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RESEARCH ARTICLE

The Spillover Effects of Auditor Sanctions on Client Firms: Evidence From Deep Learning on Investors' Online Voice in China

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ABSTRACT This study examines the spillover effects of auditor sanctions on client firms and validates the extent to which social media communications empower traditionally weak investors' voice. In the context of China which offers unique data from regulated interactive platforms, the study examines the effects of auditor sanctions on investors' online voice, employing the DID model. Results suggest that auditor sanctions increase the number of questions and number of words in the questions asked by investors about client firms on online interactive platforms. The deep learning Pre-trained $\text{BERT}_{\text{BASE}}$ model for sentiment analysis demonstrates that auditor sanctions also significantly increase the number of questions with negative sentiments. The results still hold after multiple robustness tests. Such adverse spillover effects of auditor sanctions are more pronounced among non-state-owned client firms and firms with higher shareholding concentration. This study contributes by enriching the application of deep learning models in text analysis in the social sciences, validating the importance that investors attach to auditor sanctions and thus the effectiveness of government regulation.

INDEX TERMS Deep learning, $\text{BERT}_{\text{BASE}}$ model, spillover effect, auditor sanctions, sentiment analysis, exchange online interactive platforms, minority shareholders.

I. INTRODUCTION

Auditors are motivated to pursue high-quality audits for two major reasons, i.e. to safeguard reputation and avoid legal penalties [1]. Besides legal penalties, the reputation mechanism is particularly important for the well-organized operation of the audit market. Government regulation with the use of sanctions constitutes an important influence on the formation of auditor reputation mechanism [2]. Therefore, the consequences and effectiveness of government regulation, especially government sanctions, deserve more attention.

Extant information science and marketing literature suggest that the Internet and social media enhance communications in two ways; i.e. communications become more engaging and include a larger audience [3], [4], [5], [6]. Consequently, social media communications can empower weak voices. Small businesses with limited resources for advertising and marketing are empowered to reach a broader target market than traditionally possible with the use of social media [4]. Similarly, extant accounting literature suggests that the traditionally weak voice of minority shareholders is becoming increasingly prominent with the advent of social media platforms and has the potential to play a more significant governance role [7], [8], [9], [10], [11].

Minority shareholders participate in the capital market in two ways, i.e. exit and voice [12]. Given that minority shareholders' voice was traditionally weak and rarely heard, having to voice their opinions was particularly daunting. Hence, minority shareholders preferred to express their dissatisfaction by selling shares instead, i.e. exiting. The effects of bad news like auditor sanctions on minority shareholders' sale of shares resulting in the decline in share price receive ample attention in the accounting literature [13], [14]. However, scholarly attention remains limited regarding investors' responses to auditor sanctions from the perspective of investors' voice. While extant accounting literature

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demonstrates the growing prominence of minority shareholders' online voice to the extent of having an impact on auditing, such as audit fees, audit quality as well as audit behaviors and judgments [7], [8], [9], [10], [11], much is to be understood about the effects of auditing on minority shareholders empowered voice. Consequently, this study examines the effects of auditor sanctions on minority shareholders' online voice in the context of China. This study contributes by validating the extent to which the empowered voice of investors in this information age can magnify the effect of auditor sanctions while shedding light on the effectiveness of government regulation.

Unlike in developed economies characterized by high litigation risks like those of the United States and the United Kingdom [15], auditors in China are exposed to low litigation risks and auditors' reputation plays a more crucial governance role [2], [16]. Thus, the Chinese context is conducive to validating the effectiveness of government regulations, i.e. sanctions. Further, online interactive platforms like Interactive Easy and SSE e-Interactive, are established and monitored by stock exchanges in China. Therefore, online communications on these two platforms are guaranteed to be authentic and important for minority shareholders to be heard. Similar online interactive platforms have yet to be established in other countries [17]. Hence, the context of China offers unique data to examine the effects of auditor sanctions on minority shareholders' empowered voice.

First, this study examines the spillover effect of audit sanctions on the degree of investors' concerns. Consistent with the expectations, auditor sanctions significantly and positively affect the number of questions and the number of words in the questions that investors ask on online interactive platforms. Second, this study analyzes the sentiment tendency of investors' questions using the deep learning $\text{BERT}_{\text{BASE}}$ model. Results show that auditor sanctions also significantly increase the negative sentiment in investors' voice on online interactive platforms. Such findings hold after a series of robustness checks.

The findings of this study corroborate those of previous studies, which shed light on investors' binary response—i.e. to exit or not to exit—to auditor sanctions [13], [14]. This study offers a richer understanding of where the degree of investors' concern about auditor sanctions can be examined based on the number of questions asked, the number of words in the questions, and sentiment tendency.

Results of sensitivity analysis suggest that auditor sanctions are more likely to arouse a heightened degree of investor concern among non-state-owned firms compared with state-owned firms. Results also suggest a moderating effect of shareholding concentration where auditor sanctions arouse a heightened degree of investors' negative sentiment among firms with higher shareholding concentration.

This study has three major contributions to the literature. First, this paper verifies the importance that minority shareholders attach to auditor sanctions through an empowered voice. Building on the existing stream of literature that suggests investors' voice promotes investment in audit resources to improve audit quality [7], [8], this paper fills in the front-end chain, i.e. the antecedent to investors' voice. Second, this study enriches existing research on the antecedents of investors' concerns. While a corporate stock name change [18], any random information encountered online [19], and media coverage [20] can contribute to investors' concerns, this study demonstrates that auditor sanctions can cause heightened investors' concerns. Third, this paper extends the existing stream of literature on the spillover effects of auditor sanctions. The spillover effects of auditor sanctions on audit fees & audit market share [21], [22], and audit quality [22], [23], [24] have been examined. In terms of the spillover effects of auditor sanctions on clients, existing studies mainly provide evidence from the regulator's perspective [25], the creditor's perspective [26], [27], and investors' exit behavior [13], [14]. This paper sheds light on the effect of auditor sanctions on investors' recently empowered voice. Finally, this article enriches the literature on the application of deep learning models to text analysis in the social sciences. Most of the existing literature uses machine learning like SnowNLP for sentiment analysis [28], [29], which is less accurate than deep learning like the Pre-trained $\text{BERT}_{\text{BASE}}$ model [30].

This study has three major practical implications. First, for client firms, this study sheds light on the importance of engaging auditors who have not been sanctioned, to send positive signals to investors. Second, as the public at large especially investors places great importance on auditor sanctions, this study highlights the importance of government regulation as a critical complement to legal institutions, especially in emerging economies with underdeveloped legal frameworks. Third, for other countries with low litigation risk like Germany and Japan [31], the findings of this study suggest that strict regulatory practices in imposing sanctions on the part of the government and official social media platforms to empower investors' voice can serve as governance mechanisms that motivate continuous improvement in audit quality.

The rest of this paper is organized as follows. Section II profiles the institutional background. Section III reviews the literature and develops the hypotheses. Sections IV describe our research design which includes the regression model, sample & data, and descriptive statistics. Sections V and VI present the empirical results, robust check, and sensitivity analyses. This paper presents the conclusions in Section VII.

II. INSTITUTIONAL BACKGROUND

A. CHINA AUDIT MARKET

From 1949 to 1980, the central government of China owned and managed companies in the absence of independent auditing. The early 1980s saw fundamental reform and transformation of China's economic system with the establishment of the auditing profession, which was mostly funded by the state and associated with universities or government departments. Such connection with the government hindered audit professional independence. Hence, decoupling and

restructuring of the audit profession began in 1997 when audit firms were required to become financially and operationally independent from government agencies and assume full legal responsibility for their actions [32].

Unlike their counterparts in a harsh legal environment in the United States and the United Kingdom [15], auditors in an emerging market in China face lower litigation risks [2], [16]. The Chinese government's ex-post punitive regulation becomes crucial in disciplining auditors and improving audit quality in such an environment [33].

