Secondly, standards intentionally grant management discretionary power to obtain privately held information and apply it to subjective assessments of the future. In this scenario, information disclosure behaviour is significantly influenced by motivation, not solely determined by standards. Many empirical studies have demonstrated the importance of management motivation for disclosure behaviour (Burgstahler et al., 2006; Fan & Wong, 2002). The 'motivation view' further indicates that motivation is shaped by various factors, including a country's legal system, enforcement strength, capital market forces, product market competition, corporate governance structure, and operational characteristics. Accounting standards are just one of many institutional factors that influence management's reporting motivation and, consequently, a company's disclosure behaviour. Therefore, even with strict enforcement, changing standards alone is likely to have limited impact on information disclosure practices.

According to the logic of the 'motivation view', in the research scenario of this paper, the IIDG, as a standalone regulatory policy, is challenging to fundamentally alter the motivation behind management's manipulation of textual tone. Consequently, they may not significantly impact the extent of textual tone manipulation. On one hand, under conditions where other institutions do not change simultaneously (such as whether regulatory authorities penalise textual tone manipulation), the IIDG primarily specify how listed companies should disclose industry-specific operational information. Therefore, they are unlikely to alter the utility function of management when disclosing information. On the other hand, textual information is a commonly used manipulation tool for management to pursue private gains because, compared to accounting numerical information, it has higher ambiguity and opacity, making it difficult to verify and punish (K. Wang et al., 2018; Zeng et al., 2018). It falls under the concept of 'cheap talk' (Demers and Vega, 2011). Particularly in the Chinese context, management can manipulate textual tone through the use of language and writing styles, providing them with more discretion. These characteristics of textual information are the result of various factors, and it is challenging to change them significantly solely through the implementation of the IIDG.

On the other hand, the IIDG mandate companies to disclose operational information, significantly constraining the space for management to manipulate textual tone and thereby suppressing textual tone manipulation. Firstly, by requiring the disclosure of quantitative operational information, it raises the difficulty of manipulating textual tone. Generally, quantitative information is more easily verifiable, and the manipulation space is relatively lower. In contrast, text, as a qualitative form of information, lacks unified disclosure standards and clear boundaries for judging authenticity, providing a greater manipulation space (Lin et al., 2022; Zeng et al., 2018). The IIDG necessitates companies to disclose more quantitative information related to operational activities, increasing the opportunities for mutual verification between qualitative and quantitative information. This, in turn, can compress the space for management to manipulate textual tone. For example, companies in certain industries, following the guidelines, are required to disclose production and sales volumes. These quantitative operational pieces of information

serve as the original records of a company's business, involving fewer complex accounting estimates and subjective professional judgements (Ye & Liu, 2021). External individuals can easily compare this quantitative information with textual information without specific knowledge, aiding in the identification of misleading statements within the text.

Secondly, by enhancing the comparability of textual information among different companies within the industry, it increases the probability of discovering textual tone manipulation post facto. In traditional scenarios, textual information lacks a unified format and disclosure requirements, making anomalies challenging for stakeholders to detect. Even if stakeholders become aware, it is difficult for them to find sufficient evidence to support their suspicions. The IIDG provides a relatively standardised framework for textual information disclosure across the 'five dimensions' of industry macroeconomic impact, customer market development, current status of key resources, profit strategy planning, and the execution of key processes. It requires companies to analyse and disclose related risks and impacts comprehensively and accurately, avoiding vague or general statements. Simultaneously, the guidelines demand that listed companies, when disclosing operational information, provide comprehensive explanations and interpretations of their customer market development, changes in resources, and operational models in conjunction with the characteristics of their industry and the situations of other companies in the same industry. These requirements make the textual information disclosure standards and content more comparable among different companies within the same industry. This, in turn, reduces the cost for information users to access and utilise textual information from comparable companies in the same industry, aiding information users in comparing, analysing, distinguishing, and predicting the strategic plans, operational outcomes, and future prospects of different companies within the same industry (Z. Liu & Liu, 2021; Yuan & Wu, 2012).

Thirdly, the IIDG requires companies to disclose additional operational information. After these new pieces of information are released to the market, they easily attract heightened attention from investors and other market participants. For instance, Shi (2022) found that when companies disclose more industry-related information and operational details, analysts' tracking and market attention are both elevated. Davis and Tama-Sweet (2012) noted that investors are more focused on earnings press releases than on management discussions and analyses. This implies that investors' neglect of management discussions and analyses is a crucial factor in the management's choice to manipulate textual tone. With increased attention, investors will impose constraints on opportunistic behaviour by management. They may apply direct or indirect penalties, such as voting against, selling stocks, or shorting, upon discovering management engaging in textual tone manipulation. Therefore, the IIDG will inhibit management from using overly positive tones that do not align with the company's operational situation. Combining the above analysis, this paper proposes the following research hypotheses:

**Hypothesis 1:** *After the implementation of the IIDG, compared to the control group, the treatment group exhibit a significant decrease in the degree of textual tone manipulation.*

## 4. Research design

### 4.1. Sample selection and data sources

The IIDG was initially released in 2013. To facilitate a before-and-after comparison, this study selected A-share listed companies on the Shanghai and Shenzhen stock exchanges from 2010 to 2021 as the initial sample. Following research conventions, we excluded: (1) companies in the financial industry, (2) ST companies, and (3) samples with missing variables. The IIDG was introduced at multiple time points, and even for the same industry, there were variations in the implementation dates between the Shanghai and Shenzhen stock exchanges. Leveraging this institutional characteristic, the study design aimed to mitigate interference from incomparable estimates between industries and potential biases in the staggered difference-in-differences model (Baker et al., 2022). Specifically, this study designated companies listed on the Shanghai Stock Exchange (SSE) that implemented the IIDG earlier as the treatment group, and those on the Shenzhen Stock Exchange (SZSE) in the same industry that had either not implemented or had a delay of three or more years as the control group. Conversely, companies listed on the Shenzhen Stock Exchange that implemented the IIDG earlier were considered the treatment group, while those on the Shanghai Stock Exchange in the same industry that had either not implemented or had a delay of three or more years were the control group. Subsequently, industries present only in the treatment or control group were excluded, retaining only observations three years before and after the IIDG' release (that is  $[-3, +3]$ ). This process resulted in a final sample of 8312 annual observations. The IIDG documents were manually collected and organised from the websites of the SSE and SZSE. Industry classifications for listed companies were sourced from the Wind database.<sup>2</sup> Annual report textual data came from the WinGo database and the CNRDS database, while the remaining data were obtained from the CSMAR database.

### 4.2. Model setting and variables definition

Each batch of IIDG in this study targets different industries, indicating the presence of heterogeneity in treatment effects. Baker et al. (2022) highlighted that in such cases, using a staggered difference-in-differences model with time overlap might introduce bias. One solution is to employ a stacked difference-in-differences model, where each treatment group has a corresponding clean control group. Therefore, leveraging the institutional feature of differing implementation times for the IIDG within the same industry on the Shanghai and Shenzhen stock exchanges, this study was designed. The specific process is detailed in the 'Sample Selection and Data Sources' section and will not be reiterated here. The model is specified as follows:

$$Tone\_MD\&A(AbnTone\_MD\&A)_{i,t} = \alpha + \beta_1 \times Treat_i \times Post_{i,t} + \gamma X_{i,t} + \rho_i + \delta_t + \varepsilon_{i,t} \quad (1)$$

<sup>2</sup>Due to the broad nature of the industry classification standard of China Securities Regulatory Commission (CSRC), it is challenging to align it with the industry information disclosure guidelines issued by the Stock Exchange (e.g. finding the corresponding CSRC industry classification for the film and television industry and the photovoltaic industry from information disclosure guidelines). Therefore, following a thorough comparison, this paper chooses the secondary classification standard of Shenwan industry to define the industry to which the company belongs. This choice enables a more detailed division of the treatment group and the control group.