According to China's CPA Law, the China Securities Regulatory Commission (CSRC) is a key regulatory body[1] responsible for inspecting listed companies and their auditors, and can penalize auditors if audit reports contain fraudulent or misleading information. CSRC makes public and detailed disclosures of its sanctions. This paper examines the spillover effects of auditor sanctions on client firms to test whether market players related to client firms value information pertaining to reputational damage after auditor sanctions, which is an effective way to test the effectiveness of government regulation. Auditor sanctions in this paper refer to sanctions CSRC imposes on audit firms.

B. EXCHANGE ONLINE INTERACTIVE PLATFORMS

While mature capital markets in Western countries are dominated by large investment institutions, minority shareholders are the mainstay of the capital market in China [34]. By 2021, the number of minority shareholders in the Shenzhen Stock Exchange amounted to 276,979,700, i.e. 99.74%, and the number of minority shareholders in the Shanghai Stock Exchange amounted to 298,527,000, i.e. 99.69%. ''Voice'' is a way for minority shareholders to express their concerns, including asking questions to management, writing letters, submitting motions and voting at shareholders' meetings, negotiating with management, and using social media platforms [35]. Of the various social media platforms, SSE e Interactive and Interactive Easy are exclusively for minority shareholders to ''make their voices heard''.

Shenzhen Stock Exchange (SZSE) and Shanghai Stock Exchange (SSE) set up the Interactive Easy and SSE e-Interactive in 2011 and 2013 respectively, for individual minority shareholders to exchange experiences and opinions. Unlike other social media platforms, communications on Interactive Easy and SSE e-Interactive are supervised by stock exchanges, and information authenticity is guaranteed. Therefore, Interactive Easy and SSE e-Interactive (hereinafter referred to as the exchange online interactive platform) provide a good source of data for research.

[1]According to China's CPA Law and other relevant laws, the government regulation of the audit market is mainly implemented through three major regulatory bodies: the China Institute of Certified Public Accountants (CICPA), the Ministry of Finance (MOF), and the China Securities Regulatory Commission (CSRC). CICPA is a self-regulatory organization that carries out the management and services of the profession with specific responsibility for the daily management of the auditor profession. The Ministry of Finance (MOF) is primarily responsible for managing the nation's accounting work and guiding and supervising the operations of auditors. However, the CICPA and the MOF do not fully disclose information in an open and transparent manner after imposing administrative penalties on auditors.

III. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

A. THE SPILLOVER EFFECT OF AUDITOR SANCTIONS

Extant literature suggests that sanctioned auditors face adverse consequences like a decrease in market share [36], [37] and audit fees [15], [38], while causing sanctioned auditors to increase their work effort, which in turn improves audit quality [39], [40], [41], [42]. Such adverse consequences and effects on audit quality can spill over to other innocent auditors within the same firm [22], successor auditors [43], other innocent audit firms [21], and even the audit profession [23].

Auditor sanctions, which signal poor audit quality [44], also have spillover effects on client firms. Among the adverse spillover effects on client firms are higher debt financing costs [26], [27], higher IPO rejection rates [25], and lower share prices [13], [14].

B. INVESTORS' CONCERNS

Prior literature suggests that media coverage, i.e. positive and negative news, attract minority shareholders' attention [45]. Even unrelated news coverage can direct minority shareholders' attention to firms' annual reports [20]. More recent studies suggest that changes in stock names and any random information encountered also attract minority shareholders' attention [18]. Interactions and communications on social media platforms are increasingly gaining research attention to better understand minority shareholders' concerns (e.g. [..18,..46, 47,..48]).

On Interactive Easy and SSE e Interactive, minority shareholders can ask questions and obtain answers online. Investors' questions are representative of investors' concerns; the number of questions asked on exchange online interactive platforms within a certain period and the number of words in the questions constitute the measure of investors' concerns [9], [14], [28]. Recent developments in the application of text-informed data have enabled the sentiments of questions and answers to be measured [29].

C. AUDIT SANCTIONS AND INVESTORS' CONCERNS

Signal transmission theory posits that client firms are signal senders, whereas users of financial statements which include minority shareholders are signal receivers. Independent auditing provides an assurance of the accuracy and dependability of the signals transmitted by client firms, thereby mitigating issues of information asymmetry. However, auditors who have been sanctioned are generally regarded as of lower quality, casting doubt on the credibility of the audited financial statements [49], [50]. As such, auditing no longer conveys positive signals. Furthermore, low-quality audits exhibit a contagion effect [32], [51], wherein diminished audit quality can extend to other client firms without direct evidence of

financial misconduct, suggesting an association with similarly deficient audit practices. In addition to reacting by exiting, minority shareholders also voice their concern about a firm given the prevalence of social media platforms [9], [52].

Social media is a powerful tool for minority shareholders' activism, providing a brand-new platform to speak out, and achieve equal conversation with public companies. Similarly, in line with the information age, minority shareholders' voice plays an increasingly important monitoring role [9]. The impact of minority shareholders' voice on auditor behavior has been confirmed in the existing literature; the online voice of minority shareholders can lead to a significant increase in auditors' perceived control risk, which can exacerbate auditors' concerns about reputational damage and litigation risk, and consequently increase audit investment and audit fees [7], [8].

Since social media communications can empower weak voices, investors are posited to voice their concerns about the sanctioned auditor's client firms. In an attempt to validate the signal transmission theory, this study hypothesizes that auditor sanctions increase the degree of investors' concerns. The degree of investors' concerns is reflected in the number of questions and number of words included in the questions on the exchange online interactive platform. H1 is as follows.

H1: Auditor sanctions increase (a) the number of questions and (b) the number of words in the questions, on online interactive platforms.

Extant literature suggests that the sentiments of investors' online voice, especially negative sentiments, can trigger wider dissemination on the Internet and have profound implications where auditors' risk perceptions and corporate image are affected [10]. However, much is to be understood about the antecedents of the sentiments in investors' voice. This study posits that auditor sanctions have an adverse effect on the sentiments in investors' online voice. H2 is as follows.

H2: Auditor sanctions increase the negative sentiment tendency on online interactive platforms.

IV. RESEARCH DESIGN

A. REGRESSION MODEL

1) THE DEGREE OF INVESTORS' CONCERNS MODEL

This paper treats auditor sanctions at different times as a natural experiment with multi-period, time-varying treatment, and aims to assess the impact of auditor sanctions on investors' concerns about client firms. Staggered Differences-in-Differences (Staggered DID) has been widely used in the field of policy evaluation or assessment of shocks to external events [53], [54], due to its ability to better mitigate endogeneity and effectively identify the net effect of treatment [55].

H1 is tested using a method similar to Beck et al. 's [56] study. A staggered difference-in-differences specification is applied to evaluate the relationship between auditor sanctions and the degree of investors' concerns, as shown in the following regression models (client firm and t subscripts are omitted). The degree of concern is reflected in the number of questions and the number of words in the questions on the exchange online interactive platform.

$$\mathbf{Questions} = \boldsymbol{\alpha_0} + \boldsymbol{\alpha_1}\mathbf{DID} + \sum \boldsymbol{\alpha_k}\mathbf{Controls} + \mathbf{Industry} + \mathbf{t} + \boldsymbol{\varepsilon} \quad (1)$$

$$\mathbf{Investor-length} = \boldsymbol{\alpha_0} + \boldsymbol{\alpha_1}\mathbf{DID} + \sum \boldsymbol{\alpha_k}\mathbf{Controls} + \mathbf{Industry} + \mathbf{t} + \boldsymbol{\varepsilon} \quad (2)$$

TABLE 1. Definition of variables.

Dependent variable	
Questions	The number of questions for client firm i in month t asked by investors on the exchange interactive platforms.
Investor-length	The number of words in questions for client firm i in month t asked by investors on the exchange interactive platforms.
Negative	The total number of questions with negative sentiment tendencies received by client firm i during period t.
Independent variables	
DID	The dummy variable, DID=1 for client firm-months after its audit firm was sanctioned, otherwise DID=0.
Control variables	
State	Dummy variable, State=1 for state-owned clients, otherwise State =0.
Size	Natural logarithm of total company assets.
Lev	total liability/total assets
Listage	Listage=ln (1+Length of listing)
Roa	Return on assets of the company= total profit/total assets
Dual	The dummy variable, Dual=1 for the chairman and the general manager are the same person, otherwise Dual =0.
Audittyp	The dummy variable, Audittyp =1 if the audit opinion was not clean, otherwise Audittyp =0.
Rename	The dummy variable, rename=1 for the stock that changed its name during the period t, Rename=0 otherwise.
Survey	The dummy variable, Survey=1 if there was the institutional survey, Survey=0 otherwise.
Media	Natural logarithm of the sum of online and newspaper media coverage for client firm i in given t.

TABLE 2. The sample.

Panel A: Auditor Sanction			
NO.	Sanction data	Sanctioned audit firm	Whether as treatment time
1	2021.2.18	GP Certified Public Accountants	yes
2	2021.4.12	RuiHua Certified Public Accountants	yes
3	2021.7.22	Zhongxingcai Guanghua Certified Public Accountants	yes
4	2021.9.2	RuiHua Certified Public Accountants	no
5	2021.9.14	ZhongZhun Certified Public Accountants	yes
6	2021.11.2	ZhongTianYun Certified Public Accountants	yes
7	2021.11.15	Zhongxingcai Guanghua Certified Public Accountants	no
8	2021.12.6	YaTai Certified Public Accountants	yes
9	2021.12.14	YaTai Certified Public Accountants	no
Panel B: Sample Selection			
Observations of the A-share client firms listed in SSE and SZSE (2020.11-2022.2)			74753
Less:			
Observations in the Financial Sector			（2050）
Observations treated by ST, ST*, PT			（3792）
Observations of financial fraud client firms which led to the auditor sanction			(32)
Observations with a listing date of 2021 or 2022			(6680)
Observations with Missing Data			(2198)
Observations that do not satisfy common support			(6266)
Final sample			53735

TABLE 3. Descriptive statistics.

Panel A: Descriptive Statistics for All Variables					
Variable	N	Mean	SD	Min	Max
Questions	53735	11.195	16.082	0	434
Investor-length	53735	655.456	1052.293	0	26180
Negative	48826	3.221	5.768	0	181
DID	53735	0.013	0.111	0	1
State	53725	0.313	0.464	0	1
Size	53735	22.398	1.277	20.109	26.482
Lev	53735	0.415	0.195	0.056	0.879
Listage	53735	2.205	0.864	0	3.367
Roa	53735	20.027	0.041	-0.138	0.172
Dual	52773	0.323	0.468	0	1
Audittyp	53735	0.01	0.098	0	1
Rename	53735	0.002	0.046	0	1
Survey	53735	0.149	0.356	0	1
Media	53735	17.564	34.577	0	266

Consistent with Nie & Jia's [9] study, the number of questions for client firm i in month t asked by investors on the exchange interactive platforms (Questions) is the dependent variable in model 1. The dependent variable (Investor-length) in model 2 is equal to the total number of words in the questions for client firm i in month t asked by investors on the exchange interactive platforms. How audit sanctions may subsequently impact the degree of investor concerns on the exchange interactive platforms is captured by the core variable, DID. It is an indicator variable equal to one for client firm-months after auditor sanction and zero otherwise. The initial sanction date was established for audit

TABLE 4. Degree of investors' concerns.

VARIABLES	(1) Questions	(2) Questions	(3) Investor-length	(4) Investor-length
DID	1.6678*	2.6800***	25.8667	97.0417**
	(1.91)	(2.97)	(0.61)	(2.22)
State		-2.4030***		-122.8153***
		(-13.01)		(-9.98)
Size		3.5519***		237.6542***
		(41.01)		(39.16)
Lev		-5.6687***		-454.2758***
		(-13.33)		(-16.08)
Listage		1.7082***		96.7251***
		(18.77)		(16.13)
Roa		-12.0044***		-978.3326***
		(-5.20)		(-6.18)
Dual		0.3302**		16.7289
		(2.10)		(1.62)
Audittyp		-0.4357		-58.5898
		(-0.73)		(-1.54)
Rename		0.8183		51.5380
		(0.62)		(0.67)
Survey		4.2415***		262.0141***
		(18.73)		(16.60)
Media		0.0512***		3.4645***
		(12.55)		(11.45)
Constant	11.1741***	-70.2952***	629.9818***	-4,728.8889***
	(165.29)	(-39.36)	(172.38)	(-37.61)
t FE	yes	yes	yes	yes
Industry FE	yes	yes	yes	yes
Observations	53,735	52,763	53,735	52,763
R-squared	0.053	0.152	0.049	0.138

Robust t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

firms that received multiple sanctions during the observation period. A significantly positive $\alpha 1$ favors the hypothesis. The coefficients of control variables are αk. The t and industry indicators absorb the majority of the DID effect.

This paper mainly refers to the studies of Barber & Odean, Fang, Ma et al [18], [19], [45], and includes other characteristic variables that may affect the degree of investors' concerns, i.e. the nature of property rights (State), firm size (Size), balance sheet ratio (Lev), age at listing (Listage), return on total assets (Roa), dual position (Dual), audit opinion (Audittyp), stock name change (Rename), institutional investor research (Survey), and the total amount of media coverage (Media). Regressions in this paper also control for industry-fixed effects and time-fixed effects.

2) THE INVESTORS' SENTIMENT MODEL

To test H2, the spillover effect of auditor sanction (DID) on negative sentiment tendencies in investors' questions (Negative) is tested with the following staggered difference-in-differences model (firm and t subscripts omitted):

$$\mathbf{Negative} = \boldsymbol{\alpha_0} + \boldsymbol{\alpha_1}\mathbf{DID} + \sum \boldsymbol{\alpha_k}\mathbf{Controls} + \mathbf{Industry} + \mathbf{t} + \boldsymbol{\varepsilon} \quad (3)$$

Sentiment analysis is an increasingly prominent field within natural language processing (NLP). Analytical methods in sentiment analysis are typically categorized into lexicon-based approaches, traditional machine learning approaches, and deep learning approaches [30]. Investors' voices on exchange online interactive platforms often contain certain sentiment tendencies. According to the existing literature, there are more scholars are using Python's SnowNLP sentiment analysis package [28], [29], which is traditional machine learning-based. In this paper, the basic architecture of the pre-trained BERT model ($\text{BERT}_{\text{BASE}}$), a kind of deep learning-based that includes 12 attention heads,12 transformer layers, and 110 million model parameters, is used for the final sentiment analysis [30], [57], [58]. Since $\text{BERT}_{\text{BASE}}$ is a general-purpose language model designed for a wide range of NLP tasks, its performance in financial sentiment

analysis may be limited. Therefore, in this study, the model was fine-tuned using financial-domain data derived from investors' voice on the exchange online interactive platforms, in order to develop a BERT variant tailored to the specific needs of this study. After fine-tuning, the model achieved an accuracy of 86%, indicating improved suitability for sentiment classification in the financial context.

The following are the specifics of the approach: first, investors' questions on the exchange online interactive platform during the observation period, i.e. 777,849 items, were downloaded. Second, 2,000 items were randomly selected for manual judgment, in which the negative sentiment tendency is assigned as 0, otherwise is 1. Thirdly, the adopted $\text{BERT}_{\text{BASE}}$ model was fine-tuned and evaluated on the question benchmark corpus comprising 2,000 items annotated with two primary sentiment categories, in order to develop a $\text{BERT}_{\text{BASE}}$ variant closely aligned with the specific characteristics of the study's data set. Finally, the well-trained BERTBASE model was used to judge the sentiment tendency of 777,849 items one by one. The explanatory variable Negative is equal to the sum of the number of questions with negative sentiment tendencies received by client firm i during period t.