The content concerning operational information in annual reports is primarily concentrated in the MD&A section. Therefore, the dependent variable in Model (1) is the degree of tone manipulation in the MD&A text by the company's management. Specifically, this study employs two measurement approaches. Firstly, following the practices of Huang et al. (2014) and Zeng et al. (2018), based on the LM dictionary (Loughran & McDonald, 2011), positive and negative vocabulary counts are tallied in the MD&A text. The optimism degree of the MD&A text,  $Tone\_MD\&A$ , is then defined as  $(\text{number of positive words} - \text{number of negative words}) / (\text{number of positive words} + \text{number of negative words})$ . A higher value indicates a more optimistic MD&A tone, suggesting a higher likelihood of manipulation by the management. Secondly, following the studies of Huang et al. (2014) and H. Wang and Wang (2018), a regression is performed between the MD&A text tone and a series of variables representing the company's fundamentals.<sup>3</sup> This decomposition allows the MD&A text tone to be separated into two parts: the normal tone reflecting the company's fundamentals and the abnormal tone manipulated by the management to mislead the market. This study denotes the latter as  $AbnTone\_MD\&A$ , and a higher value indicates a more severe manipulation by the management of the MD&A text tone.

The interaction term, represented as the explanatory variable  $Treat \times Post$ , signifies the interaction between two dummy variables:  $Treat$ , indicating whether the company is in the treatment group, and  $Post$ , indicating whether the IIDG has been implemented. Specifically,  $Treat$  is a dummy variable denoting the treatment group. In this context, the companies listed on the Shanghai Stock Exchange (SSE) that implemented the IIDG earlier in the sample period are designated as the treatment group, while companies in the same industry on the Shenzhen Stock Exchange (SZSE) that either did not implement the IIDG or had a delay of three or more years are the control group. Conversely, the treatment group consists of companies listed on the SZSE that implemented the IIDG earlier, with the control group comprising companies on the SSE in the same industry that did not implement the IIDG or had a delay of three or more years. Under this definition,  $Treat$  takes the value of 1 when the sample is in the treatment group and 0 otherwise.  $Post$  is a dummy variable indicating whether the IIDG has been implemented. When the time is within the year of implementation and subsequent years, the variable takes the value of 1; otherwise, it is 0. Therefore, the coefficient  $\beta_1$  of  $Treat \times Post$  essentially measures the net effect brought about by the IIDG. If the implementation of the IIDG has an inhibitory effect on the text tone manipulation behaviour of the company's management, then  $\beta_1$  will be significantly negative.

In terms of controlling variables ( $X$ ), this study draws on research by Davis et al. (2015), D'Augusta and DeAngelis (2020), and H. Wang and Wang (2018), among others. The following variables are included in the model: the ratio of current-year net profit to the total assets of the previous year ( $Earning$ ), the individual stock return considering cash dividends reinvested in the current year ( $Return$ ), year-end market capitalisation ( $Size$ ),

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<sup>3</sup>These variables include  $Earning$ , calculated as the ratio of net profit for the current year to the total assets of the previous year;  $Return$ , measured as the natural logarithm of the market value at the end of the year;  $BTM$ , and  $StdEarning$ , the standard deviation of earnings over the past three years.  $StdReturn$  is the standard deviation of the monthly yield of the stock in the current year.  $Age$  is the natural logarithm of the listing years plus 1.  $Segment$  refers to the number of cross-industry business operations.  $DetaEarning$  is computed as the difference between the net profit for the current year and the net profit of the previous year, divided by the total assets of the previous year.  $AFE$  represents the forecast error of the analyst, and  $Loss$  indicates whether the company incurred a loss in the current year.

book-to-market ratio at the year-end (*BTM*), the standard deviation of earnings over the past three years (*StdEarning*), the standard deviation of monthly stock returns in the current year (*StdReturn*), the number of years listed (*Age*), the number of business segments across industries (*Segment*), the difference between the current-year net profit and the net profit of the previous year divided by the total assets of the previous year (*DetaEarning*), analyst forecast error (*AFE*), whether the company incurred a loss in the current year (*Loss*), leverage ratio (*Leverage*), analyst attention (*AFN*), and the percentage of institutional investor ownership (*IIO*). Furthermore, this study controls for company (or industry) fixed effects and annual fixed effects in the model.

The specific definitions of the above-mentioned variables are presented in [Appendix](#). In order to mitigate the impact of extreme values, all continuous variables are winsorised at the 1<sup>st</sup> and 99<sup>th</sup> percentiles.

### 4.3. Descriptive statistics

**Table 1** presents the descriptive statistics of the main variables. It can be observed that the MD&A text tone (MD&A text abnormal tone) ranges from 0.045 (−0.515) to 0.654 (0.420), with variations across different companies. Regarding the distribution of *Treat* and *Post*, the number of companies in the treatment group and control group is relatively balanced, both before and after the implementation of the guidelines. In addition, the correlation coefficient (not reported due to space constraints) indicates a correlation of 0.878 between *Tone\_MD&A* and the annual report's abnormal tone (*AbnTone\_MD&A*), suggesting their consistency while also capturing some incremental information from different perspectives regarding the extent of text tone manipulation. Furthermore, *Treat*×*Post* is significantly negatively correlated with *Tone\_MD&A* (*AbnTone\_MD&A*) at the 1% significance level, providing initial support for Hypothesis 1.

**Table 2** reports the changes in the MD&A text tone of the treatment group and the control group companies before and after the implementation of the IIDG. It can be observed that the MD&A text tone of the treatment group significantly decreased before and after the implementation of the IIDG. More importantly, the difference in the before-

**Table 1.** Descriptive statistics.

Variables	Obs.	Mean	S.D.	Min	Median	Max
<i>Tone_MD&amp;A</i>	8,312	0.384	0.126	0.045	0.391	0.654
<i>AbnTone_MD&amp;A</i>	8,312	−0.000	0.111	−0.515	0.007	0.420
<i>Treat</i>	8,312	0.504	0.500	0.000	1.000	1.000
<i>Post</i>	8,312	0.579	0.494	0.000	1.000	1.000
<i>Earning</i>	8,312	0.043	0.073	−0.217	0.036	0.334
<i>Return</i>	8,312	0.125	0.518	−0.574	0.006	2.843
<i>Size</i>	8,312	22.586	1.305	19.671	22.462	26.408
<i>BTM</i>	8,312	0.630	0.258	0.101	0.637	1.131
<i>StdEarning</i>	8,312	0.045	0.100	0.001	0.019	0.800
<i>StdReturn</i>	8,312	0.126	0.064	0.039	0.111	0.474
<i>Age</i>	8,312	2.537	0.532	1.099	2.708	3.258
<i>Segment</i>	8,312	1.193	0.440	0.693	1.099	2.197
<i>DetaEarning</i>	8,312	0.007	0.068	−0.236	0.004	0.357
<i>AFE</i>	8,312	0.328	0.404	0.000	0.196	2.285
<i>Loss</i>	8,312	0.114	0.317	0.000	0.000	1.000
<i>Leverage</i>	8,312	0.475	0.211	0.064	0.477	0.941
<i>AFN</i>	8,312	1.513	1.182	0.000	1.609	3.807
<i>IIO</i>	8,312	0.491	0.224	0.006	0.512	0.918