The explanatory variable, DID, reflects the subsequent impact of audit sanctions on the negative sentiment tendencies in investors' questions. Definitions for the DID variable remain consistent with prior specifications, and a significantly positive $\alpha 1$ would provide support for H2. Model 3 includes the same control variables as specified in Model 1.

The definitions of variables are summarized in Table 1.

B. SAMPLE AND DATA

Considering that investors' voice behavior against auditor sanctions is highly time-sensitive, this study considered monthly data as the sampling frequency. In addition, given that in recent years, the CSRC issued the largest number of auditor sanctions in 2021 compared to other years,[2] this study manually collected a total of 9 auditor sanction announcements issued by the CSRC in 2021. For firms that were penalized multiple times during this year, the first time these firms were penalized was considered as sanctioned. Excluding audit firms with repeated penalties, the final number of sanctioned audit firms was 6. Panel A of Table 2 describes the distribution of auditor sanctions by month in 2021. In order to have at least two months of observations each before and after the auditor sanctions, this study selected the firm-month of all A-share firms listed on the SSE and SZSE from November 2020 to February 2022 as the initial research sample. The initial sample was processed according to the following principles: firms in the finance and insurance category were excluded; listed companies with ST and PT were excluded; firms with financial fraud resulting in audit sanctions were excluded; firms whose first listing was in 2021 or 2022 were excluded; and client firm-month with missing important variables were excluded.

In addition, this paper mainly focused on the estimation results of the coefficient $\alpha 1$ of the core variable DID, while the endogenous threat of reduced identification also lies in the sample selection bias problem. Therefore, this paper considered clients audited by sanctioned auditors as the treatment group, and clients audited by non-sanctioned auditors as the control group. Propensity score matching was used to match the control group and the treatment group. Based on eight

[2]The number of CSRC sanction announcements against audit firms from 2018-2022, respectively:5,4,2,9,9.

TABLE 5. Investors' sentiment.

VARIABLES	(1) Negative	(2) Negative
DID	0.3203	0.5081*
	(1.13)	(1.70)
State		-0.6066***
		(-8.16)
Size		1.2230***
		(34.96)
Lev		-2.1697***
		(-12.94)
Listage		0.3950***
		(11.64)
Roa		-7.2149***
		(-8.12)
Dual		0.1145*
		(1.93)
Audittyp		0.3782
		(1.37)
Rename		-0.1831
		(-0.43)
Survey		0.7361***
		(9.21)
Media1		0.0164***
		(10.75)
Constant	3.2176***	-24.2649***
	(125.06)	(-33.51)
t FE	yes	yes
Industry FE	yes	yes
Observations	48,826	47,946
R-squared	0.034	0.113

Robust t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

TABLE 6. Results of goodman-bacon decomposition.

"2×2" Grouping type of DID	weights	DD Estimate
Earlier T vs. Later C	0.010	0.069
Later T vs. Earlier C	0.003	2.393
T vs. Never treated	0.987	0.625

T = Treatment; C = Comparison

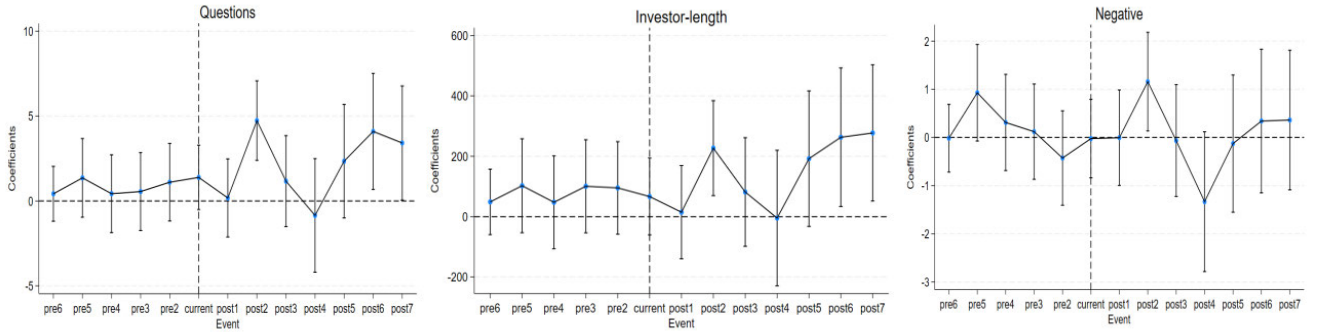
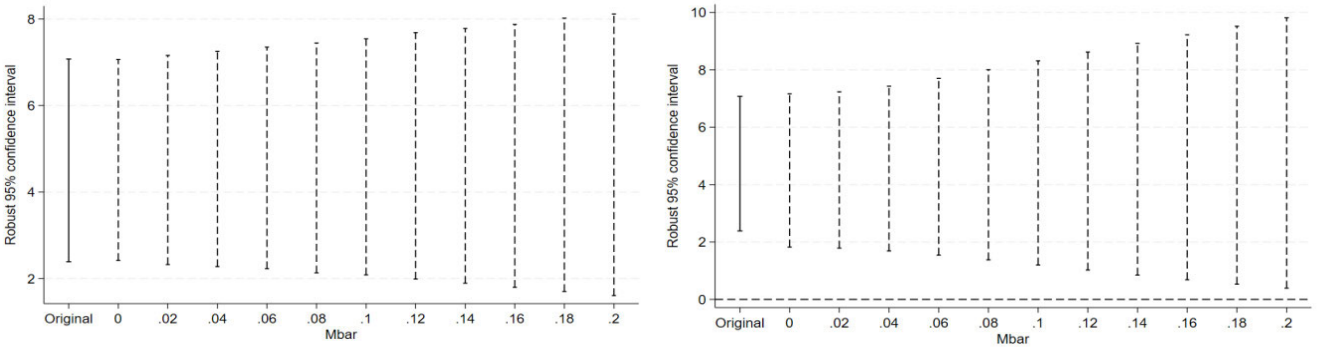


FIGURE 1. Parallel trend test.



(a)The relative deviation restriction (b)The smoothing restriction

FIGURE 2. Sensitivity analysis of parallel trends.

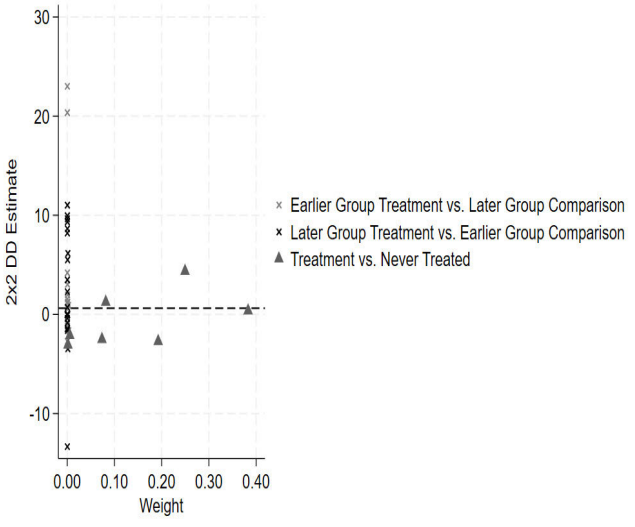


FIGURE 3. Goodman-bacon decomposition.

matching variables of company size(size), industry(industry), gearing(lev), profitability(roa), growth (TobinQ), listing age (Listage), audit opinion (Audittyp), and institutional investor share ownership (Inhold), the treatment group was matched using the radius matching having a put-back sampling method with a matching radius of 0.001 month by month. After re-matching, the differences in the sample mean of the matched variables between the treatment and control groups were within 11%, and the p-values of the differences were not significant at the 10% level, indicating that the samples of the treatment and control groups were balanced. The final result was 53,735 client firm-month samples of 16-period unbalanced panel data. The sample selection process is shown in Panel B of Table 2. The results of the balance test after PSM are shown in Appendix A.

Data pertaining to auditor sanctions were manually collected from the administrative penalty announcements published on the official website of the China Securities Regulatory Commission (http://www.csrc.gov.cn). Data on investors' concerns were obtained in three steps: first, the raw daily data of all questions on SSE e-Interactive and Interactive Ease for the period of 2020.11-2022.2 were obtained from the CNRDS database; second, the number of questions and the number of words in the questions were manually counted; finally, the sentiment tendency was analyzed via the $\text{BERT}_{\text{BASE}}$ model using PyCharm software equipped with Python language. Data on the media coverage for the client firm-month were compiled from daily data available in the CNRDS database. The financial data related to the firms were obtained from the CSMAR database. The econometric analysis software for this paper was STATA 18.0.

C. DESCRIPTIVE STATISTICS

Table 3 shows the full-sample descriptive statistics. The maximum number of questions asked on the online interactive platform in a client's firm-month is 434, and the average

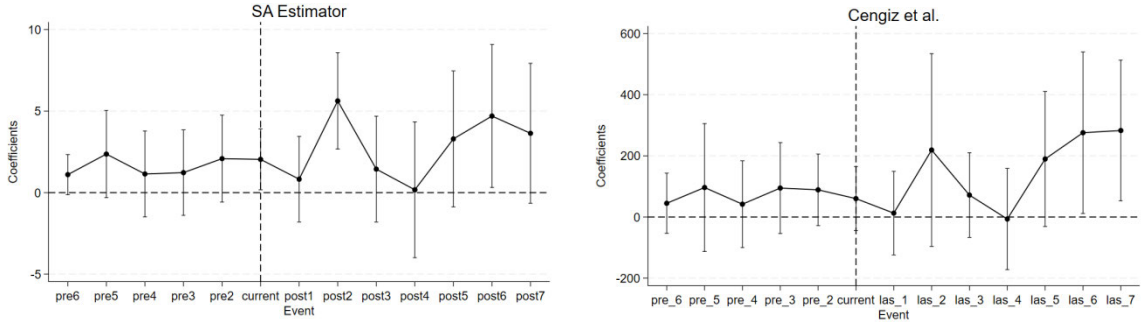


FIGURE 4. The result of sun & abraham and cengiz et al. estimator.

TABLE 7. Exclusion samples with institutional survey or stock name changes.

Panel A: Exclusion samples with institutional survey			
	(1)	(2)	(3)
VARIABLES	Questions	Investor-length	Negative
DID	2.7617***	97.4601**	0.5221*
	(2.90)	(2.13)	(1.65)
Constant	-63.8384***	-4,259.3408***	-21.8091***
	(-36.80)	(-35.66)	(-30.26)
All Control Variables	yes	yes	yes
t FE	yes	yes	yes
Industry FE	yes	yes	yes
Observations	44,841	44,841	40,382
R-squared	0.132	0.121	0.099
Panel B: Exclusion samples with stock name changes			
	(1)	(2)	(3)
VARIABLES	Questions	Investor-length	Negative
DID	2.6832***	97.1698**	0.5026*
	(2.96)	(2.22)	(1.68)
Constant	-70.2617***	-4,727.1575***	-24.2791***
	(-39.28)	(-37.52)	(-33.46)
All Control Variables	yes	yes	yes
t FE	yes	yes	yes
Industry FE	yes	yes	yes
Observations	52,656	52,656	47,845
R-squared	0.153	0.138	0.113

Robust t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

number of questions is 11.195. The number of words in the questions in a client's firm-month is up to a maximum of 26,180 words, and the average is 655.456 words. The number of questions with a negative sentiment tendency is up to a maximum of 181. Such descriptive findings suggest that online interactive platforms are important for minority shareholders to voice their concerns. Prior studies suggest the average annual number of questions and words in the questions for firms on the exchange online interactive platforms that are able to play an important governance role are 25.41 and 5542 respectively [9], [59]. The monthly average number of questions of 11.195 and words of 655.456 when extrapolated into annual data suggest that the online voice of investors plays an important governance role for firms included in the sample of this study. The control variables are within reasonable limits.

V. RESULTS

A. THE SPILLOVER EFFECT OF AUDIT SANCTIONS ON THE DEGREE OF INVESTORS' CONCERNS

Columns 1 and 2 in Table 4[3] show the regression results of Model 1. The coefficient of the core variable DID in column 1 is 1.6678, which is positive and marginally significant,

[3]In the regression of column (2)(4) in Table 4, among all the variables, the maximum correlation between every two variables is 0.523, and the variance inflation factors (VIFs) for these variables are below 2. Therefore, there is no significant multicollinearity problem. The results are shown in Appendix B.C.E.

TABLE 8. Sensitivity analysis of owner of clients.

Panel A: Non-state-owned clients			
	(1)	(2)	(3)
VARIABLES	Questions	Investor-length	Negative
DID	3.2345***	110.8893**	0.5684
	(2.73)	(2.00)	(1.49)
Constant	-82.1296***	-5,484.4823***	-27.9839***
	(-34.28)	(-32.86)	(-28.49)
All Control Variables	yes	yes	yes
t FE	yes	yes	yes
Industry FE	yes	yes	yes
Observations	36,652	36,652	33,263
R-squared	0.170	0.160	0.140
Panel B: State-owned clients			
	(1)	(2)	(3)
VARIABLES	Questions	Investor-length	Negative
DID	1.6924	90.0014	0.4660
	(1.40)	(1.31)	(1.10)
Constant	-53.8755***	-3,749.6952***	-19.9295***
	(-19.37)	(-18.38)	(-17.41)
All Control Variables	yes	yes	yes
t FE	yes	yes	yes
Industry FE	yes	yes	yes
Observations	16,111	16,111	14,683
R-squared	0.157	0.133	0.093

$p<0.10$. The explanatory strength of the model is 5.3%. The results with the inclusion of control variables are in column 2, and the coefficient of the core variable DID is 2.6800, which is positive and highly significant, $p<0.01$. H1a is supported; auditor sanctions significantly increase the number of questions asked on online interactive platforms. The explanatory strength of the model is significantly improved to 15.2%. Both regressions absorb industry and time fixed effects and use robust standard errors.

The regression results for Model 2 are shown in the columns 3 and 4. The regression model includes industry and time fixed effects and uses robust standard errors. Without the control variables, the coefficient on the core variable DID is 25.8667, which is not significant and the explanatory strength of the model is low, 4.9%. With the inclusion of the control variables, the explanatory strength of the model is improved at 13.8% as shown in column 4. The coefficient of DID, 97.0417, is positive and significant, $p<0.05$. H1b is supported; auditor sanctions increase the number of words in the questions asked by investors on online interactive platforms.

Control variables like the size of firms, listing time, institutional research, dual position, and media coverage are positively correlated with the number of questions and the number of words in the questions asked, while the nature of the firms, the gearing ratio, and the return on total assets are negatively correlated. Such results are consistent with those of prior literature [19], [45].

B. THE SPILLOVER EFFECT OF AUDIT SANCTIONS ON THE INVESTORS' SENTIMENT

Table 5[4] presents the regression results of Model 3, regressed with industry and time fixed effects and used robust standard errors. The inclusion of control variables saw the explanatory strength of the model increase from 3.4% to 11.3% and the coefficient of the core variable DID is 0.5081, $p<0.10$. H2 is marginally supported; auditor sanction increases the number of questions with negative sentiments.