**Table 2.** Univariate difference test.

	<i>Post = 0</i>		<i>Post = 1</i>		Diff.	Diff.-in-Diff.
	Obs.	Mean	Obs.	Mean		
<b>Panel A: <i>Tone_MD&amp;A</i></b>						
<i>Treat = 0</i>	1,735	0.392	2,388	0.369	-0.023***	-0.027***
<i>Treat = 1</i>	1,764	0.417	2,425	0.367	-0.050***	
<b>Panel B: <i>AbnTone_MD&amp;A</i></b>						
<i>Treat = 0</i>	1,735	-0.008	2,388	0.001	0.009**	-0.022***
<i>Treat = 1</i>	1,764	0.011	2,425	-0.003	-0.014***	

Note: The test method employed is a two-tailed t-test. \*\*\*, \*\* and \* are significant at the levels of 1%, 5% and 10% respectively.

and-after changes between the two groups is significantly negative at the 1% level, indicating that even after controlling for confounding factors (i.e. the control group's before-and-after changes), the MD&A text tone of the treatment group still significantly decreased. Similar results are obtained when the variable is replaced with abnormal MD&A text tone (*AbnTone\_MD&A*). These results indicate that the IIDG have reduced the extent of text tone manipulation by companies in the treatment group.

## 5. Empirical results

### 5.1. Basic regression results

Table 3 presents the baseline regression results for the relationship between the IIDG and the manipulation of MD&A text tone by companies. The dependent variables in columns (1) and (2) are MD&A text tone (*Tone\_MD&A*), while columns (3) and (4) focus on the abnormal tone of MD&A text (*AbnTone\_MD&A*). Each column controls for fixed effects at different levels (industry and firm). The regression results indicate that, regardless of the method used to measure text tone manipulation, the coefficient for *Treat*×*Post* is consistently and significantly negative at the 1% level. The magnitude of the coefficient remains stable, ranging from -0.019 to -0.016. In economic terms, taking column (2) as an example, the average decline in positive text tone for companies in the treatment group is 69.57% greater than that for companies in the control group (= -0.016/-0.023). In conclusion, these results suggest that the increase in operational information disclosure following the implementation of the IIDG suppresses the text tone manipulation behaviour of management in listed companies, supporting hypothesis 1.

### 5.2. Robustness test

#### 5.2.1. Parallel trend

The prerequisite for using the double difference model is that the treated and control groups exhibit parallel trends in the outcome variable before the policy implementation. Otherwise, it is not possible to accurately estimate the net effect of the policy. To examine whether the text tone in the treated and control groups follows parallel trends before the implementation of the IIDG, this study defines the virtual variables *Pre2* (whether it is the second year before the IIDG implementation), *Pre1* (whether it is the

**Table 3.** Industry information disclosure guidelines and text tone manipulation.

Dep. Var.	<i>Tone_MD&amp;A</i>		<i>AbnTone_MD&amp;A</i>	
	(1)	(2)	(3)	(4)
<i>Treat</i> × <i>Post</i>	-0.019*** (-4.245)	-0.016*** (-3.643)	-0.018*** (-4.008)	-0.016*** (-3.480)
<i>Treat</i>	0.017*** (3.340)		0.016*** (3.203)	
<i>Earning</i>	0.235*** (6.043)	0.263*** (6.960)	-0.044 (-1.154)	-0.019 (-0.505)
<i>Return</i>	0.011*** (3.228)	0.006* (1.944)	0.002 (0.454)	-0.003 (-0.978)
<i>Size</i>	0.007** (2.432)	0.022*** (3.665)	-0.012*** (-4.177)	0.006 (1.016)
<i>BTM</i>	-0.002 (-0.172)	-0.035*** (-2.628)	0.057*** (4.669)	0.015 (1.113)
<i>StdEarning</i>	-0.037** (-1.997)	-0.001 (-0.084)	0.006 (0.334)	0.031** (2.025)
<i>StdReturn</i>	-0.125*** (-4.513)	-0.073*** (-3.116)	-0.021 (-0.774)	0.028 (1.201)
<i>Age</i>	-0.023*** (-5.441)	-0.022 (-1.487)	0.004 (0.934)	-0.012 (-0.785)
<i>Segment</i>	0.012** (2.394)	0.003 (0.383)	0.003 (0.674)	-0.006 (-0.825)
<i>DetaEarning</i>	-0.083*** (-2.960)	-0.076*** (-3.118)	0.030 (1.049)	0.031 (1.234)
<i>AFE</i>	-0.018*** (-4.051)	-0.018*** (-4.546)	-0.001 (-0.275)	-0.002 (-0.581)
<i>Loss</i>	-0.047*** (-8.386)	-0.024*** (-4.716)	0.009* (1.673)	0.032*** (6.333)
<i>Leverage</i>	0.009 (0.749)	0.007 (0.408)	0.011 (0.936)	0.008 (0.467)
<i>AFN</i>	0.015*** (7.258)	0.006*** (2.997)	0.015*** (7.337)	0.006*** (2.806)
<i>IIO</i>	-0.007 (-0.662)	0.013 (0.718)	-0.004 (-0.408)	0.015 (0.858)
<i>Constant</i>	0.258*** (4.486)	-0.037 (-0.306)	0.204*** (3.551)	-0.129 (-1.079)
<i>Industry</i>	Yes	No	Yes	No
<i>Firm</i>	No	Yes	No	Yes
<i>Year</i>	Yes	Yes	Yes	Yes
Adj. R <sup>2</sup>	0.301	0.593	0.105	0.473
Obs.	8,312	8,312	8,312	8,312

Note: \*, \*\* and \*\*\* respectively indicate the significance levels of 10%, 5% and 1% in the two-tailed test, and the *t* value is in parentheses. Standard errors are clustered at the firm level. The same below.

first year before the IIDG implementation), *Current* (whether it is the IIDG implementation year), *Post1* (whether it is the first year after the IIDG implementation), *Post2* (whether it is the second year after the IIDG implementation), and *Post3* (whether it is the third year after the IIDG implementation) based on the third year before the IIDG implementation. Then, *Treat* and the interaction terms between *Treat* and these variables are introduced into Model (1).