Control variables like firm size, listing time, dual position, institutional research, and media coverage are positively correlated with the number of questions with negative sentiments, while the nature of the company, gearing ratio, and return on total assets are negatively correlated. Such results are consistent with those in Table 4 as well as in prior literature [19], [45].

C. PARALLEL TREND TEST AND SENSITIVITY ANALYSIS OF PARALLEL TRENDS

1) PARALLEL TREND TEST

The assumption of parallel trend is one of the basic conditions for the application of difference-in-difference. In this paper, the examination period is set as 6 periods before to

[4]In the regression of column (2) in Table 5, among all the variables, the maximum correlation between every two variables is 0.523, and the variance inflation factors (VIFs) for these variables are below 2. Therefore, there is no significant multicollinearity problem. The results are shown in Appendix D.E.

TABLE 9. Sensitivity analysis of HHI.

Panel A: HHI_High			
	(1)	(2)	(3)
VARIABLES	Questions	Investor-length	Negative
DID	2.7588***	85.9620*	1.1185***
	(3.01)	(1.84)	(2.69)
Constant	-58.1123***	-4,161.8510***	-22.1151***
	(-26.51)	(-25.06)	(-22.40)
All Control Variables	yes	yes	yes
t FE	yes	yes	yes
Industry FE	yes	yes	yes
Observations	26,256	26,256	23,318
R-squared	0.139	0.135	0.124
Panel B: HHI_Low			
	(1)	(2)	(3)
VARIABLES	Questions	Investor-length	Negative
DID	1.6407	52.3518	0.0628
	(1.21)	(0.80)	(0.15)
Constant	-93.6894***	-6,017.5198***	-29.7851***
	(-32.15)	(-30.47)	(-27.04)
All Control Variables	yes	yes	yes
t FE	yes	yes	yes
Industry FE	yes	yes	yes
Observations	26,507	26,507	24,628
R-squared	0.185	0.163	0.123

7 periods after the event, and 1 period before the event is set as the base period. Ex-ante parallel trends are tested through the event study method, in order to examine whether clients of sanctioned auditors (treatment group) and clients of non-sanctioned auditors (control group) are not significantly different or have the same trend of change before auditor sanctions. With reference to the event study method, this study tests the common trend hypothesis using the following equation.

$$\mathbf{Questions/Investor-length/Negative} = \alpha_0 + \sum_{m\geq -6, m\neq -1}^{7} \alpha_m D^m + \sum \alpha_k \mathbf{Controls} + \mathbf{Industry} + \mathbf{Month} + \varepsilon$$

where D^m indexes the event of auditor sanction (dummy variable). Assuming that the auditor sanction month of client firm i is y_i, make $m=t-y_i$; when $m\leq -6$, $D^{-6}=1$, otherwise 0; sequentially, when m=-5, -4…,6, the corresponding $D^m=1$, otherwise 0; when $m\geq 7$, $D^7=1$, otherwise 0. In addition, this study uses 1 month prior to the auditor sanction as the base period, so the dummy variable D^{-1} is not included in the above equation.

Figure 1 shows the results of the parallel trend at a 95 confidence interval. This result shows that before auditor sanctions, none of its estimates of investors' concern were significant, and the coefficient value changed more gently and tended to 0, so it can be seen that the parallel trend hypothesis is valid.

2) SENSITIVITY ANALYSIS OF PARALLEL TRENDS

Recent literature related to the difference-in-difference approach has pointed out that the traditional parallel trend test may suffer from insufficient statistical power [60]. In response, Rambachan & Roth [61] proposed a sensitivity test for the degree of deviation from the parallel trend in the treatment effect estimates. In this paper, referring to

TABLE 10.

		2020.11		2020.12		2021.1		2021.2	
Variable		%bias	p>|t|	%bias	p>|t|	%bias	p>|t|	%bias	p>|t|
size	U	-9.800	0.291	-13.500	0.156	-12.800	0.162	-12.800	0.162
	M	0.000	0.998	-0.800	0.947	-7.900	0.514	-6.300	0.603
lev	U	16.800	0.050	8.800	0.326	18.000	0.035	18.000	0.035
	M	-3.100	0.807	-3.800	0.771	-6.100	0.629	-4.600	0.716
Listage	U	29.000	0.002	21.100	0.025	28.600	0.002	28.900	0.002
	M	3.100	0.801	2.800	0.821	-1.800	0.878	-3.800	0.738
roa	U	-31.600	0.000	-24.900	0.003	-25.200	0.005	-25.200	0.005
	M	8.400	0.531	9.800	0.495	0.900	0.939	-0.800	0.947
TobinQ	U	4.000	0.653	6.100	0.495	1.900	0.825	1.900	0.825
	M	3.800	0.768	6.200	0.623	3.200	0.802	3.400	0.794
Audittyp	U	35.900	0.000	28.000	0.000	37.900	0.000	37.900	0.000
	M	0.000	1.000	0.000	1.000	-3.200	0.833	-3.000	0.840
Inhold	U	-33.200	0.003	-21.100	0.042	-35.600	0.001	-35.600	0.001
	M	-3.200	0.739	-4.900	0.685	-2.000	0.817	-2.800	0.746
industry	U	-2.800	0.749	1.400	0.880	9.000	0.287	9.000	0.287
	M	0.500	0.970	3.100	0.816	-2.300	0.854	3.300	0.790
		2021.3		2021.4		2021.5		2021.6	
Variable		%bias	p>|t|	%bias	p>|t|	%bias	p>|t|	%bias	p>|t|
size	U	-12.800	0.162	-12.800	0.161	-12.800	0.161	-12.800	0.161
	M	-7.400	0.551	2.200	0.853	1.900	0.874	-0.600	0.963
lev	U	18.000	0.035	17.800	0.037	17.800	0.037	17.800	0.037
	M	-6.400	0.617	-1.600	0.901	-1.200	0.928	-2.900	0.821
Listage	U	28.600	0.002	28.700	0.002	28.200	0.002	28.500	0.002
	M	-3.200	0.786	-2.600	0.819	-1.100	0.921	-2.300	0.840
roa	U	-25.200	0.005	-32.200	0.000	-32.200	0.000	-32.200	0.000
	M	1.300	0.913	7.400	0.549	6.400	0.595	10.800	0.370
TobinQ	U	1.900	0.825	4.800	0.568	4.800	0.568	4.800	0.568
	M	3.300	0.802	3.100	0.807	7.800	0.526	1.500	0.905
Audittyp	U	37.900	0.000	37.500	0.000	37.500	0.000	37.500	0.000
	M	-3.100	0.828	3.700	0.789	1.200	0.933	4.600	0.720
Inhold	U	-35.600	0.001	-34.300	0.002	-34.300	0.002	-34.300	0.002
	M	-3.200	0.709	-3.300	0.715	-2.400	0.793	-3.900	0.675
industry	U	9.000	0.287	9.300	0.266	9.300	0.266	9.300	0.266
	M	1.000	0.937	1.600	0.898	2.500	0.844	-2.900	0.820
		2021.7		2021.8		2021.9		2021.10	
Variable		%bias	p>|t|	%bias	p>|t|	%bias	p>|t|	%bias	p>|t|
size	U	-13.600	0.139	-13.600	0.139	-13.600	0.139	-15.300	0.093
	M	1.600	0.892	2.400	0.845	-0.200	0.988	0.200	0.988
lev	U	17.200	0.047	17.200	0.047	17.200	0.047	17.100	0.044