Table 4 presents the regression results of the parallel trend test. As shown in column (1), the regression coefficients of the interaction terms *Treat*×*Pre2* and *Treat*×*Pre1* are not statistically significant. This indicates that before the implementation of the IIDG, there is no significant difference in the trend of MD&A text tone (*Tone\_MD&A*) disclosed by company management between the treated and control groups, satisfying the parallel trend assumption. At the same time, although the coefficient of the *Treat*×*Current* interaction term corresponds to a larger

**Table 4.** Parallel trend test.

	<i>Tone_MD&amp;A</i>	<i>AbnTone_MD&amp;A</i>
Dep. Var.	(1)	(2)
<i>Treat</i> × <i>Pre2</i>	−0.000 (−0.034)	−0.003 (−0.622)
<i>Treat</i> × <i>Pre1</i>	0.005 (0.948)	0.002 (0.420)
<i>Treat</i> × <i>Current</i>	−0.005 (−0.767)	−0.007 (−1.033)
<i>Treat</i> × <i>Post1</i>	−0.020*** (−2.967)	−0.022*** (−3.221)
<i>Treat</i> × <i>Post2</i>	−0.018** (−2.398)	−0.020*** (−2.634)
<i>Treat</i> × <i>Post3</i>	−0.033*** (−3.801)	−0.032*** (−3.732)
<i>Constant</i>	−0.015 (−0.127)	−0.107 (−0.898)
<i>X</i>	Yes	Yes
<i>Firm &amp; Year</i>	Yes	Yes
Adj. R <sup>2</sup>	0.594	0.475
Obs.	8,312	8,312

t-value, it remains statistically insignificant. The coefficients of *Treat*×*Post1*, *Treat*×*Post2*, and *Treat*×*Post3* are at least statistically significant at the 5% level, indicating that, compared to the control group, the text tone manipulation by the management of the treated group begins to decrease after the implementation of the IIDG. Similar results are obtained when the dependent variable is replaced with abnormal tone (*AbnTone\_MD&A*).

### 5.2.2. Matched sample

According to the research design of this study, companies influenced by the IIDG (treatment group) and those not affected by the IIDG (control group) are in the same industry but listed on different stock exchanges. To further eliminate the impact of pre-existing differences between groups on empirical results, this paper utilises two matching methods, namely entropy balancing matching and propensity score matching, to select more comparable control group samples for the treatment group. 1) entropy balancing matching proposed by Hainmueller (2012), allows for the reweighting of the dataset to satisfy a set of specified moment conditions for covariate distributions. In comparison to other matching methods, entropy balancing matching can adjust for differences in the first, second, and third moments of covariate distributions (i.e. covariate means, variances, and skewness), matching each treatment group sample with a completely similar control group sample in the overall sample. This approach maximises the elimination of endogeneity bias in the sample. 2) Propensity score matching involves estimating the probability of each observation becoming part of the treatment group using a logit model and all previously mentioned control variables. The resulting propensity scores are then used to conduct one-to-one nearest-neighbour matching without replacement, selecting treatment and control group samples with closely matched propensity scores from the overall sample.

Table 5 reports the regression results using the matched subsamples. It can be observed that, whether using entropy balancing matching or propensity score matching, the coefficients obtained from the re-estimated regression remain significantly negative

**Table 5.** Matched samples.

Dep. Var.	Entropy balance matching		Propensity score matching	
	<i>Tone_MD&amp;A</i>	<i>AbnTone_MD&amp;A</i>	<i>Tone_MD&amp;A</i>	<i>AbnTone_MD&amp;A</i>
	(1)	(2)	(3)	(4)
<i>Treat</i> × <i>Post</i>	-0.017*** (-3.556)	-0.018*** (-3.764)	-0.016*** (-3.248)	-0.018*** (-3.558)
<i>Constant</i>	0.012 (0.096)	-0.080 (-0.631)	-0.016 (-0.112)	-0.144 (-1.012)
<i>X</i>	Yes	Yes	Yes	Yes
<i>Firm &amp; Year</i>	Yes	Yes	Yes	Yes
Adj. R <sup>2</sup>	0.596	0.475	0.595	0.473
Obs.	8,312	8,312	6,673	6,673

at the 1% level. The magnitude of the coefficients also shows no substantial change compared to the baseline results. This indicates that the conclusions drawn earlier are robust.

### 5.2.3. *Balanced panel data*

Previous analysis was based on unbalanced panel data, where the composition of the sample varies across periods, potentially introducing some underlying bias in the results. Subsequently, we conduct regressions based on balanced panel data. Table 6, columns (1) and (2), report the regression results using balanced panel data. It is evident that the regression coefficients remain significantly negative at the 1% level, and their magnitudes show no significant changes compared to the baseline results. This reaffirms the reliability of the conclusions drawn earlier.

### 5.2.4. *Change the measurement of text intonation manipulation*

To ensure the reliability of the measured dependent variable, this study employed additional methods to re-measure the text manipulation degree of management. Firstly, the text manipulation degree was recalibrated using a tone manipulation indicator adjusted by the industry median, referred to as *Tone\_MD&A\_adj* and *AbnTone\_MD&A\_adj*, respectively. The results of the re-regression are presented in columns (3) and (4) of Table 6, consistent with the previous findings. Secondly, based on the formula (number of positive words – number of negative words)/total words (changing the denominator), the text tone and abnormal text tone were calculated separately, following the previously described steps. Thirdly, the measurement indicator for text

**Table 6.** Other robustness tests.

Dep. Var.	<i>Tone_MD&amp;A</i>	<i>AbnTone_MD&amp;A</i>	<i>Tone_MD&amp;A_adj</i>	<i>AbnTone_MD&amp;A_adj</i>
	(1)	(2)	(3)	(4)
<i>Treat</i> × <i>Post</i>	-0.018*** (-3.666)	-0.018*** (-3.550)	-0.014*** (-3.432)	-0.015*** (-3.662)
<i>Constant</i>	0.039 (0.279)	-0.047 (-0.352)	-0.407*** (-3.623)	-0.173 (-1.570)
<i>X</i>	Yes	Yes	Yes	Yes
<i>Firm &amp; Year</i>	Yes	Yes	Yes	Yes
Adj. R <sup>2</sup>	0.579	0.465	0.513	0.443
Obs.	6,600	6,600	8,312	8,312

tone manipulation was directly derived from the quantity (in logarithmic terms) of vocabulary related to risk disclosed by the company's management in MD&A. Analysis revealed a significant increase in the vocabulary related to risk disclosed by companies after the implementation of industry disclosure guidelines. It is evident that, regardless of the measurement method used, the results from the preceding analysis did not exhibit significant changes. Due to space limitations, detailed results are not reported but are available upon request.

#### 5.2.5. Placebo test

This study also employs a placebo test based on random simulation to address potential omitted variable concerns. Specifically, while ensuring the unchanged distributional form of the core variables, *Treat* and *Post*, this study randomly alters their values (assigning 0 or 1). The regression is then re-run using the generated simulated data, and this process is repeated 1000 times, summarising the coefficients of the core variable *Treat*×*Post*. The regression coefficients for *Treat*×*Post*, obtained through multiple random simulations, consistently hover around 0, deviating significantly from the actual regression coefficient (−0.016). Additionally, the corresponding t-values are predominantly distributed around 0. These results suggest the absence of substantial omitted variable bias in influencing the empirical findings of this study.

## 6. Further analyses

Earlier findings revealed that the IIDG (operational disclosure) can reduce the extent of text manipulation by company management. Subsequently, this study will further explore the underlying mechanisms of this effect and the boundary conditions under which this governance effect is operational.

### 6.1. Mechanism analysis

In line with the theoretical analysis presented earlier, this study will examine how operational disclosure restrains the extent of managerial text manipulation by compressing the manipulation space. Specifically, the examination will focus on three concrete mechanisms: quantitative information disclosure related to operations, industry comparability of textual information, and investor attention. Empirically, the study employs the mediation testing model outlined by Baron and Kenny (1986) and further summarised by Wen and Ye (2014). The analysis of the mediating mechanisms is complemented with Sobel tests and Bootstrap tests.

Firstly, this study tabulates the frequency of quantitative information (numbers) appearing in MD&A text and uses the logarithmic transformation of this count, denoted as *Quanti*, to measure the extent of quantitative information disclosure by company management. A higher *Quanti* value indicates a greater disclosure of operational quantitative information by the company's management. Following the mediation testing method outlined by Baron and Kenny (1986) and further summarised by Wen and Ye (2014), a stepwise regression is conducted. The results, as shown in Table 7, indicate in column (1) that the regression coefficient of

**Table 7.** Mechanism analysis.

	<i>Quanti</i>	<i>AbnTone_MD&amp;A</i>	<i>Similarity</i>	<i>AbnTone_MD&amp;A</i>	<i>Attention</i>	<i>AbnTone_MD&amp;A</i>
Dep. Var.	(1)	(2)	(3)	(4)	(5)	(6)
<i>Treat</i> × <i>Post</i>	0.154*** (4.947)	-0.015*** (-3.300)	0.026*** (10.410)	-0.014*** (-3.088)	0.601*** (11.227)	-0.014*** (-3.044)
<i>Quanti</i>		-0.005** (-2.142)				
<i>Similarity</i>				-0.065** (-2.460)		
<i>Attention</i>						-0.003** (-2.489)
Constant	3.812*** (6.079)	-0.109 (-0.911)	0.263*** (5.132)	-0.111 (-0.935)	6.907*** (5.631)	-0.108 (-0.905)
<i>X</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Firm &amp; Year</i>	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R <sup>2</sup>	0.391	0.474	0.650	0.474	0.737	0.474
Obs.	8,312	8,312	8,312	8,312	8,312	8,312
Sobel test		0.006		0.003		0.006
Bootstrap test		0.024		0.009		0.012

*Treat*×*Post* is significantly positive at the 1% level, implying that the IIDG promotes the disclosure of operational quantitative information by management. In column (2), the regression coefficient of *Quanti* is significantly negative at the 1% level, suggesting that disclosure of operational quantitative information reduces the extent of text manipulation. Sobel and Bootstrap tests confirm the existence of this mediating effect. Therefore, the IIDG, by encouraging companies to disclose more operational quantitative information, compresses the space for management to manipulate textual tone, thereby exerting a governance effect on such behaviour.

Secondly, this study measures the similarity (comparability) between a company's MD&A text and that of other companies in the same industry using the following method: 1) Tokenising the text; 2) Training an LDA model, selecting the optimal number of topics, and obtaining the document-topic distribution for each document; 3) Calculating the cosine similarity between any two texts using the cosine function; 4) Computing the average cosine similarity between a company's MD&A text and the MD&A texts of all other companies in the same industry, denoted as *Similarity*. A higher *Similarity* value indicates greater similarity (comparability) between a company's MD&A text and those of other companies in the same industry. Utilising the mediation testing method outlined by Baron and Kenny (1986) and further summarised by Wen and Ye (2014), a stepwise regression is conducted. The results, as shown in Table 7, indicate in column (3) that the regression coefficient of *Treat*×*Post* is significantly positive at the 1% level, suggesting that the IIDG enhances the comparability of textual information. In column (4), the regression coefficient of *Similarity* is significantly negative at the 5% level, indicating that higher text comparability is associated with less text manipulation. Sobel and Bootstrap tests confirm the existence of this mediating effect. Therefore, the IIDG, by increasing the comparability of textual information within the industry, reduces the extent of text manipulation by management.

Finally, this study tallies the number of posts<sup>4</sup> made by investors on interactive platforms and uses the logarithmic transformation of this count to measure investor attention towards the company. Employing the mediation testing method outlined by Baron and Kenny (1986) and further summarised by Wen and Ye (2014), a stepwise regression is conducted. The results, as presented in Table 7, indicate in column (5) that the regression coefficient of *Treat*×*Post* is significantly positive at the 1% level, suggesting that the IIDG enhances investor attention. In column (6), the regression coefficient of *Attention* is significantly negative at the 5% level, indicating that higher investor attention is associated with less text manipulation by management. Sobel and Bootstrap tests confirm the existence of this mediating effect. In summary, the IIDG, by increasing investor attention, reduces the manipulation space for management and consequently constrain the extent of text manipulation.

## 6.2. Cross-sectional analysis

As mentioned earlier, the extent of managerial text manipulation in listed companies can be attributed to two aspects: (1) the motives behind managerial tone manipulation, and (2) the scope available for managerial tone manipulation. Building upon this foundation, if mandatory disclosure of operational information can serve as an alternative external governance mechanism to curb managerial text manipulation, then its effects should be more pronounced in situations where the motives for tone manipulation and the available space for manipulation are greater. Following this logic, this study further examines the cross-sectional differences in the governance effects on managerial text manipulation motives and manipulation space at different levels.

### 6.2.1. The impact of manipulative motivation

The motives driving managerial tone manipulation influence the occurrence and severity of MD&A text manipulation. While it has been previously argued that the IIDG may not fundamentally change the utility function of management and, consequently, may not alter the motives for tone manipulation, it is still essential to consider manipulation motives as a crucial moderating factor. When managerial motives for manipulating text tone are stronger, the likelihood of the company's text tone being manipulated is generally higher. Therefore, this study anticipates that if industry disclosure guidelines, as an alternative external governance mechanism, can suppress managerial text manipulation, their marginal effects will be stronger in samples of companies with higher manipulation motives.

This study employs two methods to measure the strength of managerial motives for manipulating text tone. First, based on findings by Huang et al. (2014) and Zhou et al. (2019), concealing negative news is identified as a crucial consideration in managerial text tone manipulation, where the extent of accounting earnings growth (or decline) influences the motivation for tone manipulation. Therefore, the study uses the magnitude of the increase in earnings over the previous year, measured by the variable

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<sup>4</sup>Compared to stock forum posts primarily focused on stock price changes, posts on investor interaction platforms (such as HuDongYi and e HuDong) are more closely related to the company's operational activities.

*DetaEarning* as defined earlier. A smaller value of *DetaEarning* indicates greater managerial pressure and a stronger motivation for manipulating text tone. Second, accounting information, as a form of quantitative data, can be cross-validated with qualitative information such as text. Following the approach of H. Wang and Wang (2018), who found a consistent direction between the tone manipulation in annual report text and accruals manipulation, this study employs the modified Jones model to calculate the accrual manipulation variable *Dacc*. A higher value of *Dacc* indicates a higher degree of earnings management, and correspondingly, stronger motivations for managerial text tone manipulation as a complementary strategy, consistent with the findings of H. Wang and Wang (2018) and G. Liu and Wang (2021). Results in Table 8, Panels A and B, report the grouping test outcomes based on the annual median values of the variables *DetaEarning* and *Dacc*, respectively. Regression results indicate that regardless of the method used to measure the strength of managerial motives for manipulating text tone and whether the dependent variable is MD&A tone or abnormal tone, the coefficient of *Treat*×*Post* (absolute value) is significantly larger in subsamples where managerial motives for manipulating text tone are stronger. Taking columns (3) and (4) as examples, when managerial motives for manipulating text tone are stronger (i.e. lower increase in earnings over the previous year), the coefficient of *Treat*×*Post* is