TABLE 10. *(Continued.)*

	M	-1.900	0.881	-0.200	0.986	-2.300	0.858	-3.400	0.790
Listage	U	29.400	0.002	28.900	0.002	29.300	0.002	28.500	0.002
	M	-3.600	0.753	-4.200	0.719	-5.100	0.658	-2.900	0.797
roa	U	-31.000	0.000	-31.000	0.000	-31.000	0.000	-33.300	0.000
	M	2.100	0.862	1.100	0.927	3.600	0.776	5.400	0.681
TobinQ	U	7.000	0.401	7.000	0.401	7.000	0.401	9.000	0.275
	M	-0.200	0.989	-1.400	0.911	1.000	0.940	1.000	0.942
Audittyp	U	37.700	0.000	37.700	0.000	37.700	0.000	37.600	0.000
	M	3.700	0.801	3.700	0.796	4.100	0.783	3.400	0.816
Inhold	U	-26.900	0.010	-26.900	0.010	-26.900	0.010	-27.600	0.006
	M	-3.200	0.753	-4.300	0.673	-5.300	0.602	-3.700	0.714
industry	U	9.300	0.269	9.300	0.269	9.300	0.269	9.300	0.268
	M	2.100	0.866	0.300	0.978	-5.700	0.657	-2.800	0.824
		2021.11		2021.12		2022.1		2022.2	
Variable		%bias	p>|t|	%bias	p>|t|	%bias	p>|t|	%bias	p>|t|
size	U	-15.300	0.093	-15.300	0.093	-13.800	0.127	-13.800	0.127
	M	-4.000	0.750	2.000	0.867	2.500	0.832	0.200	0.986
lev	U	17.100	0.044	17.100	0.044	14.100	0.089	14.100	0.089
	M	-3.100	0.810	0.900	0.946	3.300	0.791	-2.100	0.866
Listage	U	28.700	0.002	28.300	0.002	29.700	0.001	30.200	0.001
	M	-1.600	0.894	-1.700	0.883	-1.300	0.913	-1.400	0.901
roa	U	-33.300	0.000	-33.300	0.000	-29.500	0.001	-29.500	0.001
	M	6.500	0.619	2.500	0.849	0.600	0.955	1.400	0.896
TobinQ	U	9.000	0.275	9.000	0.275	1.800	0.834	1.800	0.834
	M	4.100	0.745	0.900	0.946	0.400	0.969	0.600	0.962
Audittyp	U	37.600	0.000	37.600	0.000	38.900	0.000	38.900	0.000
	M	-1.100	0.938	1.900	0.897	2.300	0.867	3.100	0.830
Inhold	U	-27.600	0.006	-27.600	0.006	-26.000	0.012	-26.000	0.012
	M	-3.300	0.744	-2.500	0.801	-1.700	0.851	-0.100	0.989
industry	U	9.300	0.268	9.300	0.268	17.700	0.029	17.700	0.029
	M	-1.700	0.898	-2.500	0.846	-1.500	0.902	-1.900	0.882

Biasi & Sarsons [62], Mbar=1× standard error was set as a standard error, and sensitivity analysis of the parallel trend hypothesis was conducted on the impact of auditor sanctions on investors' concerns. Based on the test results in Figure 1, this study sets matrix1= (0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0), to verify the sensitivity of the impact of auditor sanctions on investors' concerns. The parallel trend remains robust under the relative deviation restriction (a) and the smoothing restriction (b) (Figure 2), suggesting that auditor sanctions continue to significantly affect investors' concern for some shock deviation.

D. TESTS AND ESTIMATION FOR HETEROGENEITY OF TREATMENT EFFECTS

Staggered DID may have heterogeneous treatment effects due to the different timing of auditor sanctions. The use of the TWFE estimator in the benchmark regression to estimate the Staggered DID model may generate potential bias [63]. Accordingly, this study first conducts a heterogeneity test of treatment effects and subsequently re-assesses the impact of auditor sanctions on investors' concerns using the staggered Difference-in-Differences (DID) robust estimator to ensure the robustness of the conclusions.

1) TESTS FOR HETEROGENEITY OF TREATMENT EFFECTS

To test for possible bias in the estimation results, this paper performs a bacon decomposition with reference to Goodman-Bacon's [63] study to compute coefficient values and weights for each group. The total DID estimator is decomposed into this paper three groups: (1) ''client firms of early sanctioned auditors (treatment group) vs. client firms of late sanctioned auditors (control group)''; (2) ''client firms of late sanctioned auditors (treatment group) vs. client firms of early sanctioned auditors (control group)''; and (3)'' client firms of sanctioned auditors (treatment group) vs. client firms of never sanctioned auditors (control group).'' The control group in the second group is also referred to as the ''bad control group'', which contains treatment effects.

As shown in Table 6, the total DID estimation is 0.625, and the decomposition results further show that the weight of the 2×2 DID estimation for the group of ''client firms of late sanctioned auditors (treatment group) vs. client firms of early sanctioned auditors (control group)'' is only 0.3%. The bias of the estimation results obtained from the two-way fixed effects model is small, indicating that the estimation results obtained from the two-way fixed effects model do not generate a large bias.

The bacon decomposition is visualized in Fig. 3, where the horizontal axis represents the weights, the vertical axis represents the individual DD estimates, and the horizontal line represents the total TWFE estimate of 0.625. The black X for ''post-processing vs. pre-processing'' has a small weight, and thus does not have much impact on the estimates obtained using the TWFE, which further illustrates the robustness of the benchmark results.

2) STAGGERED DID ROBUST ESTIMATOR

Considering the presence of heterogeneity in Staggered DID, this section further re-assesses the impact of auditor sanctions on investors' concerns using the robust estimator of the S-A estimator proposed by Sun & Abraham [64] and the stacked estimator proposed by Cengiz et al [65]. Since these two robust statistics are statistics that are adjusted to be free from heterogeneity in treatment effects, the use of this statistic effectively mitigates estimation bias due to heterogeneity in treatment effects and improves the reliability of the benchmark results. The results of the S-A estimator and the stacked estimator are shown in Fig. 4. The results show that the confidence intervals for all periods prior to the auditor sanctions include 0, and following the event there are periods that are significantly greater than 0 at the 95% confidence level. This suggests that the estimation using the Staggered DID robust statistic excludes the ''bad control group'' problem and still yields conclusions consistent with the benchmark results.

E. OTHER ROBUSTNESS TESTS

1) AVOIDING INVESTORS' CONCERNS CAUSED BY INSTITUTIONAL SURVEY

Ma et al [19] measured investors' concerns based on the investor interaction data of Interactive Easy, this study showed that the institutional survey can attract the attention of minority shareholders. The full sample data includes 8011 client firm-month observations with institutional survey behavior. These observations are inherently more prone to attract investors' concerns. Therefore, deleting these 8011 observations and running the regression again, the results in Panel A of Table 7 show that the conclusions are still consistent with the benchmark results.

2) AVOIDING INVESTORS' CONCERNS CAUSED BY STOCK NAME CHANGES

Using the Baidu Search Volume (BSV) index to measure investors' concerns, Fang [18] finds that stock name change events can attract limited attention from investors. In the full sample data, there are 112 client firm-month observations that have changed their stock names. Therefore, these 112 observations are deleted and the regression is run again, and the results in Panel B of Table 7 illustrate that consistent conclusions with the benchmark results are still obtained.

F. SENSITIVITY ANALYSES

This study conducts a difference in ownership nature test and a difference in shareholding concentration test.

Due to the special institutional context in China, there are large differences between non-state-owned enterprises and state-owned enterprises (SOE). For normal investors, SOEs have the guarantee of the state's credibility and financial strength, which weakens the signaling value of auditor sanctions. On the other hand, non-state-owned enterprises are unable to enjoy this government protection effect and have to bear higher market risks, and to a greater extent are subject to the market reaction brought about by the disclosure of information. As a result, they are vulnerable to the impact of the auditor sanctions as a signal of reputation damage. Therefore, based on the above analysis, this paper argues that auditor sanctions can have a greater adverse spillover effect on non-state-owned firms than state-owned firms. Based on the nature of the enterprise, the sample is divided into SOE group and non-SOE group, and regression is carried out for hypothesis 1 (model 1 and model 2) and hypothesis 2 (model 3) in the two sub-samples. The regression results are shown in Table 8.