**Table 8.** Heterogeneous impact of manipulative motivation.

Dep. Var.	<i>Tone_MD&amp;A</i>		<i>AbnTone_MD&amp;A</i>	
	Higher <i>DetaEarning</i>	Lower <i>DetaEarning</i>	Higher <i>DetaEarning</i>	Lower <i>DetaEarning</i>
	(1)	(2)	(3)	(4)
<b>Panel A: Based-on <i>DetaEarning</i></b>				
<i>Treat</i> × <i>Post</i>	-0.018*** (-3.102)	-0.011* (-1.684)	-0.017*** (-2.958)	-0.010 (-1.598)
Constant	0.005 (0.030)	0.143 (0.867)	-0.083 (-0.443)	0.053 (0.336)
<i>X</i>	Yes	Yes	Yes	Yes
<i>Firm &amp; Year</i>	Yes	Yes	Yes	Yes
Adj. R <sup>2</sup>	0.613	0.578	0.501	0.473
Obs.	4,127	3,852	4,127	3,852
P value	0.052		0.057	
Dep. Var.	<i>Tone_MD&amp;A</i>		<i>AbnTone_MD&amp;A</i>	
	Higher <i>Dacc</i>	Lower <i>Dacc</i>	Higher <i>Dacc</i>	Lower <i>Dacc</i>
	(1)	(2)	(3)	(4)
<b>Panel B: Based-on <i>Dacc</i></b>				
<i>Treat</i> × <i>Post</i>	-0.019*** (-2.836)	-0.014** (-2.416)	-0.020*** (-2.957)	-0.013** (-2.228)
Constant	0.024 (0.155)	0.148 (0.817)	-0.108 (-0.723)	0.071 (0.393)
<i>X</i>	Yes	Yes	Yes	Yes
<i>Firm &amp; Year</i>	Yes	Yes	Yes	Yes
Adj. R <sup>2</sup>	0.585	0.601	0.445	0.499
Obs.	3,936	3,958	3,936	3,958
P value	0.160		0.088	

Note: The between-group difference test for regression coefficients was obtained using the Bootstrap method with 1000 samples. Unless otherwise specified, the same below.

−0.017, significantly significant at the 1% level. In contrast, when managerial motives for manipulating text tone are weaker (i.e. higher increase in earnings over the previous year), the coefficient of *Treat*×*Post* is −0.010, lacking statistical significance. Furthermore, the coefficient difference test suggests that this difference is significant ( $p = 0.057$ ). In summary, these results indicate that the IIDG, as an alternative external governance mechanism, exhibits a stronger effect in suppressing managerial text tone manipulation in samples with higher manipulation motives.

### 6.2.2. The impact of manipulation space

The size of the space available for managerial tone manipulation is another crucial factor influencing the extent of corporate text manipulation. This study will discuss the heterogeneous impact of manipulation space on the governance effect of the IIDG from three aspects: business characteristics, information features, and external supervision. Firstly, from the perspective of business characteristics, when a firm's operations are more complex, the costs for external information users to acquire, verify, and understand the firm's operational information significantly increase (Huang et al., 2014). One aspect of evidence is that existing research indicates that complex business features are a crucial factor for markets to rely on professional information intermediaries such as auditors and analysts for services (Huang et al., 2014; Ma et al., 2022). Therefore, it is not difficult to understand that when a firm's business features are more complex, managerial manipulation of text tone is less likely to be detected by external information users, indicating a larger manipulation space. Hence, this study anticipates that if the IIDG, as an alternative external governance mechanism, can suppress managerial text tone manipulation, their marginal effects will be stronger in samples of firms with higher business complexity.

Following the approach of Ma et al. (2022), this study employs the natural logarithm of the number of company-controlled subsidiaries to measure business complexity, denoted as *Sub*. The more affiliated entities a company has, the higher its business complexity. Table 9 reports the grouping test results based on the annual median values of the variable *Sub*. The results indicate that in column (1), where business complexity is higher, the absolute value of the coefficient for *Treat*×*Post* is significantly greater than in column (2), where business complexity is lower. The empirical p-value corresponding to the difference between the groups is significant at the 5% level. The dependent variable is

**Table 9.** Heterogeneous impact of manipulation space: business characteristics.

Dep. Var.	Tone_MD&A		AbnTone_MD&A	
	Higher <i>Sub</i>	Lower <i>Sub</i>	Higher <i>Sub</i>	Lower <i>Sub</i>
	(1)	(2)	(3)	(4)
<i>Treat</i> × <i>Post</i>	−0.020*** (−3.133)	−0.012* (−1.761)	−0.019*** (−2.953)	−0.010 (−1.554)
Constant	0.480** (2.366)	−0.235 (−1.393)	0.386* (1.936)	−0.282* (−1.699)
<i>X</i>	Yes	Yes	Yes	Yes
<i>Firm &amp; Year</i>	Yes	Yes	Yes	Yes
Adj. R <sup>2</sup>	0.601	0.605	0.504	0.475
Obs.	3,817	4,280	3,817	4,280
P value		0.035		0.032

replaced with abnormal MD&A text tone (*AbnTone\_MDA*), and the results remain consistent. These findings suggest that the inhibitory effect of mandatory disclosure of the IIDG on text tone manipulation is stronger in companies with higher business complexity.

Secondly, from the perspective of information features, accounting information comparability is a crucial characteristic. It refers to the idea that when economic transactions are the same, accounting information from different entities should depict similar situations; conversely, when economic transactions differ, accounting information should reflect those differences. Existing research indicates that accounting information comparability is beneficial for investors and other information users to compare, analyse, distinguish, and predict the financial conditions, operational results, and future prospects of different companies when economic transactions are the same. Moreover, it facilitates obtaining additional information about a target company's operational performance from other companies within the industry, reducing information collection costs (Yuan & Wu, 2012). It is evident that when comparability is high, managerial behaviours such as earnings management and concealing negative news are more likely to be detected (Kim et al., 2016; Sohn, 2016). Conversely, when a company's accounting information comparability is low, the space for managerial text tone manipulation is larger. Therefore, this study anticipates that if the IIDG, as an alternative external governance mechanism, can suppress managerial text tone manipulation, their marginal effects will be stronger in samples of companies with lower accounting information comparability.

Drawing inspiration from De Franco et al. (2011), this study constructs a metric for accounting information comparability, denoted as *Comparability*. The larger the value of this metric, the higher the comparability of a company's accounting information. Table 10 reports the grouping test results based on the annual median values of the variable *Comparability*. The results indicate that in column (1), where accounting information comparability is lower, the absolute value of the coefficient for *Treat*×*Post* is significantly greater than in column (2), where accounting information comparability is higher. The empirical p-value corresponding to the difference between the groups is significant at the 1% level. The dependent variable is replaced with abnormal MD&A text tone (*AbnTone\_MDA*), and the results remain consistent. These findings suggest that the

**Table 10.** Heterogeneous impact of manipulation space: information characteristics.

Dep. Var.	<i>Tone_MD&amp;A</i>		<i>AbnTone_MD&amp;A</i>	
	<u>Lower Comparability</u>	<u>Higher Comparability</u>	<u>Lower Comparability</u>	<u>Higher Comparability</u>
	(1)	(2)	(3)	(4)
<i>Treat</i> × <i>Post</i>	−0.029*** (−3.125)	−0.007 (−0.776)	−0.027*** (−2.919)	−0.007 (−0.803)
<i>Constant</i>	−0.156 (−0.554)	0.516 (1.501)	−0.212 (−0.790)	0.500 (1.365)
<i>X</i>	Yes	Yes	Yes	Yes
<i>Firm &amp; Year</i>	Yes	Yes	Yes	Yes
Adj. R <sup>2</sup>	0.609	0.613	0.506	0.527
Obs.	2,263	2,495	2,263	2,495
Empirical p-values		0.003		0.003

Note: The sample size in this table decreases due to the lack of some data required to calculate the comparability of accounting information.

**Table 11.** Heterogeneous impact of manipulation space: external supervision.

Dep. Var.	<i>Tone_MD&amp;A</i>		<i>AbnTone_MD&amp;A</i>	
	<i>Non-Big8</i>	<i>Big8</i>	<i>Non-Big8</i>	<i>Big8</i>
	(1)	(2)	(3)	(4)
<i>Treat</i> × <i>Post</i>	−0.020*** (−3.122)	−0.013* (−1.959)	−0.018*** (−2.920)	−0.013** (−2.012)
<i>Constant</i>	−0.037 (−0.220)	−0.089 (−0.510)	−0.154 (−0.948)	−0.156 (−0.882)
<i>X</i>	Yes	Yes	Yes	Yes
<i>Firm &amp; Year</i>	Yes	Yes	Yes	Yes
Adj. R <sup>2</sup>	0.687	0.684	0.596	0.595
Obs.	4,113	3,982	4,113	3,982
P value	0.063		0.136	

inhibitory effect of mandatory disclosure of the IIDG on text tone manipulation is stronger in companies with lower accounting information comparability.

Finally, from the perspective of external supervision, as the intensity of external supervision increases, the space for managerial text tone manipulation will be compressed. Taking auditing as an example, although auditors are not directly responsible for text tone, they serve as an external supervisory mechanism that limits management's discretion in reporting, thereby reducing information risk. Chen et al. (2011) pointed out that large audit firms have a stronger motivation to protect their reputation and provide higher-quality audits. They provided empirical evidence for this by showing that firms audited by large accounting firms have higher transparency in financial reporting and lower equity financing costs. Building on this, Zhou et al. (2019) further argued that when audited by large firms, it is more difficult for management to disclose false information in reports, resulting in a higher level of truthfulness in text tone. This study anticipates that if the IIDG, as an alternative external governance mechanism, can suppress managerial text tone manipulation, their marginal effects will be stronger in samples of companies with lower audit quality.

Referring to the approach of Chen et al. (2011), this study uses whether the accounting firm providing audit services to the company is one of the *Big8* (comprising the international big four accounting firm and the domestic big four accounting firm) as a measure of external audit quality, denoted as *Big8*. When a company engages an accounting firm from the *Big8*, it faces stronger external audit supervision. Table 11 reports the grouping test results based on the variable *Big8*. The results indicate that in column (1), where the audit firm is smaller, the absolute value of the coefficient for *Treat*×*Post* is significantly greater than in column (2), where the audit firm is larger. The empirical p-value corresponding to the difference between the groups is significant at the 10% level. The dependent variable is replaced with abnormal MD&A text tone (*AbnTone\_MDA*), and while the group difference slightly decreases, the basic conclusion remains unchanged. These findings suggest that the inhibitory effect of mandatory disclosure of the IIDG on text tone manipulation is stronger in companies audited by smaller accounting firms (*non-Big8*).

**Table 12.** Spillover effects: the impact of mandatory disclosure on other sections beyond MD&A.

	<i>Tone_Others</i>	<i>AbnTone_Others</i>
Dep. Var.	(1)	(2)
<i>Treat</i> × <i>Post</i>	-0.014*** (-6.628)	-0.012*** (-5.426)
Constant	-0.199*** (-3.277)	-0.136** (-2.273)
<i>X</i>	Yes	Yes
<i>Firm &amp; Year</i>	Yes	Yes
Adj. R <sup>2</sup>	0.719	0.659
Obs.	8,194	8,194

### 6.3. Spillover effects: impact on other texts

Annual reports, as the primary means of external disclosure for listed companies, encompass a plethora of content beyond the MD&A section, including financial analysis and notes, corporate governance, social responsibility, and various other textual information. Therefore, it is plausible to consider whether the IIDG, besides constraining managerial text tone manipulation in the operational information section (i.e. MD&A), also exhibit spillover effects, influencing text tone manipulation in other sections of the annual report. The rationale lies in the fact that within the annual report, the MD&A section provides the management's description, interpretation, and explanation of the company's production and operational activities, as well as future plans. This section is inherently connected to other parts of the annual report, and typically, the tones in both sections are consistent, allowing for cross-verification. If the IIDG can enhance the quality of textual disclosure in the MD&A section, market participants such as investors, auditors, analysts, and regulatory authorities can conveniently utilise the textual descriptions in the MD&A section to assess the company's true situation. This facilitates pre-emptive deterrence against managerial manipulation of text tones in other sections of the annual report. Moreover, it enables prompt detection and subsequent punishment after actual manipulation by the management.

To test this, the study utilises the annual report text excluding the MD&A section. Following the methodology used to calculate the degree of textual tone manipulation in the MD&A section, the study obtains measures of textual tone manipulation for other sections of the annual report. These measures are denoted as *Tone\_Others* and *AbnTone\_Others* for textual tone and abnormal textual tone in other sections of the annual report, respectively. Similar to the previous approach, larger values of these measures indicate a more severe manipulation of textual tone by the management in other sections of the annual report. These two measures replace the dependent variable in Model (1), and the regression results are presented in Table 12. It is evident that the coefficient of *Treat*×*Post* is significantly negative at the 1% level. This suggests that the IIDG not only curb textual tone manipulation in the MD&A section but also mitigate textual tone manipulation in other sections of the annual report, indicating the presence of spillover effects.

**Table 13.** The punishment effect of capital market.

Dep. Var.	CAR[-2,+2]		
	Full sample	<i>Treat</i> × <i>Post</i> =0	<i>Treat</i> × <i>Post</i> =1
	(1)	(2)	(3)
<i>Tone_MD&amp;A_adj</i> × <i>Treat</i> × <i>Post</i>	-0.067** (-1.980)		
<i>Tone_MD&amp;A_adj</i>	0.005 (0.235)	0.016* (1.720)	-0.024* (-1.680)
<i>Tone_MD&amp;A_adj</i> × <i>Treat</i>	0.027 (0.908)		
<i>Tone_MD&amp;A_adj</i> × <i>Post</i>	0.014 (0.544)		
<i>Treat</i> × <i>Post</i>	0.000 (0.047)		
Constant	0.229*** (2.950)	0.067** (2.286)	0.010 (0.232)
X	Yes	Yes	Yes
Firm & Year	Yes	Yes	Yes
Adj. R <sup>2</sup>	0.042	0.031	0.028
Obs.	8,304	5,879	2,425