Columns 1 and 2 in panel A and panel B show the estimation results of H1, while column 3 in panel A and

panel B shows the estimation results of H2. We find that in the group of state-owned clients, none of the coefficients of DID is significant. However, in the group of non-state-owned clients, the coefficients of DID in columns 1 and 2 are positive and significant at 1% or 5% level which is consistent with expectations. These results suggest that auditor sanctions in non-state-owned firms are more likely to arouse investors' concerns compared to state-owned firms.

It has been found that high shareholding concentration tends to be accompanied by poorer levels of corporate governance in some emerging market economies [66]. Therefore, argues that client firms with higher shareholding concentration are more vulnerable to adverse shocks from auditor sanctions and are more likely to attract investors' concerns than client firms with low shareholding concentration. The sample is divided into the HHI_High group and the HHI_Low group based on the median shareholding concentration of the top three shareholders. Table 9 shows the regression results for the two sub-samples, and the coefficient of the core variable DID is insignificant in low shareholding concentration groups. However, the coefficient of DID is positive and significant at the 1% or 10% level in the high shareholding concentration group. Such results suggest that the higher the shareholding concentration of the client firms, the more likely it is to attract investors' concerns with negative sentiments in the event of an exogenous shock to the auditor sanctions.

VI. CONCLUSION

This paper investigates the spillover effects of auditor sanctions on client firms. Specifically, this paper examines the relationship between auditor sanctions and the degree of investors' concerns voiced on online interactive platforms about their client firms. Using a sample of Chinese A-share listed firms between 2020-2022, this paper finds that from the perspective of investors, the auditor sanctions can have expected adverse spillover effects on clients. The conclusions are as follows. First, auditor sanction is positively associated with the increment of the number of questions and the number of words in the questions asked by the investors about client firms on online interactive platforms. Second, auditor sanctions significantly increase the number of questions with negative sentiment tendencies. Moreover, the positive relationship between auditor sanctions and the increment of investors' voice is more pronounced when the client firm is a non-state-owned enterprise or has a higher concentration of shareholding. To further confirm the results, a series of robustness tests, i.e. parallel trend test, sensitivity test for parallel trends, as well as a Bacon decomposition test taking into account the heterogeneity of the treatment effects and the more robust S-A & stacked estimator, were conducted. Results suggest that innocent client firms not engaged in financial fraud are affected by the reputational damage caused by auditor sanctions as reflected in investors' online voice.

Based on the findings, this study further proposes the following policy recommendations. First, client firms, particularly non-state-owned enterprises or those with a higher concentration of shareholding, are advised to engage reputable auditors who have not been recently sanctioned, in order to strengthen investor confidence and send credible market signals. Second, regulatory authorities are encouraged to enhance the intensity and transparency of audit oversight, given that investors are responsive to sanction disclosures and that such responsiveness, when combined with the proven governance function of investor voice, can serve as an effective tool to reinforce audit quality. Third, for countries with relatively low litigation risk like Germany and Japan, it is recommended that stricter sanction disclosure practices be adopted and that mechanisms be developed to amplify investors' voice through official platforms, so as to reinforce market discipline and audit quality.

APPENDIX A
BALANCE TEST AFTER MATCHIN

See Table 10.

APPENDIX B
CORRELATION ANALYSIS FOR MODEL 1

See Table 11.

APPENDIX C
CORRELATION ANALYSIS FOR MODEL 2

See Table 12.

APPENDIX D
CORRELATION ANALYSIS FOR MODEL 3

See Table 13.

APPENDIX E
VARIANCE INFLATION FACTORS (VIFS) TEST

See Table 14.

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TABLE 11.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Negative	1.000											
(2) DID	-0.001	1.000										
(3) State	0.013*	-0.004	1.000									
(4) Size	0.220*	-0.006	0.370*	1.000								
(5) Lev	0.049*	0.022*	0.258*	0.523*	1.000							
(6) Listage	0.112*	0.041*	0.458*	0.491*	0.343*	1.000						
(7) Roa	-0.008	-0.040*	-0.101*	-0.005	-0.287*	-0.134*	1.000					
(8) Dual	-0.012	-0.022*	-0.311*	-0.197*	-0.127*	-0.271*	0.021*	1.000				
(9) Audittyp	0.013*	0.120*	-0.041*	0.017*	0.066*	0.044*	-0.096*	0.003	1.000			
(10) Rename	0.001	0.006	0.010	0.006	0.013*	0.016*	-0.002	-0.004	-0.005	1.000		
(11) Survey	0.061*	-0.026*	-0.113*	-0.008	-0.064*	-0.116*	0.101*	0.057*	-0.024*	0.005	1.000	
(12) Media	0.165*	-0.004	0.056*	0.324*	0.090*	0.057*	0.096*	-0.022*	0.014*	0.006	0.053*	1.000

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

TABLE 12.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Investor-length	1.000											
(2) DID	0.003	1.000										
(3) State	-0.003	-0.004	1.000									
(4) Size	0.221*	-0.006	0.370*	1.000								
(5) Lev	0.031*	0.022*	0.258*	0.523*	1.000							
(6) Listage	0.109*	0.041*	0.458*	0.491*	0.343*	1.000						
(7) Roa	0.020*	-0.040*	-0.101*	-0.005	-0.287*	-0.134*	1.000					
(8) Dual	-0.008	-0.022*	-0.311*	-0.197*	-0.127*	-0.271*	0.021*	1.000				
(9) Audittyp	-0.002	0.120*	-0.041*	0.017*	0.066*	0.044*	-0.096*	0.003	1.000			
(10) Rename	0.002	0.006	0.010	0.006	0.013*	0.016*	-0.002	-0.004	-0.005	1.000		
(11) Survey	0.115*	-0.026*	-0.113*	-0.008	-0.064*	-0.116*	0.101*	0.057*	-0.024*	0.005	1.000	
(12) Media	0.184*	-0.004	0.056*	0.324*	0.090*	0.057*	0.096*	-0.022*	0.014*	0.006	0.053*	1.000

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

TABLE 13.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Negative	1.000											
(2) DID	-0.001	1.000										
(3) State	0.013*	-0.004	1.000									
(4) Size	0.220*	-0.006	0.370*	1.000								
(5) Lev	0.049*	0.022*	0.258*	0.523*	1.000							
(6) Listage	0.112*	0.041*	0.458*	0.491*	0.343*	1.000						
(7) Roa	-0.008	-0.040*	-0.101*	-0.005	-0.287*	-0.134*	1.000					
(8) Dual	-0.012	-0.022*	-0.311*	-0.197*	-0.127*	-0.271*	0.021*	1.000				
(9) Audittyp	0.013*	0.120*	-0.041*	0.017*	0.066*	0.044*	-0.096*	0.003	1.000			
(10) Rename	0.001	0.006	0.010	0.006	0.013*	0.016*	-0.002	-0.004	-0.005	1.000		
(11) Survey	0.061*	-0.026*	-0.113*	-0.008	-0.064*	-0.116*	0.101*	0.057*	-0.024*	0.005	1.000	
(12) Media	0.165*	-0.004	0.056*	0.324*	0.090*	0.057*	0.096*	-0.022*	0.014*	0.006	0.053*	1.000

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

TABLE 14.

	(1)	(2)	(3)
Variables	Questions	Investor-length	Negative
DID	1.02	1.02	1.02
Size	1.97	1.97	1.99
Listage	1.57	1.57	1.57
Lev	1.57	1.57	1.57
State	1.39	1.39	1.38
Roa	1.16	1.16	1.17
Media	1.15	1.15	1.16
Dual	1.14	1.14	1.14
Survey	1.03	1.03	1.03
Audittyp	1.03	1.03	1.03
Rename	1	1	1
Mean	1.27	1.27	1.28

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