#### 6.4. Punishment effect

Previous research has shown that, following the IIDG implementation, there has been an increase in the disclosure of industry-related quantitative information, the comparability of textual information within the industry, and investor attention. This has subsequently constrained the manipulation space for management in manipulating textual tones. However, a crucial aspect of the effectiveness of industry disclosure guidelines in restraining textual tone manipulation is that, with the overall decrease in industry-wide positive tones, individual firms still engaging in such manipulation will face corresponding punishment. Therefore, this study utilises the previously defined industry-adjusted annual median textual tone, *Tone\_MD&A\_adj*, to measure individual firms' deviations from the industry's positive tone. Subsequently, the paper examines how stakeholders respond to those companies that continue to engage in textual tone manipulation following the IIDG implementation. Table 13 reports the regression results for the dependent variable, the market reaction in the two days around the publication of the annual report.<sup>5</sup> From column (1), it can be observed that the coefficient of *Tone\_MD&A\_adj*×*Treat*×*Post* is significantly negative. This implies that, following the IIDG implementation, companies engaging in textual tone manipulation relative to the industry face more negative reactions from investors. To provide a clearer comparison, the study conducts subgroup tests, as shown in columns (2) and (3). For the samples not affected by the IIDG, investors' reaction to abnormal positive tones is significantly positive (0.016), indicating investors are misled. However, after the IIDG implementation, investors' reaction to abnormal positive tones becomes significantly negative (-0.024). This aligns with the earlier logic,

<sup>5</sup>The text describes that the study also considers how regulators would treat companies that continue to engage in text sentiment manipulation. However, due to missing data resulting from the fact that regulatory inquiries were only publicly disclosed starting in 2015, regression analysis could not be performed. Nevertheless, the study reviews the regulatory inquiries involving the sample companies. Descriptive statistics reveal that out of 732 inquiries, 306 inquiries explicitly mention the 'industry disclosure guidelines'. This indicates that regulators also apply sanctions to companies that fail to disclose operational information according to the guidelines.

suggesting that, benefiting from factors such as increased investor attention and improved comparability due to industry disclosure guidelines, the overall industry's abnormal positive tones decrease. In this scenario, individual firms continuing to engage in textual tone manipulation will face the punishment of investors 'voting with their feet.

## 7. Conclusion

The IIDG is an important exploration of the regulatory model for information disclosure in capital markets in recent years, and their economic consequences are worthy of continuous attention and in-depth research. This study, based on the unique perspective of managerial text sentiment manipulation, examines the governance effects of the IIDG mandating companies to disclose operational information. The research finds that industry disclosure guidelines play a role by increasing the disclosure of quantitative information related to a company's operations, the comparability of textual information within the industry, and mechanisms such as investor attention, thereby inhibiting managerial text sentiment manipulation. Further, from multiple dimensions (business characteristics, information environment, and external supervision), the study measures the motivation and space for managerial text sentiment manipulation. It finds that this governance effect is more pronounced when managerial motivation for text sentiment manipulation is stronger and the manipulation space is larger. The study also discovers that industry disclosure guidelines have a spillover effect, not only affecting the text sentiment of managerial discussion and analysis but also improving the text sentiment manipulation in other parts of the annual report. If individual companies still engage in text sentiment manipulation, they will face certain penalties from investors and regulators.

The policy implications of this study are evident in several aspects. Firstly, industry disclosure guidelines, as a new form of external governance mechanism, enhance the quality of textual information disclosure by mandating companies to disclose operational information. This effect is particularly strong when managerial motivation for textual sentiment manipulation is stronger and the manipulation space is larger. Therefore, it is possible to further refine industry-specific information disclosure models to improve the targeted and effective nature of information disclosure. This can, in turn, play a more significant and positive role in promoting capital market services for the real economy.

Secondly, as textual sentiment manipulation has low costs, is difficult to identify, and lacks effective governance mechanisms, it has been a common means for management to harm investor interests, hindering the improvement of the company's information environment. The evidence provided in this study indicates that increasing the disclosure of quantitative information related to operations, improving the comparability of textual information within the industry, and garnering more attention from investors are effective mechanisms to govern managerial textual sentiment manipulation. Therefore, encouraging and guiding listed companies to increase the disclosure of non-financial information such as operational data through diverse channels and forms can be considered based on the specific conditions of each industry.

Lastly, the study's conclusions suggest that securities market regulation not only influences company earnings and other accounting figures but also indirectly affects

textual information. Therefore, regulatory authorities, when formulating information disclosure policies, should proactively consider various unintended effects of the policies to achieve higher benefits at lower costs.

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## Appendix

### Appendix Variable Definitions

Variables	Definition and calculation
<i>Tone_MD&amp;A</i>	MD&A text tone, equal to (number of positive words-number of negative words)/(number of positive words + number of negative words)
<i>AbnTone_MD&amp;A</i>	Abnormal tone of the MD&A text, calculated by the regression with the company fundamental variables. See the description of the specific algorithm in the text.
<i>Treat</i>	If the stock exchange issues industry information disclosure guidelines for the industry to which the company belongs in the sample period, the value is 1, 0 otherwise.
<i>Post</i>	After the implementation of the guidelines issued by the exchange for the company's industry (and the corresponding control group of another exchange), the value is 1, 0 otherwise.
<i>Earning Return</i>	Net profit/total assets of previous year
<i>Size</i>	Annual individual stock returns considering reinvestment of cash dividends
<i>BTM</i>	The natural logarithm of market value at the end of the year
<i>StdEarning</i>	Year-end total assets/Year-end market value
<i>StdReturn</i>	Standard deviation of Earning over the last three years
<i>Age</i>	Standard deviation of monthly stock returns for the current year
<i>Segment</i>	The natural logarithm of listing years after adding 1
<i>DeltaEarning</i>	The natural logarithm of the number of cross-industry business operations after adding 1.
<i>AFE</i>	Change in net profit, (net profit of current year-net profit of last year)/total assets of last year
<i>Loss</i>	Analyst forecast error, the average of analyst forecasts minus the actual earnings divided by the stock price at the beginning of the year
<i>Leverage</i>	If earnings in the current year is less than 0, the value is 1; 0 otherwise.
<i>AFN</i>	Total liabilities/total assets
<i>IIO</i>	The natural logarithm of the number of analysts following in the current year after adding 1
<i>Quanti</i>	Shareholding ratio of institutional investors in the current year
<i>Similarity</i>	The natural logarithm of the amount of quantitative information (number) in the MD&A text after adding 1
<i>IAttention</i>	The average similarity between the text of the MD&A and the text of all other companies in the same industry, and the specific calculation is described in the text.
<i>Dacc</i>	Investor attention, the natural logarithm of the sum of the number of posts posted by investors on the interactive and e-interactive platforms in the same year after adding 1
<i>Sub</i>	The absolute value of discretionary accruals calculated by the modified Jones model
<i>Comparability</i>	The natural logarithm of the number of subsidiaries controlled by the company
<i>Big8</i>	Referring to De Franco et al. (2011), and calculate the annual median of other companies in the same industry.
<i>Tone_Others</i>	If the accounting firm is one of the top four in the world or one of the top four in China, the value is 1; 0 otherwise
<i>AbnTone_Others</i>	The tone of the text of the annual report excluding the MD&A section, equal to (number of positive words-number of negative words)/(number of positive words + number of negative words)
<i>Tone_MD&amp;A_adj</i>	Abnormal text tone calculated by regression with company fundamental variables
<i>AbnTone_MD&amp;A_adj</i>	MD&A text tone adjusted by industry annual median
<i>CAR[-2,+2]</i>	Abnormal MD&A text tone adjusted by industry annual median
	Market reaction with [-2, + 2] before and after the publication of the annual report, and the estimated window is 120 days before the publication of the annual report ([-130, -11])